RELATIONSHIP OF READING ABILITY OF REMEDIAL TRACK UNIVERSITY FRESHMEN TO TEXT READABILITY AND INSTRUCTIONAL METHODOLOGY

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ELAINE E. CHERNEY

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ABSTRACT

RELATIONSHIP OF READING ABILITY OF REMEDIAL TRACK UNIVERSITY FRESHMEN TO TEXT READABILITY AND INSTRUCTIONAL METHODOLOGY

By

Elaine E. Cherney

The inability of university students to read their assigned texts with understanding has been recognized as a problem by administrators and instructors concerned with university and college reading programs. The freshman entering the university with a reading ability that is too low to effectively handle the required reading is often overwhelmed by the amount and complexity of the required readings. As institutions of higher education move toward a more open admission policy, some find it necessary to provide skill development programs for students whose reading skills are inadequate for university level reading.

The purpose of this study was to compare reading ability of university freshmen in two remedial track courses with readability of the assigned texts and instructional methodology employed by instructional staff

of the two courses. Answers were sought to the following questions:

1. Is there a significant difference between the readability level of the instructional texts used in the Fall Term 1972 American Thought and Language 101B classes and the Natural Science 181 classes at Michigan State University and the reading ability of the students?

2. Were the instructional strategies employed by the staff of the two remedial courses modified to compensate for the readability of the texts and the reading ability of the students?

3. What factors were considered by the instructional teams in the selection of text materials used in the two courses?

4. Additionally, did the final grades in the two courses reflect the reading ability of the students?

The following data was obtained: (1) grade levels of assigned texts according to application of the SMOG Grading Readability Formula and the Fry Graph for Estimating Readability, (2) the reading level placement of students as determined by the Nelson-Denny Reading Test, Form A, Revised Edition, 1962, and the MSU Reading Test, (3) teaching strategies employed by the staff and the criteria for textbook selection, and (4) a comparison of scores of the students with the final grades in

the classes through the use of the Computer Institute for Social Science Research Contingency Analyses Program (ACT).

The investigation's findings seemed to suggest that the reading ability range of the students in the two remedial courses ranged from grade level nine to grade level twelve. The readability level of the texts, which ranged from grade nine to graduate level, tended to be higher than the mean reading ability of the students. While the teaching staff of the two remedial courses did attempt to modify their teaching methodologies to some degree to compensate for the reading ability of the students, no modifications were made for the readability levels of the texts. None of the instructors applied readability formulas in the selection of texts nor were they cognizant of formal concepts of readability. Informal standards for book selection were applied such as price and adequate vocabulary load. Those students who tended to score higher on the reading tests tended to have higher final grades than the students whose reading abilities were lower.

In light of the large numbers of remedial students who are now entering universities the following recommendations were made: (1) greater utilization of a university reading consultant by content area teachers

should be encouraged; (2) placement testing should be continued so that these remedial students can be identified; (3) the development of skill remedial components within the content areas should be continued; and (4) those who are concerned with the planning and teaching of university remedial courses should be aware of readability concepts and those instructional strategies that can aid students in the clarification of reading assignments.

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CHAPTER I

THE PROBLEM

Purpose of the Study

The purpose of this study was (1) to compare the reading ability of students in the remedial sections of freshman introductory science and English classes in a large Midwestern university with the readability levels of their textbooks and (2) to determine if the teaching staff of the remedial sections adapted their instruction to the students' reading abilities and the readability level of the texts.

Justification for the Study

The inability of unversity students to read their assigned texts with understanding has been recognized as a problem by those concerned with university and college reading programs (Cartwright, 1971). Research that has dealt with the reading problems of college students has focused primarily upon specific programs and their results and the strategies employed (McDaniel, 1971; Spencer, 1970; Cartwright, 1971; Curry and Roberts, 1971; Ikenberry, Kennedy and Field, 1966; Carpenter and Sawyer, 1971; Schick, 1971, Buffone (1965).

Few studies have been concerned with the readability of assigned textbooks and their relationship to the reading level of university students. Moreover, there have been no studies which have considered the readability of assigned textbooks and their relationship to the reading level of remedial university freshmen or whether teachers of remedial sections have, indeed, been aware of the concepts of readability and reading levels and have adapted their courses appropriately.

The studies that have been conducted in the area of readability of college textbooks and reading level of the students using the texts have not been related specifically to textbooks used by poor readers in freshman remedial courses (Major, 1955; Burford, 1969; Brownrigg, 1962). These studies concluded that the readability level of the textbooks assigned to freshmen should be a significant factor in the selection of the texts, but it is not.

The significance of the present study lay in its potential for (1) increasing information about the reading ability of remedial Michigan State University freshmen, the readability of the assigned texts and the reading strategies employed by their instructors; (2) obtaining information that might contribute to the selection of textbooks and other printed material used by the faculty of the Michigan State University College's

American Thought and Language Comprehensive English 101B track and the Natural Science 181 track; (3) providing these faculties with a better understanding of the reading abilities of the students they instruct and the instructional reading strategies that may be utilized; and (4) providing information for others who might wish to investigate the problem in their own institution. Are texts used in the American Thought and Language Comprehensive English 101B track and the Natural Science 181 track comparable to the reading ability of the students who are assigned to read the texts? Are the instructional strategies utilized by the teachers of the ATL 101B sequence and the Natural Science 181 track modified or structured to compensate for the reading ability of the students and is the readability of the texts a consideration of these teaching staffs?

Rationale for the Study

The ability to handle the textbook assignments is particularly critical for the freshmen at a university. According to Dr. Larry Alexander, Director of the Department of Learning Services at Michigan State University (phone conversation, September, 1974), approximately 90 percent of instruction at universities is handled by lectures plus text reading assignments. The freshman who enters the university with a reading

ability that is too low to effectively handle the required reading is often overwhelmed by the amount and complexity of the required readings.

At Michigan State University those freshmen whose reading level falls below the 20th percentile on the Michigan State University Reading Test are required to take two remedial courses structured for students with low reading ability. These are American Thought and Language Comprehensive English 101B and Natural Science 181. Entrance into Natural Science 181 is predicated on the students being required to take ATL 101B. While remedial in nature, these two courses count toward fulfillment of the general education requirement for Freshman English and Natural Science, which all freshmen are required to take.

American Thought and Language 101B and Natural Science 181 were designed to help those students whose reading abilities were considered below the expected level of those freshmen entering the university. Further support for these students is provided by the University College's Learning Resources Center which provides an individualized learning center for reading and general study skill improvement. Both American Thought and Language 101B classes and the Natural Science 181 classes use the Center as an adjunct instructional support system.

It seemed appropriate that both the 101B and the 181 teachers and the staff of the Learning Resources Center should know the readability levels of the assigned texts and the reading abilities of the students using the texts. Moreover, knowledge of the instructional reading strategies in use by the teaching staffs would provide an invaluable source of information for those who will be designing future remedial courses for freshmen at Michigan State University.

Research on the nature of the student of the '70s (Cross, 1972) indicates that a new type of student is entering institutions of higher education. This new student, according to Cross (1972), is distinguished by past experience with failure in the American school system. If universities are to successfully cope with the new students of the '70s, then those concerned with the entering freshmen must be able to select texts that relate to the reading ability of the students; must be able to modify teaching strategies so that the student will have successful experiences in the university; must provide the necessary skill development within the framework of the remedial courses so that the student will be able to cope with other university coursework.

Research Questions

To guide the investigation the following research questions were formulated:

1. Is there a significant difference between the readability level of the instructional texts used in the fall term 1972 American Thought and Language 101B classes at Michigan State University as determined by the SMOG Readability formula and the Fry readability formula and the reading ability of the students using the texts as determined by the students' Michigan State University Reading Test scores and the results of the Nelson-Denny Reading Test scores?

2. Is there a significant difference between the readability level of the instructional texts used in the fall term 1972 Natural Science 181 classes at Michigan State University as determined by the SMOG Readability formula and the Fry readability formula and the reading ability of the students using the texts as determined by the students' Michigan State University Reading Test scores and the Nelson-Denny Reading Test scores?

3. Were the instructional strategies of the teachers in American Thought and Language 101B classes during fall term 1972 at Michigan State University modified to compensate for the reading ability of the classes?

4. Were the instructional strategies of the teachers in the Natural Science 181 classes during the

fall term of 1972 at Michigan State University modified to compensate for the reading ability of the classes?

5. What factors were considered in the selection of the text materials used in the American Thought and Language 101B classes during the fall term of 1972 at Michigan State University?

6. What factors were considered in the selection of the text materials used in the Natural Science 181 classes in the fall term of 1972 at Michigan State University?

Delimitations

Findings of this study should be considered within the limits of the subjects, measurement instruments, materials and procedures used in this investigation. The present study is limited to the readability levels of the textbooks and the reading abilities of freshmen students in specific remedial courses during the fall term of 1972 at Michigan State University.

The Subjects

The population of this study consists of those students who were enrolled in the American Thought and Language 101B classes and the Natural Science 181 classes in the fall term of 1972 at Michigan State University and for whom Nelson-Denny Reading Test scores were available.

Definitions of Terms

Reading Ability: The ability of the freshman student to read with understanding the assigned printed materials. This includes the ability to grasp the main idea, recognize details and support as used by the writer, draw inferences, make judgments, organize and synthesize the written material well enough to write papers or pass examinations over the printed materials with a passing grade. (A 2.0 grade-point average is required to graduate from Michigan State University.)

Reading Scores: The scores obtained from the Michigan State University Reading Test and the Nelson-Denny Reading Test, Form A.

Reading Level: The graded reading level assigned to written material based on the results of the application of the SMOG readability formula and the Fry readability formula to that material.

Readability: "The sum total (including the interactions) of all those elements within a given piece of printed material that affects the success a group of readers have with it. The success is the extent to which they understand it, read it at an optimum speed and find it interesting" (Chall, 1958).

Readability Formula: "A method of measurement intended as a predictive device to estimate the probable

success a reader will have in reading and understanding a piece of writing" (Klare, 1963).

Instructional Strategies: The techniques utilized by the staffs of the American Thought and Language 101B and the Natural Science 181 classes in the fall term of 1972 at Michigan State University to facilitate the students' understanding of the assigned texts and to help students understand the major concepts of the course. These strategies include specific reading instructional techniques as defined on the questionnaire designed for this study (see Appendix) as well as strategies to help students understand the content of the course without reading.

American Thought and Language 101B (ATL 101B): American Thought and Language 101B is an English composition course that uses readings in American Literature as the basis for the required composition. The 101B sequence is the first term of the remedial sequence and is designed to help students whose limited reading comprehension, inadequate vocabulary and slow reading rate make it difficult for the students to understand the literature used as the basis for college writing and to read the amount of material required at the college level (Featherstone, 1972). Students who enter Michigan State University with Michigan State University Reading Test scores below the 20th percentile and whose SAT

Verbal scores are below 409 are placed in ATL 101B. The course carries three English credits.

Natural Science 181: Natural Science 181 is an integral part of the general education program in science. It was developed to service those students whose reading and writing skills are deficient (Natural Science, 1974). It aims to bring these students to the same level of understanding as the academically advantaged student. The 181 series is predicated upon the existence of the ATL 101 series. This course carries four Natural Science credits.

Overview of the Study

Chapter II includes a critical review of the research related to university students and their reading problems, the instruments used in the study and the procedures for collecting the data.

Chapter III focuses on the precedures which include a description of the Nelson-Denny Reading Test for High School and College, the Michigan State University Reading Test, the McLaughlin SMOG Grading Readability Formula, the Fry Graph for Estimating Readability and the survey for determining instructional strategies and criteria for book selection utilized by the staffs of ATL 101B and Natural Science 181 in the fall term of 1972.

Chapter IV presents the findings and is followed by Chapter V which contains a summary of the investigation, the conclusions and general recommendations and suggestions for further study and research.

CHAPTER II

REVIEW OF THE RELATED RESEARCH

This chapter contains a critical review of the research related to college and university students and their reading problems, the procedures for collecting the data, and the instruments used in the study.

The Reading Problems of College and University Students

Extent of College and University Reading Problems

That some college students have reading problems is not a new phenomenon. Reading improvement programs in colleges and universities in the United States have existed since 1915* (Leedy, 1958). Moreover, the reading problems of college students seem extensive. In November, 1972, the National Reading Center in Washington, D.C., reported that one-third of all college freshmen that fall lacked the basic reading skills they

*For the reader interested in the history of college and university reading programs, two earlier dissertations might be useful. These are "A History of the Origin and Development of Instruction in Reading Improvement at the College Level" (Leedy, 1958) and "A Survey of College and University Reading Programs, and an Analysis of the Reading Program at the University of Oklahoma" (Buffone, 1965).

needed to meet minimal requirements for college study. Additionally, Hadley (1957) estimated that approximately 95 percent of the students who entered four-year institutions of higher education lacked adequate study skills. Included in the study skills, according to Hadley (p. 353), were inadequate reading speeds and comprehension skills which the student must have in order to successfully handle college reading assignments.

Crooks and Smith (1957) observed that students in a science curriculum simply have not learned to study. The poor reader in college science meets "scientific facts and ideas presented in long, complex sentences made up of difficult and unfamiliar new words of many syllables" (Crooks and Smith, p. 56).

Large college and university enrollments have simply magnified the problem. In recent years deficiencies in reading and study skills at the college level have been accentuated because of the increasing number of young people who continue their education at the college level (Dubois, 1969, p. 113).

That the ability to read with competence is a necessity at the college and university level is emphasized by Ratekin (1971) who states:

> There is ample evidence to indicate that the degree of success a student has in college is related to his ability to operate successfully with printed matter--to find it, read it,

> understand, remember, and reproduce its contents and organization, and to evaluate its contribution to a store of knowledge (p. 2).

The Nature of Reading Problems Experienced by College and University Students

The literature that relates to college and university students' reading problems concerns itself mostly with descriptions of various programs developed to cope with the problem. There is no tight body of research that defines the nature of the reading problems experienced by college and university students. However, in reviewing the reading problems of college and university students, the reader needs to be cognizant of the fact that no definitive explanation of the reading process has been evolved. According to Farr (1969), "research has provided no clear-cut theoretical definition of reading" (p. 2).

Various reading specialists have suggested what the reading process might include.

Bond and Tinker (1967) suggest that the reading process "involves both the acquisition of the meanings intended by the writer and the reader's own contributions in the form of interpretation, evaluation, and reflection about these meanings" (p. 27). To understand and react to what is read the reader must have certain basic reading skills.

The basic reading skills, according to Duffy and Sherman (1972, pp. 1-3), extend in a hierarchy from the simple to the complex. The hierarchy of skills include readiness, word recognition and comprehension. The successful reader would be one who has attained competency in each of the skills in the hierarchy.

Dechant (1970, p. 26) argues that reading is more than a skill to be learned. It is a conceptual and thinking process. Reading and thinking, according to Dechant, are "inseparable processes when the printed word provides the stimulus for thought" (p. 26).

Russell and Fea (1963, p. 868) divide the reading act into two processes: (1) identifying the symbol and (2) obtaining meaning from the recognized symbol.

Whatever reading definition is adhered to, the reading problems of college and university students seem to focus around the general inability to think about what is read. To say that these students cannot read is incorrect. The research would seem to indicate that, while the student who enters the university with low reading ability has much difficulty in handling the assigned text readings, the student can usually get the literal meaning of what is read. Based on the hierarchy of reading skills (Duffy and Sherman, 1972), these students have learned to decode, to recognize main ideas, and to handle vocabulary to some degree. What they

cannot do is read in a critical fashion or think about what is read. These students cannot evaluate and pass judgment upon the material (Smith, 1969).

Reading at the college level, concluded a group of panelists at the International Reading Association in 1956, "is an extension of the skills which, presumably, the student has been developing all through the grades" (Gray and Larrick, p. 174).

Twelve areas of reading deficiency symptoms characteristic of high school and college disabled readers are listed by McDonald (1967, p. 251). These are (1) general vocabulary lacks, (2) poor spelling, (3) deficiencies in word sense, (4) weakness in word recognition and structural analysis, (5) self-concept of being a poor reader, (6) desire for more speed, (7) lack of retention, (8) inability to concentrate, (9) tendency to give equal stress and value to every word, (10) search for the one best way to read, (11) procrastination and cramming and (12) reading causing nervousness, restlessness, fatigue, etc.

Schleich (1969, p. 64) suggests that college students need an effective, over-all approach to the reading task. The college student must be able to classify, analyze, interpret, infer, make judgments and criticize the assigned reading materials.

Halfter and Douglas, of the DePaul University reading program, conclude that the reading skills should be operationally defined as "thinking" skills rather than comprehension (Halfter and Douglas, 1958, p. 42). Their conclusions are based on the results of eight years of a carefully controlled testing and reading improvement program at DePaul University. They noted that those students who received training in specific content area thinking-reading skills seemed to earn better grades than those students who received training in reading courses which emphasized speed training, phonics or vocabulary (Halfter and Douglas, 1958, pp. 43-44).

Five levels of thinking/reading skills are described by Halfter and Douglas (pp. 45-51). These are:

Level 1	Ability to recognize the author's deductive conclusion or to infer one when the facts are inductively presented.
Level 2	Ability to think through statements of positive judgments presented in a negative manner.
Levels 3 and 4	Ability to reconcile the author's conflicting viewpoints into an integral theory. Recognize adversative propositions.
Level 5	Ability to recognize the dilemma or paradox the writer is presenting and solve this with the author by making a complex and qualified decision.

Although the writers limited their experimentation to social studies content and to the School of Commerce

at DePaul University, they concluded that these skills are probably common to other college and university content areas (Halfter and Douglas, 1958, p. 51).

We may conclude that while there is not a large body of research that defines the nature of college and university students' reading problems, the literature does indicate that these students cannot think about what is read. It would seem that students at the college and university level can decode but not process.

Research Related to the Procedures for Collecting the Data

There is little research while deals with the readability of textbooks used for instruction at four-year institutions of higher education and the reading levels of students using the textbooks. Research that compares the readability of textbooks with the reading level of the students using them in universities and then considers the instructional strategies of the teachers as they relate reading ability and readability is nonexistent. Yet, the relationship between the difficulty of reading material and the reading ability of students assigned to read it, presents one of the most pressing problems for those who rely upon printed materials for instruction (Hagstrom, 1971).

Community College

The largest segment of the literature that looks at the readability level of texts and the reading ability of students who use the texts is to be found at the community college level. Because the author's research is concerned with comparing the reading ability of freshmen students in remedial courses with the readability of texts assigned to such students at a university, it was felt that the research done at the community college level would have some applicability.

Gibson (1971) compared the reading scores of community college students with the readability level of their English textbooks. The study was limited to seven sections of English classes in one community college in southeast Los Angeles. Gibson concluded that the readability levels of most reading materials selected for the community college's English classes did not coincide with the reading ability of the students in the classes. He concluded further that most of the instructors were not adequately informed as to the difficulty level of the texts or the reading ability of the students in the classes. Gibson used the Gunning FOG Index Readability Formula, the McLaughlin SMOG Grading Readability Formula, and the Fry Graph for Estimating Readability to determine the readability levels of the textbooks in the selected classes. The

Nelson-Denny Reading Test and an informal reading inventory were used to determine the reading ability of the students. The population of the study was 200 students in seven classes. The seven classes were selected by a sample of convenience (Gibson, p. 50). In Gibson's research, remedial reading and developmental reading classes were excluded.

Terry Cline (1971) compared the readability levels of 17 textbooks used in a junior college in Missouri with the reading level of the students assigned to the textbooks. Cline noted that the mean reading ability of the students included in the study was grade 12.6 while the mean readability of the textbooks in the study was grade 13. In 14 of the 17 textbook/class comparisons, 33 percent of the students had reading abilities below the grade placement of the assigned textbooks (Cline, 1971, p. 8).

Cline justifies his use of a single readability formula by quoting Bormuth (1968) who concludes, based on his research, that a single readability formula can be used at almost any level of reading ability.

Jon Hagstrom (1971) used the Dale-Chall formula to determine the readability level of textbooks used in 16 classes at Columbia Junior College. Hagstrom found that 14 of the 16 textbooks were one grade level above the mean reading ability of the students using the texts.

Three hundred and fifty-nine students took the Diagnostic Reading Test--Form A, and 35.9 percent of these students were reading at grade levels 10-12; 19.1 percent were at a junior high reading level and 11.4 percent were reading below grade level 7. In five of the classes Hagstrom found the reading levels of the students ranged between grades 10 to 12.2 while the readability level of the textbooks was grade level 16.

Hagstrom (p. 2) states that his study is not research looking for application but an application looking to answer some questions within a community college setting. Hagstrom quotes Beldent who states:

> if course materials are on a level above the reading skill of the students, frustration, anxiety and failure result. Without a doubt, the relationship between the difficulty of material and the reading ability of the students present one of the most pressing problems for those who rely upon printed material for learning experiences (p. 4).

Dorinda McClellan (1970) used the Dale-Chall formula to ascertain the readability level of texts used in 20 classes at Hillsborough Junior College. The Nelson-Denny--Form A Revised Edition was used to determine the reading ability of 358 students in the classes. Of the 358 students who took the Nelson-Denny Reading Test, 30 percent were at the appropriate reading level of grade 13. Thirty-four percent of those tested were slightly below grade level and 36 percent

were considerably below the required grade level (p. 1). Sixty-four of the students tested had a reading level of grade 13.8; 44 of the students had a level of grade 13. One hundred and twenty had a reading grade level between grades 10 to 12; 115 had a reading level of grades 7 to 9 and 15 of the students were below grade level 7 (p. 2). McClellan claimed that her results were consistent with the estimates that 95 percent of the college entrants lack adequate reading/study skills (p. 2).

McClellan computed a difference score for each student by subtracting the reading level score from the readability level of the textbooks (p. 5). She also ran a "Z" test to see if the differences between the readability levels of the textbooks and the reading levels of the students were statistically significant and concluded that they were.

Of the 20 textbooks that McClellan analyzed, eight had readability levels of grade 16 plus and four had levels of grade 13 to 15. These particular textbooks were used in remedial or nonacademic type courses (p. 5).

Gibson (1971), Cline (1971), Hagstrom (1971) and McClellan (1970) all concluded that the staffs of the community colleges in which they conducted their research were not aware that printed materials could

have readability levels that might be higher than the reading ability of the students using the texts. The researchers further indicated that instructional strategies in use by the faculties of the community colleges would have to be changed so that students could cope with the reading assignments. The researchers did not, however, survey the faculties of the various community colleges to see if any adjustments were being made to handle the discrepancies between the readability levels of the assigned texts and the reading ability of the students reading the texts. Recommendations were made for more careful textbook selection.

The University

Three doctoral studies that considered the readability level of college or university assigned texts and then compared the readability level with the reading ability of the students assigned to read the texts were available.

Major (1955) determined the readability level of the most preferred college general biology textbooks in use at the time of his study to see if the textbooks were within the estimated reading comprehension level of the freshmen students using the books. Major also attempted to determine the manner in which the readability elements of biology material should be altered to achieve maximal comprehension.

Major used the Rudolph Flesch Reading East formula to estimate the readability level of the biology textbooks. The population of the study consisted of about 200 liberal arts freshmen who were not likely to major in the biological sciences. The students were randomly divided into three groups with approximately the same number of average, above average and below average students in each group. Major did not clarify how the reading levels were determined.

Major found that above average students would probably encounter difficulty in reading 32.8 percent to 70.8 percent of the material; average students would encounter difficulty with 53.6 percent to 84.7 percent of the reading assignments.

As part of his procedure, Major (1961, p. 218) sent a questionnaire to 168 colleges to determine the most extensively used college biology textbooks during the year 1953-54. The ten most extensively used and preferred textbooks were anlyzed in the study. To determine the readability scores, 100 word samples were taken from every tenth page. The lowest had a grade level estimate of fifth grade and the highest that of the graduate level in college. None of the textbooks had a "human interest" score as determined by the Flesch formula (Major, 1961, p. 219). Major contends that Flesch considers this lack of "human interest" to

be true of most textbooks (1961, p. 229). Major reported the syllable index, average sentence length and readability score for each sample. Additionally, the mean readability score and standard deviation of the sample from each textbook was calculated (Major, 1961, p. 220).

Major concluded that the average readability level of general biology textbooks in his study were written at least two grade levels above the reading comprehension of college freshmen of "average" ability (Major and Collette, 1961, p. 222).

As part of his study, Major constructed three graded biology passages with approximate readability levels of grades 10, 12 and 14. The vocabulary loads of the passages were reduced by two grade levels and average and above average college readers were able to improve their comprehension of the material (Major, 1955, p. 1574).

Major concluded that readability should be one of the criteria used by teaching staffs when selecting biology textbooks for freshmen biology courses. Major also suggested that the freshmen biology instructors should test the readability of the assignments they give and adapt their instructional strategies accordingly (Major and Colletee, p. 223).

Burford (1969) determined the readability of selected earth science textbooks and compared the readability levels of the texts with the reading ability of the college freshmen earth science students reading the books. The population of the study consisted of 501 East Texas State University students in 21 sections of Earth Science 141. Burford applied the Dale-Chall Readability Formula to the textbooks to determine the readability levels of the books. The reading ability of the students in the study was measured by the Cooperative English Test: Reading Comprehension Form 1A.

Burford concluded that 38 percent of the students in his study were reading below the grade levels of the textbooks which were between grades 12 to 15. Forty-eight percent of the students had low grades and the researcher theorized that the readability level of the textbooks might have been a factor in causing the low grade points.

Brownrigg (1962) considered the reading ability of a selected number of beginning college drafting students and compared their reading ability with the readability levels of commonly used drafting textbooks and with informational achievement in drafting. The Dale-Chall formula of readability was applied to four textbooks. Three of the textbooks sampled ranged in

readability levels from grades 8 to 16 plus. The reading ability of the 431 college drafting students ranged from the eighth grade level to 16 plus. The mean reading ability was equal to the thirteenth grade. Approximately 60 percent of the students could read the samples on the thirteenth or fifteenth grade level and only 7.43 percent were capable of understanding material on the sixteenth grade level. The research concluded that in order to successfully read the books in the study, the students would have needed much higher reading abilities.

Research Related to the Instruments Used in the Study

Readability Formulas

The literature on readability and the use of readability formulas is vast. Klare (1963, pp. 193-311) lists 482 references on readability formulas. John Bormuth (1968, p. 6) states that the past few years have seen rapid and somewhat startling developments in readability research. According to Bormuth (p. 6) the accuracy of readability formulas has increased by as much as 75 percent in the past few years.

Jeanne Chall (1958) states: "The idea underlying readability measurement is the appropriate matching of reader and printed material" (p. 9).

Powers, Summer and Keanly (1958) state that

> there are two ways of looking at precision in a readability formula. One way is to admit that formulas are rough estimates at best, and that

> a little loss of precision is not important. The other is to argue that since the formulas give only rough estimates, it is important to keep whatever precision and prediction power exists (p. 104).

Klare and Buck (1954, p. 142) conclude that even though readability formulas are often inaccurate in predicting absolute readability scores, their ability to predict relative readability scores is not impaired. Klare and Buck (p. 29) indicate that readability measures can give a fairly accurate picture of how many readers can understand a particular piece of writing.

In trying to define readability, Chall (1958) says:

> in the broadest sense readability is the sum total (including the interactions) of all those elements within a given piece of printed material that affects the success a group of readers have with it. The success is the extent to which they understand it, read it at optimum speed and find it interesting (p. 7).

Klare (1963, p. 34) indicates that readability formulas are a method of estimating the probable success a reader will have in reading and understanding a piece of writing. Klare (p. 91) also states that one readability formula or another can be applied to almost any contextual material.

Bormuth (1968) cites that:

> The results of readability research provide the specialists with the information they need to tailor instructional materials to fit the reading abilities of their students and with

> readability formulas by which they can determine if materials already prepared are suitable for their students (p. 1).

Further, Bormuth defends the use of a single and simple readability formula:

> If the same features of language influence readability for both poor and able readers by the same amount, then a single and fairly simple formula can be used to predict readability for all students, regardless of their level of accomplishment in reading (p. 5).

Bormuth (p. 5) found that regardless of the person's reading ability the same features of language that caused difficulty for one reader caused the same amount of difficulty for others. The language factors that influence what children can learn from materials also influence what adults can learn from printed materials.

It is Bormuth's contention that what makes the language in materials easy or difficult to read is of central importance in the educational process. Bormuth concludes that much of what a student learns, he acquires through the study of written instructional materials (Introduction).

Geyer (1970) notes that one must recognize the limitations of readability formulas. Readability formulas do not

1. Give any measure of conceptual difficulties in the textual material.
2. Take into consideration the way the material is organized or arranged.
3. Allow for variations in the meaning of multiple-meaning words.

4. Accept the fact that a fresh or unusual word may make a sentence or idea clearer than a commonplace word.
5. Vary their rating terms of different interests which a person may have at different levels or in individual activities (p. 84).

(These limitations of Geyer's are taken from an analysis by Russell and Fea that Geyer quotes.)

Dechant (1970) considers readability as the success an individual has with a book. According to Dechant,

> if the major aim of reading is the comprehension of meaning, the teacher must be interested in the measurement of the comprehension of meaning, the teacher must be interested in the measurement of the comprehensibility of the materials. He wants some means for quantifying his statements about the difficulty of the material. It is not enough to say that reading material is difficult or easy. He must have reference points or a scale with which to judge printed materials (p. 278).

When the researcher uses a readability formula it must be remembered these formulas measure one aspect of writing, style, and one aspect of style--difficulty (Klare, pp. 24-25). Also, that formulas do not measure difficulty perfectly; they are not measures of good style (Klare, p. 25). Readability formulas are a method of measurement intended as a predictive device (Klare, p. 33).

The Fry Readability Graph

Rakes (1972, p. 38) describes the Fry graph as a separate graph upon which a combined score, including

the average sentence length and total number of syllables per 100 words is plotted. According to Rakes, early validation of the Fry readability graph was reported by Kistulentz who found a correlation of .94 with the Dale-Chall formula and .96 with the Flesch. Rakes' analysis was based on the results of an unpublished master's thesis by A. C. Kistulentz (1967), "Five Readability Ratings Compared to Comprehension Test Scores on Ten High School Literature Books."

Fry (1968, p. 577) presents his readability graph as a faster and simpler method of determining readability. Fry states that the graph correlates highly with the Dale-Chall formula, the SRA, Flesch and the Spache formulas (p. 577). The Fry graph revolves around average sentence length and the aggregate number of three or more syllables in the sample (Pauk, 1969).

To test the accuracy of the Fry graph, Pauk had the Fry graph, the Dale-Chall formula and the McLaughlin SMOG applied to 20 articles. This was done by a class of Pauk's graduate students (Pauk 1969, p. 209). The results as tabulated in the list below seem to indicate that the Fry graph correlated quite highly with the Dale-Chall formula.

Article	Dale-Chall	Fry	McLaughlin
1	5	5	10
2	6	5	7

Article	Dale-Chall	Fry	McLaughlin
3	6	7	8
4	7	7	10
5	7	7	11
6	7	8	10
7	7	10	10
8	8	8	11
9	9	8	11
10	9	9	10
11	9	9	11
12	9	9	12
13	9	10	13
14	9	11	12
15	10	7	11
16	10	8	11
17	10	9	11
18	10	10	11
19	10	11	11
20	11	11	11

The mean readability of the 20 books for the Dale-Chall formula was grade 8.4 and for the Fry graph, grade 8.8. (The McLaughlin SMOG will be discussed later.) Both the Fry graph and the Dale-Chall formula rely on the average length of sentences within their samples for their primary inputs (Pauk, 1969, p. 209).

Pauk (1970, p. 142) replicated the study, again applying the three formulas to 44 articles with very similar grade results, as follows:

Article	I Dale-Chall	II Fry	III McLaughlin	Differences I & II	Differences I & III
1	7	7	11	0	4
2	7	8	11	1	4
3	7	8	11	1	4
4	8	8	12	0	4
5	8	8	12	0	4
6	9	9	13	0	4
7	9	9	13	0	4
8	8	9	12	1	4
9	8	9	12	1	4
10	9	11	13	2	4
11	9	11	13	2	4
12	7	7	10	0	3
13	8	8	11	0	3
14	8	8	11	0	3
15	8	9	11	1	3
16	10	8	13	2	3
17	10	10	13	0	3
18	10	12	13	2	3
19	13	13	16	0	3
20	8	8	10	0	2
21	8	8	10	0	2
22	8	12	10	4	2
23	9	10	11	1	2
24	10	8	12	2	2
25	10	9	12	1	2
26	10	9	12	1	2
27	10	10	12	0	2
28	10	10	12	0	2
29	10	10	12	0	2

Article	I Dale-Chall	II Fry	III McLaughlin	Differences I & II	Differences I & III
30	10	11	12	1	2
31	8	7	9	1	1
32	8	8	9	0	1
33	9	8	10	1	1
34	9	8	10	1	1
35	10	8	11	2	1
36	10	8	11	2	1
37	10	9	11	1	1
38	10	10	11	0	1
39	11	11	12	1	1
40	11	11	12	1	1
41	12	8	13	4	1
42	10	7	10	3	0
44	13	12	12	1	1

Fry (1968, p. 513) developed the readability graph in Uganda. Fry (1968, p. 514) considers his readability graph accurate within a grade level. Fry (p. 577) did not copyright the readability graph so that it could be readily used.

The SMOG Grading Readability Formula

The SMOG Grading Readability Formula was developed by G. Harry McLaughlin. McLaughlin (1969, p. 640) argues that the linguistic measures with the greatest predictive powers are word and sentence length. Furthermore, word and sentence length are powerful predictions of readability (McLaughlin, 1966, p. 195). Mean word length correlates--0.6 with children's

comprehension scores and mean sentence length correlates--0.5. In English, according to McLaughlin,

> word length is associated with precise vocabulary, so the reader must usually make extra effort in order to identify the full meaning of a long word, simple because it is precise. Long sentences nearly always have complex grammatical structure, which is a strain on the reader's immediate memory because he has to retain several parts of each sentence before he can combine them into a meaningful whole (p. 640).

McLaughlin suggests that semantic and syntactic difficulty interact. He suggests a readability formula to follow this form (1969, p. 640): readability - a + b (word length x sentence length^{c}) where a, b, and c are constants. The equation McLaughlin developed can be approximated by SMOG Grade = 3 + square root of polysyllable count (1969, p. 643). This formula will predict the grade of a passage within one and a half grades within 68 percent of cases (p. 643). SMOG grades 13-16 indicate the need for college education; 17-18, the need for graduate training (p. 645).

According to Pauk's analysis of the Fry readability graph and the SMOG (see pages 32-34), the grade levels obtained by using the SMOG showed a wide variance with the Dale-Chall formula. McLaughlin (1969) in responding to Fry stated that the SMOG grading demands samples totaling 30 sentences, usually involving around 600 words and not the 100 word sample Pauk used. McLaughlin (p. 211) points out that the Fry formula

correlates 0.71 with the Dale-Chall and the SMOG; 0.63 with the Dale-Chall and 0.62 with the Fry.

McLaughlin (Gibson, 1971, pp. 79-80) used a computer to run his trials and errors to arrive at his formula. The formula has a standard error of about 1.5 grades.

While the SMOG tends to score readability at a higher level than the Fry graph, Wall (1969) notes that readability formulas often tend to underestimate the reading grade level. Underestimation occurs

> because the formulas do not take into account such factors as abstractness of words, syntax, density of ideas, interrelationship of ideas and the legibility of print and format. These factors are highly relevant when considering the difficulty of a text (p. 15).

McLaughlin (1969, p. 45) argues that while the grade levels obtained by the SMOG formula tend to be high that this is not unreasonable since this is the level a reader would need to insure complete comprehension of the text materials.

The Instruments Used in the Study

The Nelson-Denny Reading Test

The Nelson-Denny Reading Test--Form A (Buros, 1968) consists of a 100-item vocabulary test, eight reading comprehension passages and a rate score. The raw score on the comprehension test is multiplied by two. Townsend, in her review of the Nelson-Denny (Buros,

pp. 316-317), indicates that the weighting is justifiable in that it brings the vocabulary and comprehension score more closely in line. However, the text, Townsend states, is more weighted with vocabulary in the total score.

The rate scores have a Dale-Chall readability index which places them at the college level (Buros, p. 317).

Townsend seems to feel that while one should be cautious in interpretation of the rate score, one can use the part scores with considerable confidence. The percentile norms, according to Townsend's review, seem to have been carefully constructed and the populations upon which they are based carefully described. She notes that standard error of measurement figures are reported along with the reliability data.

Townsend seems to conclude that the test might be a challenging test with a highly academic flavor.

The examiner's manual for the Nelson-Denny Reading Test--Form A (Nelson-Denny, 1960) provides directions for giving and scoring the test, percentile rank of scores for grades 9 through 16. The manual recommends the test as a good one for predicting academic success at the college level (Nelson and Denny, p. 22). The authors indicate that with one study of

test scores and scholastic achievement, the Nelson-Denny showed a correlation of .67. The study was not described.

The manual indicates validity and difficulty data for the vocabulary items and the comprehension section. The reliability coefficients were .93 for vocabulary and 110 samples and .81 for comprehension with 110 samples.

At the college level the test was standardized on approximately 4,000 students in five different kinds of colleges and universities (Nelson and Denny, p. 29). Thirty-three institutions of higher education were involved in the standardization program.

The use of the Nelson-Denny as a means of obtaining reading test scores for college and university students is well documented. In "1972 Review of Research on College Adult Reading" (Nacke, 1973, pp. 217-47) the Nelson-Denny Reading Test is the primary reading test used to ascertain reading level (the test was cited eight times). Spencer (1970, p. 5), McClellan (1970, p. 1), Cline (1971, p. 3) and Martin (1967, p. 1) describe the use of the Nelson-Denny Reading Test as a screening device for remedial college readers.

The MSU Reading Test

The MSU Reading Test was developed by the Office of Evaluation Services at Michigan State University and is used as a screening device during the Freshmen Orientation Programs. There is no wide body of research

concerning its use. However, the Office of Evaluation Services at Michigan State University has used the test in some long-range prediction studies.

The entire group of freshmen who entered Michigan State University in the fall of 1958 were followed through the beginning of their junior year (OES, 1959, p. 2). However, the initial report of the research only analyzed the students through their first year at the university. The MSU Reading Test was the orientation test that best predicted the male students' grades in the Computer Science 112 course. According to Juola (1964, p. 4) the MSU Reading Test had a .51 correlation between students' first term grade point average and a .26 between the students' seventh term grade point average. Apparently, the test is a better predictor of success in the university for the beginning student than for the student who has had time to develop a variety of reading and study skills.

In using freshmen level ability test scores as a predictor of the college dropout Juola (1964) studied all new freshmen who entered Michigan State University in the fall of 1960. The two predictor tests used were the MSU Reading Test and the College Qualification Tests --Total Score. From the data Juola concluded that the ability test scores did provide a basis for predicting failure to complete college. A .57 product moment

correlation coefficient between the MSU Reading Test and the two-year or terminal grade point average for women was found. Juola concluded further that the tests seemed to predict failure in the university when withdrawal from college is related to academic attainment.

The Interview-Questionnaire

Sax (1968, p. 214) indicates that in many ways the interview and the questionnaire are similar. Both, according to Sax, attempt to elicit feelings, attitudes and beliefs of the respondents. The interview provides flexibility; the questionnaire, economy. The questionnaire insures that each respondent receives the same set of questions phrased in the same way (Sax, p. 215), and is a means of gathering information for specific purposes (p. 216).

While the questionnaire insures that each respondent is being asked the same questions in a uniform manner, the interview does permit the interviewer some latitude in probing for additional information if it is desired (Sax, p. 214).

The nominal scale questionnaire involves few assumptions (Sax, p. 218). "Its purpose is simply to identify or categorize" (Sax, p. 218).

The nondisguised-structured interview item provides the respondent with accurate information about

the questionnaire but restricts the responses to those specifically asked for (Sax, p. 227).

Summary

The review of the literature would seem to support the following conclusions:

1. Universities have long felt the need to provide remedial reading and study skills programs for students with inadequate reading skills.

2. There is no tight body of research that defines the specific reading disabilities of university students.

3. There does seem to be a general consensus that the university student with inadequate reading skills lacks the ability to think about and process what is read.

4. Research that compares the readability level of textbooks used by university students with the reading ability of the students would seem to suggest that, in general, the readability of the texts is higher than the mean reading ability of the students.

5. There is no body of research that looks to analyze the instructional strategies used by instructors or compensate for the readability level of the textbooks and the reading ability of the students using the texts.

6. The research on readability formulas is vast.

7. The Fry Readability Graph is a fairly new formula that seems easy to apply. The Fry graph would appear to correlate quite highly with the Dale-Chall formula.

8. The McLaughlin, SMOG, is another new, fairly quick and easy readability formula. It tends to produce scores that are approximately two grade levels higher than the Fry graph.

9. The Nelson-Denny Reading Test is widely used to survey the reading ability of university students. The test seems to have adequate reliability and validity as a survey reading test for college and university students.

10. The interview and questionnaire are similar research techniques that attempt to elicit the attitudes and beliefs of the respondent.

CHAPTER III

PROCEDURES AND SOURCES OF DATA

Certain choices were made with regard to the procedures to be followed in this study. The bases for these decisions, as well as a description of the steps undertaken, are presented in this chapter.

Considered are (1) the basic method of research, (2) the selection of the classes and texts to be measured, (3) the standardized test used to measure the reading ability of the students in the selected classes, (4) the two readability formulas used to appraise the readability levels of the texts, (5) the questionnaire developed to assess the teaching strategies utilized by the instructional staffs of the selected courses and their use of readability as a criteria in the selection of texts, and (6) the treatment of the data.

The Basic Method of Research

A combination of the analytical and descriptive methods was employed in this study. A combination of these two research methods was considered best since the purpose of this investigation was to describe the relationship between readability of texts and reading levels

of students using the texts and to analyze the teaching strategies utilized by the concerned staffs. According to Sax (1968, p. 288) the descriptive method of research hopes to study the "current status of a field." Descriptive research seeks not to show causal relationships but rather to describe existing conditions. Research questions one and two were approached from the descriptive method of research.

Analytical research, on the other hand, seeks to "derive relationships within a deductive system and point out assumptions and possible consequences of proposed changes" (Sax, 1968, p. 36). Data retrieval is a useful tool in analytical research to gather information from both primary and secondary sources. Research questions four, five, and six represent the analytical approach. Additionally, the relationships between reading ability and final grades were derived analytically and handled descriptively.

Selection of the Classes

In the fall of 1972, the Learning Resources Center at Michigan State University began developing supportive reading programs for the freshmen remedial courses--American Thought and Language 101B and Natural Science 181. Therefore, the writer chose all of the fall term 1972 sections of these two courses as the sample for the research.

The ATL 101B classes and the Natural Science 181 classes were each made up of 20 sections of approximately 20 students each. Since enrollment in Natural Science 181 was predicated on enrollment in ATL 101B, the total sample of students was approximately 351 while the total number of sections involved was 40. (However, in that year, only 207 Natural Science 181 students had Nelson-Denny test scores.)

Following is the catalog description of the two selected courses:

> American Thought and Language.
> 101B. Comprehensive English
> (I 8 065; 100.) Fall, Winter, Spring, Summer. 3(4-0) No student may earn credits in both 101A and 101B. Admission by examination or approval of department.
> Instruction and practice in reading and writing. Instruction in reading is emphasized.
>
> Natural Science. University College.
> 181. Natural Science
> Fall. 4(2-3) Student may not receive credit in both 181 and 192. Approval of department.
> The role of methods in science emphasizing the development and modification of systems of explanation. The nature of the cell and sexual reproduction as background for Mendelian gene theory and its modern modifications. Social implications are emphasized.

Selection of the Texts

The texts used in the investigation were the books used by the instructors for the specific sections. Table 1 lists the texts with the author, title, course, publisher and copyright date.

TABLE 1.--Texts Used in the Investigation.

Course	Author	Title	Publisher
American Thought and Language 101B	Troyka and Nudelman	Steps in Composition, Alternative Edition	Prentice-Hall, Inc. 1972
	Dan Wakefield	Going All the Way	Dell Publishing Co., Inc. 1970
Natural Science 181	Gary Parker, W. Ann Reynolds, Rex Reynolds	The Structure and Function of the Cell	Educational Methods, Inc. 1966
	Gary Parker, W. Ann Reynolds, Rex Reynolds	Heredity	Educational Methods, Inc. 1970
	Paul Barrett et al.	Laboratory Manual Natural Science 181	Michigan State University 1971
	A. M. Winchester	Human Genetics	Michigan State University 1971
		Science Journal, June 1970	
	Alain Corcos and C. S. Scarborough (editors)	Natural Science Laboratory Manual and Text 192F	Michigan State University

Sources of Data and Procedures Used

The Nelson-Denny Reading Test

The standardized reading test used to determine the mean reading ability of the classes was the Nelson-Denny Reading Test, Form A, revised edition.

The Nelson-Denny Reading Test, Form A is composed of a 100-item vocabulary subtest and a 36-item comprehension subtest. Reading rate is marked one minute into the comprehension subtest. The vocabulary score is one point for each correct answer and the comprehension score is given double weight. The test takes thirty minutes to administer and can be scored either by using self-scoring answer sheets or IBM machine scoring sheets. The machine scoring sheets were used for this investigation.

Administration of the reading test took place during the first week of classes for the 1972 fall term. All the ATL 101B classes were involved. Approximately 351 ATL 101B students were administered the test.

Additionally, that fall term, the Office of Evaluation Services at Michigan State University normed the Nelson-Denny Reading Test, Forms A and B, revised edition, on a representative sample of the entering freshmen. Thus, we were provided with a more viable diagnostic and predictive tool for the Michigan State University freshmen.

The MSU Reading Test

The MSU Reading Test was given to all entering freshmen at Michigan State University during their fall term 1972 orientation programs. The test was administered and scored by the Office of Evaluation Services at Michigan State University.

The test consists of nine reading selections, each followed by a number of questions that together total fifty items. There are eight pages to the test. The test attempts to analyze the student's ability to read material of university level understanding and to answer questions that test the skills of literal, inferential and applied comprehension. Additionally, the student's general vocabulary knowledge is tested. The form of the test used in 1972 was normed in 1963.

The test takes 45 minutes to administer.

The Readability Formulas

Two readability formulas were chosen for use in this study. These were (1) the Fry Readability Graph and (2) the McLaughlin SMOG Grading Readability Formula. These formulas were chosen for the following reasons:

1. The researcher had used both formulas and felt that both were adequate for the approximation of readability levels.
2. The ease with which both formulas could be applied made them a practical choice.

3. The literature on readability formulas seemed to indicate that most of the readability formulas could provide adequate readability approximations.

The Fry Readability Graph

The Fry Readability Graph was applied as follows:

1. A sample of three 100-word passages from the beginning, middle and end of each text was taken. Proper nouns were omitted.

2. The total number of sentences in each 100-word passage was counted and an average of the three numbers made.

3. The total number of syllables in each 100-word sample was counted. The total number of syllables was averaged.

4. The average number of sentences per 100 words and the average number of syllables per 100 words was plotted on the Fry graph and the approximate readability level was indicated.

The McLaughlin SMOG Grading Readability Formula

The McLaughlin SMOG Readability Formula was applied as follows:

1. A sampling of ten consecutive sentences from the beginning, middle and end of the texts was taken. (The sampling for the SMOG and Fry was taken from the same portions of the texts.)

2. The number of words in each sampling with three or more syllables was recorded and totaled.

3. The square root of the nearest perfect square of the total was recorded.

4. The number three was added to the square root producing the approximate readability level. This approximates the readability level necessary for a person to fully understand the written material.

The Questionnaire

To determine if the concept of readability was a consideration used by the teachers of ATL 101B and Natural Science 181 and, further, to ascertain if the instructional strategies utilized by the specific instructors compensated in any way for the reading ability of the students in the selected classes, an undisguised-structured nominal scale questionnaire was developed.

Because the number of instructors involved was small--13--the writer felt it practicable to interview each still at Michigan State University. Hopefully, this procedure would provide more complete data.

The questionnaire consisted of four pages (see Appendix D). Categories covered were (1) the types of printed materials used, (2) the supplementary instructional materials used, and (3) the criteria for textbook selection.

The Treatment of the Data

The Readability Formulas

The readability formulas were applied three times to verify the findings.

After application of the formulas the mean readability levels of the text materials was determined and listed. Next, the difference of the means of the two formulas was indicated. Finally, the difference of the means between the mean reading grade placement scores of the Nelson-Denny Reading Test and the mean readability level of the texts was presented. Since there is not a grade placement conversion for the MSU Reading Test the difference between the means of the readability levels of the text and the mean reading grade placement of the MSU Reading Test could not be calculated.

The Reading Tests Results

An analysis of the Nelson-Denny Reading Test and the MSU Reading Test scores for the selected classes was made using the Computer Institute for Social Science Research Contingency Analyses Program (ACT). The reading test scores were compared with the readability level of the selected texts and also the students' final grades in the classes.

The Faculty Questionnaire

The results of the faculty questionnaire were analyzed and tabulated. (See Appendix D.) Tables are presented for each section of the questionnaire.

Summary

1. A combined analytical-descriptive method of research was employed in this study.

2. The classes selected for the research were the sections of ATL 101B and Natural Science 181 taught in the fall term of 1972 at Michigan State University.

3. The texts selected for analysis were those used in the selected classes.

4. The instrument used to determine the reading ability of the selected classes was the Nelson-Denny Reading Test, Form A, revised edition.

5. The readability formulas selected for use were the Fry Readability Graph and the McLaughlin SMOG Formula.

6. The questionnaire given in an interview situation that sought to probe the use of readability as a criterion for textbook selection and to determine the instructional strategies utilized by the teachers of the selected classes was an undisguised-structured nominal scale questionnaire.

7. An analysis of the Nelson-Denny Reading Test and the MSU Reading Test scores was made by the Computer Institute for Social Science Research Contingency Analysis Program (ACT).

8. The mean readability levels of the selected texts was compared to the mean reading ability of the selected classes.

9. The difference of the means between the two readability formulas was shown.

10. The difference between the mean Nelson-Denny Reading Test reading grade placement scores and the mean readability level of the texts was indicated.

CHAPTER IV

ANALYSIS OF THE DATA

In the first section of this chapter the reading ability of the students in the sample as determined by the Nelson-Denny Reading Test, Form A, Revised Edition, is considered. The second section details the findings of the textbook analysis using the Fry Readability Graph and the McLaughlin SMOG Grading Readability Formula. In the third section the comparison of the mean reading scores of the sample with the mean readability levels of the texts is presented. The next section contains a comparison of the mean reading scores of the sample with the final grades in the selected classes. The last major section presents an analysis of the faculty questionnaire.

Results of the Nelson-Denny Reading Test

American Thought and Language 101B

As explained in Chapter I, in the rationale for the study, the students in the sample were considered to be inadequate readers by their placement on the Michigan State University Reading Test given to them during their orientation program. The students selected for the

ATL 101B classes generally scored at or below the twentieth percentile on the MSU Reading Test.

Nelson-Denny Reading Test Scores, Form A, were available for 351 ATL 101B students. The mean vocabulary subtest for the ATL 101B students was 24.85 with a standard deviation of 8.06. This placed the students in approximately the eighth percentile for the vocabulary subtest of the Nelson-Denny Reading Test as compared to other Michigan State University freshmen.*

The mean comprehension subtest scores for the ATL 101B students was 32.53 with a standard deviation of 9.15. This placed the ATL 101B students in approximately the sixteenth percentile for the comprehension subtest of the Nelson-Denny Reading Test as compared to other Michigan State University freshmen.

While there are no grade equivalent rankings for the Michigan State University percentiles for the Nelson-Denny Reading Test, an approximate grade equivalent can be obtained from the Nelson-Denny Reading Test Examiner's Manual (p. 20). Thus, for the mean vocabulary subtest score of 24.85 an estimated reading grade equivalent of eleven may be projected. For the mean comprehension subtest score of 32.53 an estimated reading grade equivalent of ten may be projected.

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*See Appendix A for the Michigan State University Nelson-Denny Reading Test score percentiles.

Natural Science 181

While there were final grades for 567 Natural Science 181 students, Nelson-Denny Reading Test scores were available only for those 181 students who were in ATL 101B and had taken the Nelson-Denny Reading Test. Two hundred seven was the total number of students in this category.

For those students in Natural Science 181 for whom a Nelson-Denny Reading Test score was available the mean vocabulary subtest score was 24.65 with a standard deviation of 8.14; for those students in Natural Science for whom a Nelson-Denny Reading Test score was available, the mean comprehension subtest score was 32.02 with a standard deviation of 9.04. The mean total score was 56.67 with the mean standard deviation of 8.59.

In percentile rankings the mean vocabulary subtest score of 24.65 placed the Natural Science 181 students, who had taken the Nelson-Denny Reading Test, in approximately the eighth percentile compared to other Michigan State University freshmen. The mean comprehension subtest score of 32.02 placed the Natural Science 181 students who had taken the Nelson-Denny Reading Test in approximately the sixteenth percentile when compared to other Michigan State University freshmen. The total Nelson-Denny Reading Test mean score of 56.67 placed the Natural Science 181 students in approximately the twelfth

TABLE 2.--Vocabulary Subtest Mean Scores: Nelson-Denny Reading Test, Form A.

Course	Mean Score Vocabulary	Standard Deviation	Percentile Rank	Approximate Mean Grade Equivalent
ATL 101B (N = 351)	24.85	8.06	8th	11 plus
Natural Science 181 (N = 207)	24.65	8.14	8th	11 plus

TABLE 3.--Comprehension Subtests Mean Scores: Nelson-Denny Reading Test, Form A.

Course	Mean Score Comprehension	Standard Deviation	Percentile Rank	Approximate Mean Grade Equivalent
ATL 101B (N = 351)	32.53	9.15	16th	10 plus
Natural Science 181 (N = 207)	32.02	8.59	16th	10 plus

TABLE 4.--Total Nelson-Denny Reading Test Score Means.

Course	Total Mean Reading Score	Standard Deviation	Percentile Rank	Approximate Mean Grade Equivalent
ATL 101B (N = 351)	57.38	8.50	12th	11 plus
Natural Science 181 (N = 207)	56.67	8.37	11th	11

percentile in relation to other Michigan State University freshmen who took the Nelson-Denny Reading Test.

For the Natural Science 181 students for whom there were Nelson-Denny Reading Test scores, the estimated grade equivalent for the mean vocabulary subtest score of 24.65 was approximately grade 11 plus. The estimated grade level equivalent for the mean comprehension subtest score is approximately grade level 10 plus.

Results of the Readability Analysis of the Texts

The mechanics of applying the two readability formulas to the texts used in this investigation were developed in detail in the preceding chapter. The two readability formulas used were the Fry Readability Graph and the McLaughlin SMOG Grading Formula.

Table 5 lists the eight texts, the approximate grade level rating of the texts by the two formulas, and the approximate mean grade level.

The McLaughlin SMOG formula tended to approximate the readability level two to four levels higher than the Fry graph in all but one of the texts. The one text that the Fry graph estimated to be at the college level of readability seemed to correlate with the SMOG estimation of grade level 16 for that book.*

*The pages selected for application of the formulas are listed in Appendix E.

TABLE 5.--Readability Ratings of the Texts.

Text	Readability Formula		Mean
	Fry	McLaughlin SMOG	
Structure and Function of the Cell	11	13	12
Heredity	10	13	11.5
Natural Science Laboratory Manual 181	10	13	11.5
Science Journal (optional) June, 1970	College	College	16
Human Genetics	10	12	11
Natural Science Laboratory Manual 192F	11	16	13.5
Steps in Composition	8	12	10
Going All the Way	8	9	8.5

Comparison of Results

The comparisons of the mean reading scores of the sample with the mean readability scores of the texts and the differences between the reading means and readability means is found in Table 6.

A plus score in the difference column indicates that the text readability mean is above or more difficult than the students' reading ability mean; a minus score indicates that the text readability mean is lower or easier than the mean reading score of the classes.

TABLE 6.--Comparison of Mean Reading Scores of the Sample on the Nelson-Denny Reading Test With the Mean Readability Levels of the Texts.

Testbook	Readability Mean	Mean Grade Placement Reading Score	Difference of Means
Structure and Function of the Cell	12	11	+1
Heredity	11.5	11	+ .5
Natural Science Lab. Manual 181	11.5	11	+ .5
Science Journal June, 1970	16	11	+5
Human Genetics	11	11	--
Natural Science Lab. Manual 192F	13.5	11	+2.5
Steps in Composition	10	11	-1
Going All the Way	8.5	11	-2.5

Two of the texts, Steps in Composition and Going All the Way indicated a readability level below the mean reading ability of the students. Steps in Composition was approximately one grade placement below the mean reading level of the students and Going All the Way was approximately two and one-half grade placements below.

In contrast, the Science Journal was approximately five grade levels higher in readability than the mean reading ability of the students. However, the textbook, Human Genetics, seemed to have a readability

level that approximated the mean reading ability of the students. The Natural Science Laboratory Manual 181 and the book Heredity were both just slightly above the mean reading level of the students. Again, in contrast, the Laboratory Manual 192F had a readability level approximately two and one-half grade placements above the students' mean reading ability.

While the mean readability level of the texts used with the Natural Science 181 classes at Michigan State University in the fall of 1972 were somewhat higher than the mean reading ability of the students, the text materials used in the ATL 101B classes had readability levels that were below, by one to two grade levels, the mean reading ability of the 101B students.

It is interesting to note that the Natural Science 181 Laboratory Manual, which was written specifically with the reading ability of the students in mind, had a readability level just slightly above the mean reading ability of the students.

The readability levels of the texts tended to fall at the upper quartile of the reading ability of the students. Thus, those students who were at the lower quartile of reading ability should have had significant difficulty in reading the assigned materials with competency. While the difference of the means between the mean readability level of the text and the

mean reading ability of the classes may have, in some instances, been only five-tenths to one level above the mean reading level of the students, the reader must bear in mind that the reading spread of the classes was approximately equivalent to grades 9 through 12.

The Mean Reading Scores Compared With Final Grades in the Classes

Table 7 summarizes the comparison of the mean toal Nelson-Denny Reading Test Score with the final grade in Natural Science 181. The grade equivalent range of the Natural Science students is 9.0 to 12.8. With the mean readability level of the Natural Science texts ranging between grades 11 and 16, those students whose reading ability lay between grades 9 and 10 should have found the text materials fairly difficult to handle.

In general the results of Table 7 would seem to suggest that reading ability does tend to influence how well a student will do in a class. Variables such as attendance, interest, and aptitude were not measured by this research. Thus, the students who failed the course apparently did so for reasons that did not relate to reading ability.

One notes the higher the reading test score the better, on the average, the students tended to do in the classes, as suggested by their final grades.

TABLE 7.--Comparison of the Mean Total Nelson-Denny Reading Test Scores With the Final Grades in Natural Science 181, Fall Term, 1972.

Final Grade	Number of Students (N=207)	Total Mean Reading Score	Percentile Rank	Grade Level Equivalent
0.0 (F)	1	72	30	12.8
1.0 (D)	4	40.50	3	9.0
1.5 (D+)	16	51.87	9	10.3
2.0 (C)	54	54.26	10	10.0
2.5 (C+)	46	56.59	11	11.0
3.0 (B)	47	57.55	12	11.1
3.5 (B+)	27	62.82	17	11.9
4.0 (A)	12	61.17	16	11.7

The students whose grades fell between 2.0 and 1.0 were also the students with the lowest mean reading ability. Since their mean reading ability ranged from approximately grade 9 to grade level 10, one may suggest that the readability level of the textbooks may have been a factor in their inability to do better on the tests which determined their grades in the classes.

Table 8 summarizes the comparison of the mean total Nelson-Denny Reading Test scores with the final grades in ATL 101B. The grade equivalent range of the ATL 101B students is 10.2 to 12.5. Since the mean readability level of the texts, 10 and 8.5, was below the

TABLE 8.--Comparison of the Mean Total Nelson-Denny Reading Test Scores With the Final Grades in ATL 101B, Fall Term, 1972.

Final Grade	Number of Students (N=347)	Total Mean Reading Score	Percentile Rank	Grade Level Equivalent
0.0 (F)	3	54.67	10	10.7
1.0 (D)	6	57.33	12	11.1
1.5 (D+)	6	50.50	8	10.2
2.0 (C)	34	53.08	9	10.6
2.5 (C+)	92	52.89	9	10.4
3.0 (B)	146	58.91	13	11.3
3.5 (B+)	47	62.06	17	11.9
4.0 (A)	13	68.61	24	12.5

reading ability of the students, the final grades were probably more a reflection of the students' writing ability than their ability to handle the texts. ATL 101B is primarily a writing course with major emphasis placed on the student's ability to successfully complete writing assignments.

In contrast to the Natural Science 181 students, those ATL 101B students who made final grades of 4.0 did have the best reading scores. However, the three students who made 0.0 in ATL 101B had reading scores that were about .5 percent higher than the students who made 2.0.

MSU Reading Test

The MSU Reading Test was used as the selector factor for placement in the ATL 101B and Natural Science 181 classes. All the scores for these students should have fallen below the twentieth percentile on the MSU Reading Test. However, there were evidently a few students who took Natural Science 181 who had MSU Reading Test scores above the twentieth percentile in the sample.

In both the ATL 101B and Natural Science 181 classes those students who made 0.0 tended to have higher mean MSU Reading Test scores than those students who made 1.0, 1.5, 2.0 and 2.5.

There are no grade equivalent scores for the MSU Reading Test as none were made.

The Faculty Questionnaire

Ten members of the original 13 faculty were available for the interview-questionnaire as the others had left the campus. The analysis of the data is presented in Tables 11 through 15.

During the interview sessions the respondents were encouraged to expand any area they so chose. Rapport was no problem as the faculty members either knew

TABLE 9.--Comparison of the Mean MSU Reading Test Scores With the Final Grades in ATL 101B, Fall Term, 1972.

Final Grade	Number of Students (N=405)	Total Mean Reading Scores	Standard Deviation
0.0 (F)	5	18.20	4.55
1.0 (D)	9	16.56	3.88
1.5 (D+)	10	17.10	2.28
2.0 (C)	41	17.07	3.59
2.5 (C+)	105	16.70	3.64
3.0 (B)	165	17.62	3.58
3.5 (B+)	51	18.65	3.27
4.0 (A)	19	19.74	3.16

TABLE 10.--Comparison of the Mean MSU Reading Test Scores With the Final Grade in Natural Science 181, Fall Term, 1972.

Final Grade	Number of Students (N=511)	Total Mean Reading Scores	Standard Deviation
0.0 (F)	7	18.86	3.24
1.5 (D)	9	14.56	4.00
1.5 (D+)	26	17.19	4.06
2.0 (C)	110	17.85	4.13
2.5 (C+)	118	20.32	4.73
3.0 (B)	107	21.02	5.41
3.5 (B+)	83	22.34	5.34
4.0 (A)	51	24.22	5.19

TABLE 11.--Analysis of Faculty Questionnaire, Part 1.

	Yes	No	Sometimes
Did you use any of the following types of printed materials in your classes?			
a. Required textbooks	10		
b. Laboratory manuals	4	6	
c. Workbooks	3	7	
d. Supplementary texts	4	5	1 no comment
e. Supplementary handouts	8	2	
f. Reserved readings in main library	3	7	
g. Other (One respondent suggested that assignment sheets and other instructional handouts fall into this category.)	Generally none		

TABLE 12.--Analysis of Faculty Questionnaire, Part 2.

	Yes	No	Sometimes
Did you use any of the following supplementary materials?			
a. Provide tapes of your lectures	1	9	
b. Provide vocabulary tapes to aid students with technical vocabulary	1	8	1-does not apply
c. Provide vocabulary lists to aid students with technical vocabulary	3	6	1-does not apply
d. Provide vocabulary tapes to aid students with general vocabulary	1	8	1-does not apply
e. Provide taped renderings of the assigned written materials		10	(1 began in 1973)
f. Provide study questions to guide your students toward getting the literal comprehension of what they read	9	1	
g. Provide clarification of the assignments so that your students could read the material critically	7	3	
h. Provide study guides that were prepared by the publisher	3	5	
i. Provide instruction to your students on the application of study techniques that help students preview materials and guide their reading in an organized fashion	9		

TABLE 13.--Analysis of Faculty Questionnaire, Part 3.

	Yes	No	Sometimes
When you selected the textbooks and other printed materials to be used with your classes, did you consider any of the following?			
a. Authorship	2	5	3 respondents indicated did not select textbook.
b. Publishing house		7	
c. Readability level of the text or printed materials as determined by the application of a readability formula or formulas		7	
d. Readability level of the text or printed materials as stated by the publisher	2	5	
e. Readability level of the text based on your own judgment derived from comparing the text with other available texts	6	1	
f. The format of the book including:			
1. Kind and type of print			The respondents considered all of these to be significant.
2. Illustrations			
3. General appearance of the printed material			
4. Reference guides			
5. Paragraph divisions			
6. Chapter division			
7. Density of fact presentation			
8. Interest appeal			
9. Abstractness of treatment			
10. Other			
g. Who the readers would be; their general reading ability	7		
h. Other			

TABLE 14.--Analysis of Faculty Questionnaire, Part 4.

	Yes	No	Sometimes
When the books you used were selected by a committee within your department, did they consider any of the following?			
a. Authorship			
b. Publishing house			
c. Readability level of the text or printed materials as determined by the application of a readability formula or formulas			
d. Readability level of the text or printed materials as stated by the publisher			
e. Readability level of the text based on your judgment derived from comparing the text with other available texts	None of the respondents indicated that this question was relevant to them.		
f. The format of the book including:			
1. Kind and type of print			
2. Illustrations			
3. General appearance of the printed material			
4. Reference guides			
5. Paragraph divisions			
6. Chapter divisions			
7. Density of fact presentation			
8. Interest appeal			
9. Abstractness of treatment			
10. Other			
g. Who the readers will be; their general reading ability			
h. Other			

TABLE 15.--Analysis of Faculty Questionnaire, Part 5.

	Yes	No	Sometimes
If your department used material that was written by members of the department, did the writers consider such factors as:			
a. Who the readers would be; their general reading ability	2		Not initially-2 Not sure -1
b. The kind and type of printing . . .	3	1	Not sure-1
c. The illustrations	5		
d. General appearance	5		
e. The paragraph divisions	4		No reply-1
f. The readability level of the material as determined by the application of readability formulas	1	4	
g. The density of fact presentation . .	1	4	
h. The interest appeal of the material	2	3-tried but secondary	
i. The abstractness of the treatment .	4	1-tried	
j. Other	3-commented tried to keep price down		
(Only five respondents felt they could answer this part.)			

the investigator or were familiar with her role in the Learning Resources Center. It would seem feasible to suggest that because of the investigator's relationship, particularly with those respondents from the American Thought and Language department, that some of the respondents may have adjusted their answers somewhat

to answer as they thought they should have rather than as they were actually doing.

As may be seen from the tables, the respondents all used required texts and other forms of printed materials as part of their instructional strategies. Instructional aides in the form of taped lectures, vocabulary lists, and tapings of printed materials were not used. The use of supplementary materials tended to be limited to the primary utilization of additional handouts which the respondents labeled study guides. However, the respondents did indicate that they provided some form of clarification of assignments and instruction in study techniques to help guide the students' reading in an organized fashion. The technique most often utilized was some form of the survey, question, read, recite, review method.

The study method was modeled by one instructor who stated that the teaching method utilized was in effect a form of the survey method of study. The respondent indicated that in lecture the class would be led through the development of questions, pre-reading and summary.

The study guide outlines used by the respondents tended not to provide clarification of the reading assignments, but rather were printed handouts that either defined some technical vocabulary, gave

suggestions for written assignments or attempted to clarify concepts through the use of explanatory diagrams. Course outlines that indicated the required texts, outside readings, dates of examinations and the dates for the completion of assignments were considered study guides also. Several of the respondents provided the students with sample tests which were included under the classification of a study guide.*

It should be noted that study guides that provided clarification of the reading assignments through the use of probing questions that called for either literal, inferential or problem-solving comprehension skills were, in general, not used. Nor did any of the respondents use such techniques as margin guides, resource guides or leveled reading guides.

All the respondents seemed to suggest that while they considered the use of study guides to be important they were not thoroughly familiar with all aspects of the construction of study guides.

Readability formulas were not applied in the selection of textbooks. Several of the respondents did not know the meaning of the term readability. Of those respondents who selected their own textbooks, six indicated that they used some sort of "eyeball" or

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*See Appendix F for examples.

informal standard of determining whether or not their students could handle the book. The informal standards varied but in general the respondents considered the following areas:

1. Were diagrams clear and well labeled?
2. Was the vocabulary easy?
3. Was the material heavily packed with facts?
4. Does the material hold interest?
5. Were the illustrations attractive?
6. Did the book relate to the students' everyday experiences?
7. Is the information valuable to the students?
8. What was the length of the selections?
9. Can one make good writing assignments from the material?
10. Do grammar books completely cover the grammar problems?
11. What was the price of the text?

The informal methods used by the respondents included the suggestion that a text should be of a higher readability level than the reading of the students, but not so complex that the students could not handle the materials. A suggestion was made that the content should be flexible so that it could be used for a variety of writing assignments. Another respondent wanted the information in the texts to be valuable to the students

in that the content should reflect humane problems and principles related to the everyday experiences of the students.

It is significant to note that while none of the respondents were pedagogically aware of readability, each respondent did apply some standards of informal readability in the selection of texts. No adjustments were made for the complexities of the materials.

One respondent implied that the text materials used in the remedial courses did not approximate the regular reading assignments the student would find in the nonremedial classes. None of the other respondents seemed to agree with this implication.

Where the respondents were questioned concerning their selection of textbooks, only seven indicated that they selected their own texts. Three respondents stated that they were not involved in the selection of the texts they used. The respondents who were not involved in text selection were temporary staff.

Where material was written by members of the department, readability formulas were not used to determine the readability levels.

The questions involving the use of a textbook selection committee brought fairly strong responses from those respondents who replied. In general, the respondents from the Natural Science 181 classes seemed less

pleased with the use of a committee for textbook selection than did the ATL 101B staff. However, these attitudes may have been tempered by the fact that the ATL 101B instructors hold temporary status in the university while the Natural Science 181 staff are part of the regular teaching personnel of the Natural Science department. The Natural Science 181 instructors seemed more inclined to select their own text materials while the ATL 101B teachers indicated that the choice of the selection committee was satisfactory to them. When necessary, the ATL 101B respondents indicated that they would use supplementary readings.

Several respondents suggested that the textbook selection done by the committee was often an arbitrary last minute decision. The Natural Science 181 respondents seemed less inclined to use the suggestion of the textbook committee than the ATL 101B instructors.

Five respondents indicated that they could not respond to the questions concerning texts written by members of their department.

Only one text was written by a committee for use with the remedial course. The respondents indicated that initially the committee did not concern itself with the general reading ability of the students who were going to read the text. Readability formulas were not applied to any of the text materials. Primary concerns of the

committee were interest appeal, abstractness of the material, and format of the text. According to one respondent, the committee applied a "gut" feeling to the material in order to adjust for readability. Concepts included in the text were those that the committee felt were worthwhile enough to ask the students to learn. Another primary criteria for the development of the text was that it should not be too expensive and that the students could sell the text when they were finished with the course.

One respondent cited that the respondent never realized students could have such skill needs until teaching the remedial course. To quote, "the first year of teaching the remedial course was a real eye-opener."

It should be noted that while all the respondents taught these courses without coercion, the staffs of the Natural Science 181 had the option of teaching the regular courses if they so desired. On the other hand, the ATL 101B instructors had no other options within the department.

Summary

1. The students in the sample had all scored below the twentieth percentile on the MSU Reading Test.

2. The mean total Nelson-Denny Reading Test, Form A, score for the ATL 101B students was 57.38 which placed those students in approximately the twelfth

percentile rank in comparison to other MSU freshmen with a mean grade equivalent of about 11 plus.

3. The mean total Nelson-Denny Reading Test, Form A, score for the Natural Science 181 students was 56.67 which placed those students in approximately the eleventh percentile rank in comparison to other MSU freshmen with a mean grade equivalent of about 11.

4. The SMOG and the Fry readability formulas were applied to the eight texts. Only two of the texts had a readability level that could be considered appropriate for the students using the texts. Six of the texts ranged from appropriate level to approximately one to four grade levels higher than the mean reading abilities of the students.

5. The final grades in both the classes seemed to fall within the same percentile ranges of both reading tests.

6. The results of the Faculty Questionnaire suggest that:

a. Readability formulas were not used by the respondents in the selection of texts.

b. All the respondents used required texts.

c. The respondents indicated use of informal readability standards.

d. Taped supplementary teaching aids were not employed by the respondents.

e. Price was one of the prime considerations in textbook selection.

f. The respondents all tried to provide their students with instruction in the use of study techniques to facilitate their reading.

g. Study guides used by the respondents were often course outlines, diagrammatic aids to simplify difficult concepts. Study guides that actually clarified reading assignments through the use of guide reading questions were not used.

h. Respondents were unaware of formal readability concepts.

i. The use of textbook selection committees was not favored.

CHAPTER V

SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

The study was conducted (1) to compare the reading ability of students in the remedial sections of freshman introductory science and English classes in a large Midwestern university with the readability levels of their textbooks, (2) to determine if the teaching staff of the remedial sections adapted their instruction to the students' reading ability and the readability level of the texts, and (3) to ascertain the criteria utilized for textbook selection by the instructional staff of the remedial classes. This chapter contains a summary of the procedures followed in this investigation, the listing of the findings and conclusions, implications of the investigation, and recommendations for further research.

Summary of the Study

The Problem

Since the study was concerned with comparing the reading ability of university students in remedial freshman science and English courses with the readability

levels of the assigned texts and determining if the instructional strategies utilized by the teachers were modified to compensate for the reading ability of the students and the readability levels of the texts, and ascertaining what criteria were applied in the process of textbook selection, it was necessary to obtain the following data: (1) grade levels of assigned texts according to two readability formulas, (2) reading level placement of students on a standardized reading test, (3) analysis of the teaching strategies of the instructional staffs and the criteria for textbook selection using a questionnaire-interview. Answers were sought to the following questions:

1. What were the reading abilities of the students as determined by the Nelson-Denny Reading Test and the MSU Reading test?

2. What were the difficulty levels of the textbooks assigned to the students as determined by the Fry Graph for Estimating Readability and the McLaughlin SMOG Grading Readability Formula?

3. How closely did the reading abilities of the students as measured by the Nelson-Denny Reading Test and the MSU Reading Test compare to the difficulty level of the assigned texts as measured by the two readability formulas?

4. Did the instructional strategies of the staffs compensate for the reading ability of the students and the readability levels of the assigned texts?

5. What criteria were used by the staffs in textbook selections for the two courses?

6. Additionally, did the final grades in the two courses reflect the reading ability of the students as determined by the MSU Reading Test and the Nelson-Denny Reading Test?

The Sample

The population of this study was those students who were enrolled in the American Thought and Language 101B classes and the Natural Science 181 classes in the fall term of 1972 at Michigan State University and for whom Nelson-Denny Reading Test scores were available. The sample consisted of approximately 351 ATL 101B students and 207 Natural Science 181 students.

Methods of Gathering Data

The Reading Tests

The students enrolled in the ATL 101B classes were administered the Nelson-Denny Reading Test during the first week of classes for the fall term, 1972. The tests were administered by the staff of the Learning Resources Center. The MSU Reading Test was administered

to all entering students during their orientation program prior to the fall term by the Office of Evaluation Services.

The Readability Formulas

The two readability formulas were applied by the investigator to all the text materials in the same portion of the texts. The mean readability level of the texts was determined. The difference of the means between the readability level of the texts and the reading ability of the classes was calculated.

The Faculty Questionnaire

Ten members of the 1972 ATL 101B and Natural Science 181 staffs were available for interview. The questionnaire developed for the interview was an undisguised-structured nominal scale questionnaire. The interviews were held at the convenience of each staff member in his or her office.

Findings

The findings which present answers to the six questions are summarized below.

The Reading Ability of the Students

1. The students selected for the ATL 101B course and concurrently the Natural Science 181 course

fell below the twentieth percentile on the MSU Reading Test.

2. The results of the Nelson-Denny Reading Test scores for these students seemed to have verified the MSU Reading Test results. The mean total Nelson-Denny Reading Test score for the ATL 101B students was 57.38 which placed them in the twelfth percentile rank on the Nelson-Denny Reading Test when compared with other MSU freshmen. The reading grade equivalent for these students was approximately 11 plus. The mean range of reading grade levels for the ATL 101B students was approximately grades 10 to 12.

3. The Natural Science 181 students in the sample had a mean total Nelson-Denny Reading Test score of 56.67 which placed the students in the eleventh percentile rank compared to other MSU freshmen. The reading grade equivalent for the Natural Science 181 students was approximately 11 with a mean range from grades 9 through 12.

Textbook Difficulty Levels

1. Rating the eight texts with the Fry Readability Graph and the McLaughlin SMOG Grading Readability Formula disclosed that the one text used by all the ATL 101B classes, Steps in Composition, had a mean readability of grade 10. A supplemental novel, Going All

the Way had a mean readability level of grade eight and a half.

2. The Natural Science 181 texts had a much wider readability spread. Two of the texts, Heredity and The Natural Science Laboratory Manual 181, had mean readability levels of grade eleven and one-half. The highest mean readability score was grade level 13 assigned to the optional journal readings in Science Journal, June, 1970. In contrast, the text Human Genetics had the lowest mean readability score for the 181 texts of grade level 11. The Natural Science Laboratory Manual 192F had a mean grade level of grade 13.5. Lastly, the book, Structure and Function of the Cell, had a mean readability of grade level 12.

Comparison of students' reading ability according to the reading tests and the difficulty levels of the required texts as determined by the readability formulas: The readability levels of the eight texts ranged from two and one-half grade levels below the mean reading ability of the students to five grade levels above the mean reading ability of the classes. The mean readability level of the text Human Genetics was the only one that approximated the mean reading ability of the classes. The text written specifically for the Natural Science 181 classes, Laboratory Manual 181, had a

readability level of 11.5 which nearly approximated the mean reading ability of the classes.

The Faculty Questionnaire

Instructional strategies of the instructors:

1. Responses to the faculty questionnaire suggest that all the faculty tended to require texts. Four used laboratory manuals; three, workbooks; four, supplementary texts; eight used supplementary handouts; and three of the staff required reserved readings in the main library.

2. Only one faculty member provided taped renderings of lectures; one provided vocabulary tapes to aid students with technical vocabulary; three staff provided lists to aid students with technical vocabulary and one provided vocabulary tapes to aid students with general vocabulary. None of the respondents provided taped renderings of assigned printed materials.

3. Nine of the respondents provided study guides to assist students with the literal meaning of what they read, and seven indicated that they provided clarification of the materials so students could read more critically. Nine of the respondents indicated that they did provide instruction to their students on the application of study techniques to guide their reading. One respondent stated good study techniques were modeled by the professor during the lecture sessions. The materials

used as study guides by the respondents tended to be course outlines, vocabulary definitions, diagrammatic schemes of concepts and sample tests. Guided readings were not provided nor were such study aids as margin guides or process guides utilized.

Criteria for textbook selection:

1. Seven of the respondents indicated that formal readability was not a consideration in the selection of textbooks. Three of the respondents did not select the text they used. Although formal application of readability formulas was not considered, the seven respondents who did select their own texts indicated that they used informal readability criteria. Their "eyeball" technique included looking at such factors as the difficulty of the vocabulary, the texts' appeal to the students, the relevance of the material, the book's format and illustrations, the density of the information, and, especially, the cost.

2. The seven respondents were concerned about the general reading ability of the students who would be using the books.

3. The publishing house and authorship were not considered to be important criteria.

4. In general, the respondents who indicated that the questions concerning the selection of texts by

committee related to them tended to reiterate that the use of a textbook selection committee was, at its best, a poor method for textbook selection.

5. Where the printed materials used were written by a committee of the department the respondents felt that the committee tried to consider such areas as general appearance, print, and format. However, the application of readability formulas was not considered by the Committee. Again, the price of the finished product was of prime concern to the writers.

Comparison of the Final Grades in the Two Courses With the General Reading Ability of the Students

1. In ATL 101B those students whose reading scores on the MSU Reading Test were the highest (mean score 19.74) also made the highest grade in the classes (4.0). The students who scored highest on the Nelson-Denny Reading Test (total mean score 68.61) made 4.0 grades in the classes.

2. Those students whose Nelson-Denny Reading Test score would seem to indicate that they were more capable readers tended to achieve final grades in the two courses that were higher than those students whose Nelson-Denny Reading Test scores would seem to suggest that the students were less capable readers.

3. Those students whose MSU Reading Test scores would seem to suggest that they were more

capable readers tended to achieve final grades in the two courses that were higher than those students whose MSU Reading Test scores would seem to suggest that they were less capable readers.

Research Questions

This section contains an examination of the research questions stated in the first chapter with respect to the findings of this study.

1. Is there a significant difference between the readability level of the instructional texts used in the fall term 1972 American Thought and Language classes at Michigan State University as determined by the SMOG Readability Formula and the Fry Readability Graph and the reading ability of the students using the texts as determined by the students' MSU Reading Test scores and the results of the Nelson-Denny Reading Test scores?

According to the MSU Reading Test scores all the students selected for ATL 101B scored at or below the twentieth percentile on the test. This placed the students in the fifth or lowest quartile of that test. The Nelson-Denny Reading Test scores suggest that the students were reading at a mean grade level of eleven with a range between grades 10 to 12. The mean percentiles of these students on the Nelson-Denny Reading

Test compared to other M.S.U. freshmen ranged from the ninth to the twenty-fourth. The mean readability levels of the texts as determined by applying the two readability formulas fell below and within the range of the mean reading ability of the students. There was no significant difference between the readability level of the instructional texts used in ATL 101B and the reading ability of the students using the texts.

2. Is there a significant difference between the readability level of the instructional texts used in the fall term 1972 Natural Science 181 classes at Michigan State University as determined by the SMOG Readability Formula and the Fry Readability Graph and the reading ability of the students using the texts as suggested by the students' MSU Reading Test scores and the Nelson-Denny Reading Test scores?

Admission to the Natural Science 181 sections was predicated upon the student's placement in ATL 101B. Thus, those students in Natural Science 181 for whom there were Nelson-Denny Reading Test scores had scored at or below the twentieth percentile on the MSU Reading Test, placing the 181 students in the fifth or lowest quartile for the students who took the MSU Reading Test. The Nelson-Denny Reading Test scores for the Natural Science 181 students seemed to suggest that these students were reading at a mean grade level of 11 and had

a mean percentile rank of eleventh in comparison with other M.S.U. freshmen who had taken the Nelson-Denny Reading Test. The mean reading grade equivalent ranged from grade 9 to grade 12. The mean readability levels of the texts was determined by applying the two readability formulas. The mean readability of the Natural Science 181 texts was approximately grade level 12.6. The mean readability levels of the texts was from six-tenths to three grade levels higher than the mean reading ability of the students. There was a significant difference between the readability level of the instructional texts used in Natural Science 181 and the reading ability of the students using the texts.

3. Were the instructional strategies of the teachers in American Thought and Language 101B classes during the fall term 1972 at Michigan State University modified to compensate for the reading ability of the classes and the readability levels of the texts?

The ATL 101B teachers all indicated that they used a required text. While the teachers did not provide any type of taped instructional aids as supplementary teaching aids they did indicate the use of study guide questions and other attempts to clarify the assignments to facilitate the ease with which the students were able to complete the required readings. All of the respondents indicated an attempt to teach their

students the use of a good study technique to guide their reading. Because the ATL 101B classes did meet for three weeks of the term in the Learning Resources Center the ATL 101B instructors indicated that they considered the instructional modules used by the students in the Center as supplementary teaching aids. The ATL 101B instructors did attempt to modify their instructional strategies to compensate for the reading ability of their students to the extent that they used study guides, supplemental handouts and gave instruction in study techniques to guide reading assignments. No adjustments were made for the readability levels of the instructional texts since formal readability had not been a concern of the staffs.

4. Were the instructional strategies of the teachers in the Natural Science 181 classes during the fall term of 1972 at Michigan State University modified to compensate for the reading ability of the classes and the readability levels of the texts?

The Natural Science 181 instructors all indicated that they used required texts. Additionally, laboratory manuals, workbooks, supplementary handouts and reserved readings in the main library were part of the instructional pattern. None of the respondents provided taped renderings of assigned written materials. One respondent provided tapes of lectures and tapes for

general and technical vocabulary. The respondents indicated that they did provide study questions, outlines, and sample tests for their students as well as clarification of reading assignments to aid the students to read critically. All of the respondents taught their students how to use study methods to guide their readings. To the extent that the Natural Science 181 instructional staffs used study guides, supplemental study handouts to clarify terms and reading assignments, and instructed their students in the use of study techniques to facilitate their reading, the staffs did attempt to compensate for the reading ability of their students. However, the use of taped materials as an aid in understanding the printed materials was not utilized by the staffs to any great extent.

No adjustments were made to the readability levels of the instructional materials used since the instructional staff of the Natural Science 181 classes had not been concerned with the readability levels of the printed materials.

5. What factors were considered in the selection of the text materials used in the American Thought and Language 101B classes during the fall term of 1972 at Michigan State University?

The ATL 101B faculty did not consider the application of readability formulas in the selection of texts

materials. Three of the respondents indicated that they did not participate in the selection of the textbook they used. The respondents stated that, in general, they wanted interesting, relevant books with attractive formats that would keep the students involved. Price was a major concern; the lower, the better. Text material that was not too densely packed with facts and that could provide good theme topics was the prime factor in the selection of texts. The general reading ability of the readers was stated to be an important factor.

6. What factors were considered in the selection of the text materials used in the Natural Science 181 classes in the fall term of 1972 at Michigan State University?

The Natural Science 181 faculty did not consider the application of readability formulas in the selection of the texts used. It was interesting to note that many of the faculty stated that they applied informal criteria of readability in text selection although none of the faculty were familiar with readability in a formal sense. Informal factors of readability or standards for selection included whether or not the vocabulary was within the knowledge range of the students as assessed by the teacher, the general attractiveness of the book, the density of the fact presentation, the relevance of the material, would the

material be interesting to the students, the format of the book--chapter divisions, were study questions included, as well as glossary and illustrations. Of prime importance was the price. Apparently the informal standards work only to a point since the readability levels of the texts used were approximately from one to three grade levels higher than the reading level of the students. The respondents suggested that often the pressure of time precluded an in-depth analysis of a text before selection.

Conclusions

In relation to the findings, the following general conclusions have been made:

1. The reading ability of the students in the two remedial classes at Michigan State University in the fall term of 1972 tended to range from grade level equivalent 9 to 12 with a mean reading grade equivalent of 11.

2. In general, the readability level of the texts used in the two remedial freshmen courses at Michigan State University in the fall term of 1972 tended to be higher than the mean reading ability of the students using the texts.

3. The teaching staffs of the two remedial courses in this investigation did modify their

instructional strategies to some degree to help compensate for the reading ability of the students in the classes.

4. None of the instructors of the classes applied readability formulas in the selection of texts nor were they cognizant of formal concepts of readability.

5. The instructional staffs applied informal standards for text selection. The English staffs were more successful at this than the staffs of the Natural Science course.

6. The cost of texts was a prime consideration in textbook selection for all the instructors in the investigation.

7. The research would seem to suggest that students whose reading scores in remedial courses are closer to those of nonremedial readers have more success in remedial courses than the students whose test scores are lower.

8. The results of the MSU Reading Test scores for the ATL 101B students seem to have been borne out by the Nelson-Denny Reading Test results. Both reading test scores seem to suggest that the ATL 101B students were not strong readers. Indeed, if one considers grade 13 reading ability as an appropriate reading level for a university freshman, then a freshman who enters the

university with a reading ability between grades 9 to 11 may be considered a poor university reader.

Implications

The results of this study suggest the following implications for those who are concerned with the development of freshmen remedial courses at universities and the students for whom the courses are intended.

1. Staff involved in teaching students whose reading abilities fall below the general expected reading proficiency of entering university freshmen should be made more cognizant of the reading skills deficiencies of their students. This may be done through in-service programs run by the professional reading staff of the university. Such in-service programs should acquaint the instructional staff of the spread of reading ability among these students, the students' inability to gain more than literal comprehension from materials read, their general inability to "think" about what they read, and their immaturity as readers. The instructional staff should be made to realize that part of their role in the content area is to help these students gain a sophistication in their reading skills if the students are to survive in the university.

2. Further, the instructional staff of the freshmen remedial courses need to become competent in

the use of readability formulas and familiar with the concept of readability itself, which goes beyond numerical computations. While one does not expect the teachers to become readability experts per se they should be able to either apply and interpret a formula or be willing to use the expertise of the university reading consultant who could apply readability formulas to suggested texts and discuss with the instructor the appropriateness of the text for the specific clientele. While the research indicated that most of the instructors of the two remedial courses had a vague notion of informal readability criteria, it seems appropriate to suggest that those who are concerned with remedial students should have more sophisticated readability tools for their use. Again, in-service programs such as mini-courses may be developed by the university reading consultant to help provide the instructors with the knowledge they must have in order to use readability as an appropriate tool. An additional means of providing the instructors with readability information would be for the university reading consultant to instruct one of the content area instructors in the use of readability formulas and let that instructor be the resource person for the other members of the staff.

3. The instructional staffs of the remedial programs should be encouraged to use audio-visual

presentations of text materials in order to enhance the learning ability of the students. These types of instructional materials would be considered adjunct teaching materials to be used as additional learning aids rather than substitutes for the texts. The instructional staffs of the remedial content courses should work with staff members from Learning Resources Centers or instructional media programs to develop viable alternative learning modules. Such audio-visual types of learning modules would be particularly useful for the development of both technical and general vocabulary programs.

4. Because of the apparent reading ability spread among the remedial students faculty should be encouraged to use a multi-level text approach to required text readings. Additionally, study guides and process guides should be prepared by the staffs for each level of text so that the students are guided toward successful reading-learning experiences. Further, the instructional staffs need to be made cognizant of what comprises a good, useful study guide. Every respondent stated that study guides were used yet none seemed to understand the nature of reading instructional study guides.

5. A model for the development of freshmen remedial courses should include an instructional team approach. The team would consist of the instructional

staff of the specific content area, the university reading consultant and the services of the Learning Resources Center or other instructional consultant units. Such a team approach would facilitate the development of instructional strategies that would best help the remedial students to become capable, self-sufficient university readers and learners.

6. The use of reading tests as a means of determining reading ability of entering freshmen should be continued. When the university admits a student, to some degree, that is tantamount to telling the student that the university believes the student can succeed. Since all students do not come to the university with the same entry skills, it would seem feasible to imply that the university has an obligation to help those students who are deficient in reading skills to build their skills' levels to a degree of competency that will enable them to succeed in the university. Also, knowing the mean reading range of the students would help the instructors of the remedial courses in preparing appropriate teaching materials. Thus, a screening device is needed so that the appropriate courses can be developed.

7. Publishers of university level texts should provide readability scores for their textbooks. Further, book companies should encourage textbook writers to become familiar with readability and the application of

readability formulas so that even the most erudite tome could be readable. Also, wherever possible, publishers should attempt to produce books that can be sold at a fairly reasonable price since this seems to be of prime consideration in the adoption of textbooks.

8. The use of committees to select textbooks for university departments should be scrutinized. The generally negative attitude toward textbook selection committees by the respondents of this research leads the investigator to infer that the use of textbook selection committees may not be efficient.

9. Where appropriate, members of the instructional staffs should be encouraged to write their own text materials. The Natural Science Laboratory Manual 181 written by the staff members nearly approximated the mean reading ability of the 181 students. Materials written specifically for the needs of the remedial students in specific courses could be extremely efficient teaching materials.

10. Students who tend to score low on standardized reading tests should not be discouraged by parents or teachers from entering the university.

11. This research seems to verify earlier research that suggests teachers at two- and four-year institutions of higher education do not have formal knowledge of readability concepts and are not aware of the use of readability formulas.

12. When universities develop remedial courses the staff selected to teach should be those faculty who are innovative as teachers and who are willing to learn what the reading problems of university freshmen are so that they can, within the framework of the content, provide a skill development experience as well as content growth.

13. The university reading consultant should be utilized more as a resource person by the instructional staffs of the various teaching departments.

14. Large universities like Michigan State University have the capabilities to work with students who need reading remediation and have successfully demonstrated this ability in the past. Thus, the universities' constituency can be assured of the excellence of its continuing efforts.

15. The movement toward lifelong learning has many implications for those involved with freshmen remedial courses. The returning adult learner often feels very insecure with his/her ability in the area of reading and study skills. The content teacher and reading consultant will have to build learning experiences that are specific to the reading needs of the adult learner.

16. Staffs selected for teaching in freshmen remedial courses should have demonstrated an attitude of

support for such programs. Departments would probably serve the programs' best interests through the selection of staffs on a volunteer basis. Further, the staffs of remedial courses should be members of the regular instructional team of the departments. There should be no stigma attached to the teaching of such supportive programs.

Recommendations for Further Research

In concluding this study, the following are suggested as areas of further research:

1. A parallel study to this investigation using data from other remedial freshmen courses might be undertaken.

2. All faculty who teach freshmen at a university might be surveyed to determine how they select textbooks, whether readability formuls are used and whether or not the reading ability of their students is a consideration of theirs.

3. Parents of potential remedial freshmen should be surveyed to determine if they (a) see their children as reading-deficient, (b) feel the university should provide remedial courses in the freshman year, and (c) would want the university to provide remedial courses in the sophomore year. Further, if they perceive their child as reading-deficient, how successful

in the university do they feel the child will be. The children of these parents should be surveyed in a comparable fashion to determine their attitudes toward themselves as potential university students, remedial courses and their own chances of success. Would these students, on a volunteer basis, take a credit reading course aimed at improving their skills?

4. Compare the informal readability standards utilized by various instructional staff with the results of readability formulas carefully applied to the selected texts.

5. Take a random sample of reading-deficient freshmen who succeed in the university by graduating and compare their reading scores with a comparable sample of reading-deficient freshmen who do not succeed--i.e., graduate. Note at what point in their career the unsuccessful student drops out and the courses both groups took in their freshmen and sophomore years. Additionally, interview both groups to see what factors influenced those who succeeded in the university and those who did not.

6. Compare the mean reading scores and mean final grades in freshmen remedial courses of teachers who use the traditional lecture method with teachers who tend to use specific study aids to minimize the difference between readability and reading level.

7. Survey publishing houses that print books for use in universities to see if they (a) have a reading expert apply readability formulas to the textbooks, (b) encourage their writers to use concepts of readability and apply readability formulas to their work, (c) try to analyze the specific skill needs of reading remedial freshmen and encourage their writers to incorporate techniques for remediation of these needs into the content area books. Verify the results of their readability formulas with field studies on student achievement and reading level.

8. Analyze the personality traits and teaching techniques of successful freshmen remedial course teachers to develop criteria for the selection of instructors for such courses.

9. Analyze the variables that enter into the grading criteria for remedial courses as opposed to the criteria for regular track courses.

APPENDICES

APPENDIX A

NELSON-DENNY READING TEST FORM A AND B

ALL MSU FRESHMEN NORMS, FALL 1972

Nelson-Denny Reading Test Form A and B, All MSU Freshman Norms, Fall 1972. Raw Scores and High School GPA Corresponding to Percentile Ranks.

%ile Rank	Form A Vocab-ulary	Form A Compre-hension	Form A V + C Total	Form A Reading Rate	Form B Vocab-ulary	Form B Compre-hension	Form B V + C Total	Form B Reading Rate	High School GPA*	High School Rank*	%ile Rank
99	74+	68+	140+	639	78+	68+	141+	--	--	--	99
98	69-74	--	133-135	621	74-76	66	137-140	615	4.00	99	98
97	67-68	66	129-131	600	69-73	--	131-135	599	--	--	97
96	66	--	128	563-578	65-67	64	125-129	524-561	3.95-399	--	96
95	64-65	64	125-127	513-537	64	--	123-124	499-511	3.92-3.94	98	95
94	63	--	121-124	491-501	62-63	--	121-122	475-488	3.89-3.91	--	94
93	62	62	119-120	480	60-61	62	119-120	450-461	3.87-3.88	--	93
92	61	--	118	468	59	--	118	438	3.83-3.86	--	92
91	60	--	117	456	58	60	117	425	3.81-3.82	97	91
90	59	60	116	446	57	--	115-116	--	3.78-3.80	--	90
89	57-58	--	115	436	56	--	114	413	3.76	--	89
88	56	58	113-114	--	--	--	113	403	3.73-3.75	96	88
87	--	--	111-112	426	55	58	111	--	3.70-3.72	--	87
86	55	--	110	--	--	--	110	391	3.67-3.69	--	86
85	--	--	109	417	54	--	109	--	3.66	95	85
84	54	56	--	--	--	--	108	379	3.63-3.65	--	84
83	--	--	108	--	53	56	--	--	3.62	--	83
82	53	--	107	--	--	--	106-107	--	3.59-3.61	94	82
81	52	--	106	407	52	--	105	368	3.56-3.58	--	81
80	51	--	105	396	--	--	104	--	3.55	--	80
79	--	54	104	--	--	54	--	356	3.52-3.54	93	79
78	50	--	103	--	51	--	103	--	--	--	78
77	--	--	101-102	384	--	--	--	--	3.50	--	77
76	49	--	100	371	50	--	102	344	3.45-3.49	92	76
75	--	--	99	--	49	--	101	--	3.44	--	75
74	48	52	98	--	--	52	100	--	--	91	74
73	--	--	97	--	--	--	99	333	3.41-3.43	--	73
72	--	--	--	359	48	--	98	--	3.40	--	72
71	47	--	96	--	--	--	--	--	3.38-3.39	90	71
70	--	--	--	--	--	--	97	327	--	--	71
69	46	50	95	349	47	50	96	--	--	--	69
68	--	--	--	--	--	--	95	--	3.35-3.37	--	68
67	--	--	94	--	--	--	--	--	3.33-3.34	89	67
66	45	--	--	--	46	--	94	319	3.32	--	66
65	--	--	93	--	--	--	--	--	3.31	--	65

%ile Rank	Form A Vocab-ulary	Form A Compre-hension	Form A V + C Total	Form A Reading Rate	Form B Vocab-ulary	Form B Compre-hension	Form B V + C Total	Form B Reading Rate	High School GPA*	High School Rank*	%ile Rank
64	--	48	--	--	--	--	93	--	3.29-3.30	80	64
63	44	--	92	--	45	48	92	309	3.28	--	63
62	--	--	--	--	--	--	--	--	3.27	87	62
61	--	--	91	327	44	--	91	--	3.25-3.26	--	61
60	43	--	90	--	--	--	--	--	--	--	60
59	--	--	--	--	--	--	90	299	3.23-3.24	86	59
58	--	46	89	--	43	--	89	--	3.21-3.22	--	58
57	--	--	88	318	--	46	--	--	3.20	85	57
56	42	--	87	--	--	--	88	--	3.18-3.19	--	56
55	--	--	--	--	--	--	87	290	3.17	--	55
54	--	--	86	309	42	--	--	--	3.16	84	54
53	--	--	85	--	--	--	86	--	3.14-3.15	--	53
52	41	--	--	--	--	44	--	--	3.13	83	52
51	--	44	84	298	41	--	85	279	3.12	--	51
50	40	--	83	--	--	--	--	--	--	82	50
49	--	--	--	--	--	--	84	--	3.08-3.10	--	49
48	--	--	82	--	40	--	83	269	3.07	81	48
47	--	--	--	287	--	42	82	--	--	--	47
46	39	--	81	--	--	--	--	--	3.06	80	46
45	--	--	80	--	--	--	81	--	--	--	45
44	--	42	--	275	39	--	--	--	3.01-3.05	79	44
43	38	--	79	--	--	--	80	257	--	--	43
42	--	--	78	--	--	--	79	--	--	78	42
41	--	--	--	--	38	40	--	--	3.00	--	41
40	--	--	77	--	--	--	78	--	--	77	40
39	37	--	76	--	--	--	--	--	--	--	39
38	--	40	--	--	37	--	77	--	2.95-2.98	76	38
37	36	--	--	262	--	--	--	245	--	--	37
36	--	--	75	--	--	--	76	--	2.94	--	36
35	--	--	--	--	36	38	75	--	--	--	35
34	35	--	74	--	--	--	--	--	2.93	--	34
33	--	--	--	--	35	--	74	--	2.89-2.92	--	33
32	--	38	73	--	--	--	73	235	2.88	75	32
31	--	--	--	250	--	--	72	--	--	--	31
30	34	--	72	--	--	--	71	--	2.87	--	30
29	--	--	71	--	--	36	--	--	--	--	29
28	--	--	70	--	34	--	70	--	2.86	--	28
27	33	36	--	--	--	--	69	226	2.84-2.85	--	27
26	--	--	69	--	--	--	--	--	2.83	--	26
25	32	--	--	--	33	--	68	--	2.82	74	25

%ile Rank	Form A Vocab-ulary	Form A Compre-hension	Form A V + C Total	Form A Reading Rate	Form B Vocab-ulary	Form B Compre-hension	Form B V + C Total	Form B Reading Rate	High School GPA*	High School Rank*	%ile Rank
24	--	--	68	238	--	34	67	--	2.81	73	24
23	31	--	--	--	--	--	66	--	2.80	--	23
22	--	34	67	--	32	--	65	--	2.78-2.79	72	22
21	--	--	66	--	--	--	--	214	2.77	71	21
20	30	--	65	--	--	32	64	--	2.76	70	20
19	--	--	64	--	31	--	63	--	2.75	69	19
18	29	--	63	--	--	--	62	--	2.74	--	18
17	--	--	62	226	30	30	61	203	2.73	68	17
16	--	32	61	--	--	--	--	--	2.72	67	16
15	28	--	60	--	29	--	60	--	2.70-2.71	66	15
14	--	30	59	--	--	--	--	195	2.68-2.69	65	14
13	--	--	58	216	--	28	59	--	2.67	64	13
12	27	--	57	--	28	--	58	--	2.65-2.66	63	12
11	--	28	56	--	--	26	56-57	188	2.64	62	11
10	--	--	54-55	207	27	--	54-55	--	2.62-2.63	60-61	10
9	26	26	51-53	--	--	--	52-53	--	2.60-2.61	58-59	9
8	25	--	50	195	26	24	51	--	2.57-2.59	57	8
7	24	--	48-49	--	24-25	22	49-50	177	2.53-2.56	55-56	7
6	23	24	47	185	23	--	48	165	2.52	53-54	6
5	22	22	44-46	--	--	20	46-47	--	2.47-2.51	51-52	5
4	20-21	20	43	174	21-22	--	43-45	153	2.43-2.46	48-50	4
3	18-19	--	40-42	161	19-20	18	39-42	141	2.37-2.42	44-47	3
2	17	18	37-39	150	17-18	16	34-38	117-129	2.28-2.36	38-43	2
1	11-16	14-16	32-36	115-140	12-16	10-14	21-32	106	2.04-2.27	26-37	1
0	0-10	0-12	0-31	0-104	0-11	0-8	0-21	0-95	2.03 minus	25 minus	0

*High school ranks not reported for 5.9 percent of freshmen; high school GPA's not reported for 0.3 percent and 2.9 percent reported on the percent scale but converted to 4.0 scale.

APPENDIX B

SMOG READABILITY FORMULA

APPENDIX B

SMOG READABILITY FORMULA

SMOG Grading
A New Readability Formula

1. Count 10 consecutive sentences near the beginning of the text to be assessed, 10 in the middle and 10 near the end. Count as a sentence any string of words ending with a period, question mark, or exclamation point.

2. In the 30 selected sentences count every word of three or more syllables. Any string of letters or numerals beginning and ending with a space or punctuation mark should be counted if you can distinguish at least three syllables when you read it aloud in context. If a polysyllabic word is repeated, count each repetition.

3. Estimate the square root of the number of polysyllabic words counted. This is done by taking the square root of the nearest perfect square. For example, if the count is 95, the nearest perfect square is 100, which yields a square root of 10. If the count lies roughly between two perfect squares, choose the lower number. For instance, if the count is 110, take the square root of 100 rather than that of 121.

4. Add 3 to the approximate square root. This gives the SMOG Grade, which is the reading grade that a person must have reached if he is to understand fully the text assessed.

McLaughlin, G. Harry.
"SMOG Grading--A New Readability Formula." Journal of Reading, May, 1969, Vol. 12, No. 8, 639-646

READABILITY WORK FORM
SMOG Grading

Book Title_____ Date_____

Author/Publisher_____

Class Using Text_____

SAMPLE

	Beginning of Text	Middle of Text	End of Text
1. Page number	_____	_____	_____
2. First word of sentence	_____	_____	_____
3. Last word of sentence	_____	_____	_____
4. Number of polysyllabic words	_____	_____	_____

5. Total number of polysyllabic words _____

6. Square root of polysyllabic words _____

7. Square root _____ + 3 = _____

8. SMOG grade _____

APPENDIX C

FRY GRAPH FOR ESTIMATING READABILITY

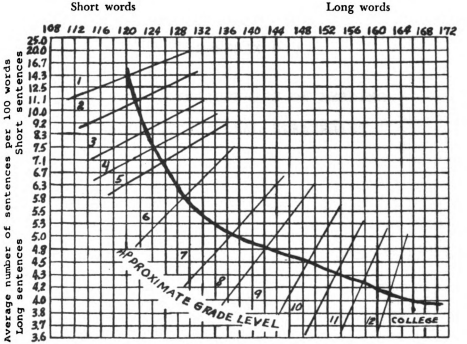
APPENDIX C

FRY GRAPH FOR ESTIMATING READABILITY

Graph for Estimating Readability

by Edward Fry, Rutgers University Reading Center

Average number of syllables per 100 words



DIRECTIONS: Randomly select 3 one hundred word passages from a book or an article. Plot average number of syllables and average number of words per sentence on graph to determine area of readability level. Choose more passages per book if great variability is observed.

Journal of Reading, April, 1968, p. 577.

Note: The Readability Graph is not copyrighted. Anyone may reproduce it in any quantity, but the author and the editors would be pleased if this source were cited.

APPENDIX D

FACULTY QUESTIONNAIRE ON READING AND INSTRUCTIONAL STRATEGIES

APPENDIX D

FACULTY QUESTIONNAIRE ON READING AND INSTRUCTIONAL STRATEGIES

	Yes	No	Sometimes
1. Did you use any of the following types of printed materials with your classes?			
a. Required textbooks	_____	_____	_____
b. Laboratory manuals	_____	_____	_____
c. Workbooks	_____	_____	_____
d. Supplementary texts	_____	_____	_____
e. Supplementary handouts	_____	_____	_____
f. Reserved readings in main library	_____	_____	_____
g. Other	_____	_____	_____
2. Did you use any of the following supplementary materials?			
a. Provide tapes of your lectures	_____	_____	_____
b. Provide vocabulary tapes to aid students with technical vocabulary	_____	_____	_____
c. Provide vocabulary lists to aid students with technical vocabulary	_____	_____	_____
d. Provide vocabulary tapes to aid students with general vocabulary	_____	_____	_____
e. Provide taped renderings of the assigned written materials	_____	_____	_____

	Yes	No	Sometimes
f. Provide study questions to guide your students toward getting the literal comprehension of what they read	_____	_____	_____
g. Provide clarification of the assignments so that your students can read the material critically	_____	_____	_____
h. Provide study guides that have been prepared by the publisher	_____	_____	_____
i. Provide instruction to your students on the application of study techniques that will help the student preview materials and guide their reading in an organized fashion	_____	_____	_____

3. When you selected the textbooks and other printed materials to be used with your classes, did you consider any of the following?

a. Authorship	_____	_____	_____
b. Publishing house	_____	_____	_____
c. Readability level of the text or printed materials as determined by the application of a readability formula or formulas	_____	_____	_____
d. Readability level of the text or printed materials as stated by the publisher	_____	_____	_____
e. Readability level of the text based on your own judgment derived from comparing the text with other available texts	_____	_____	_____
f. The format of the book including:			
1) Kind and type of print	_____	_____	_____
2) Illustrations	_____	_____	_____
3) General appearance of the printed material	_____	_____	_____
4) Reference guides	_____	_____	_____

	Yes	No	Sometimes
5) Paragraph divisions	_____	_____	_____
6) Chapter divisions	_____	_____	_____
7) Density of fact presentation	_____	_____	_____
8) Interest appeal	_____	_____	_____
9) Abstractness of treatment	_____	_____	_____
10) Other _____	_____	_____	_____
g. Who the readers would be, their general reading ability	_____	_____	_____
h. Other _____	_____	_____	_____

4. When the books you used were selected by a committee within your department, did they consider any of the following?

a. Authorship	_____	_____	_____
b. Publishing house	_____	_____	_____
c. Readability level of the text or printed materials as determined by the application of a readability formula or formulas	_____	_____	_____
d. Readability level of the text or printed materials as stated by the publisher	_____	_____	_____
e. Readability level of the text based on your judgment derived from comparing the text with other available texts	_____	_____	_____
f. The format of the book including:			
1) Kind and type of print	_____	_____	_____
2) Illustrations	_____	_____	_____
3) General appearance of the printed material	_____	_____	_____
4) Reference guides	_____	_____	_____
5) Paragraph divisions	_____	_____	_____
6) Chapter divisions	_____	_____	_____
7) Density of fact presentation	_____	_____	_____
8) Interest appeal	_____	_____	_____
9) Abstractness of treatment	_____	_____	_____
10) Other _____	_____	_____	_____

	Yes	No	Sometimes
g. Who the readers would be, their general reading ability	_____	_____	_____
h. Other _____	_____	_____	_____

5. If your department used material that was written by members of the department, did the writers consider such factors as:

a. Who the readers would be, their general reading ability	_____	_____	_____
b. The kind and type of printing	_____	_____	_____
c. The illustrations	_____	_____	_____
d. The general appearance of the material	_____	_____	_____
e. The paragraph divisions	_____	_____	_____
f. The readability level of the material as determined by the application of readability formulas	_____	_____	_____
g. The density of fact presentation	_____	_____	_____
h. The interest appeal of the material	_____	_____	_____
i. The abstractness of the treatment	_____	_____	_____
j. Other _____	_____	_____	_____

(The above factors were compiled from Know Your Reader by George S. Klare and Byron Buck.)

APPENDIX E

WORKSHEETS FOR READABILITY FORMULAS

APPENDIX E

WORKSHEETS FOR READABILITY FORMULAS

1. Structure and Function of the Cell

SMOG	p. 1	36	
	pp. 43-44	33	Grade 13
	pp. 72-74	38	
Fry	p. 72 (198) to 73 (203)		Mean 12
		179 words	
		285 syllables	
		10 sentences	Grade 11

2. Heredity

SMOG	p. 1	11	
	p. 77	40	Grade 13
	pp. 161-162	43	
Fry	p. 77	223 words	Mean 11.5
		337 syllables	
		10 sentences	Grade 10

3. Natural Science Laboratory Manual 181

SMOG	Ex. 1	40	
	Ex. 4-8	15	Grade 13
	Ex. 8-9	39	
Fry	Ex. 4-8	177 words	Mean 11.5
		259 syllables	
		10 sentences	Grade 10

4. Steps in Composition

SMOG	p. 3	19	
	p. 193	24	Grade 12
	p. 302	38	
Fry	p. 193	10 sentences	Mean 10
		146.9 syllables	
		6.3 sentences	Grade 8

5. Human Genetics

SMOG	p. 7	29	
	p. 91	29	Grade 12
	p. 163	33	
Fry	p. 7	146 syllables; 5.1 sentences	
	p. 91	163 syllables; 3.9 sentences	
	p. 163	33	
			Mean 11
			Grade 10

6. Science Journal--June, 1970

SMOG	p. 26	105	Graduate Level--16+
	p. 48	104	
	p. 97	82	
Fry	p. 26	170 syllables; 3.1 sentences	
	p. 48	172 syllables; 4.5 sentences	
	p. 97	181 syllables; 5.5 sentences	
			Graduate Level

7. Laboratory Manual and Text Natural Science 192F

SMOG	pp. 1-3-4	91	
	pp. 3-12	65	Grade--Graduate 16
	Ch. 9, Part I	48	
Fry	pp. 1-3	177 syllables; 3.5 sentences	
	pp. 3-12	166 syllables; 5 sentences	
	Ch. 9, Part I	159 syllables; 5.9 sentences	
			Mean 13.5
			Grade 11

8. Going All the Way

SMOG	p. 1	22	
	p. 121	8	Grade 9
	p. 305	8	
Fry	p. 1	140 syllables; 2.5 sentences	
	p. 121	139 syllables; 6.5 sentences	
	p. 305	132 syllables; 2.9 sentences	
			Mean 8.5
			Grade 8

APPENDIX F

EXAMPLES OF SUPPLEMENTARY HANDOUTS

USED IN THE REMEDIAL COURSES

APPENDIX F

EXAMPLES OF SUPPLEMENTARY HANDOUTS

USED IN THE REMEDIAL COURSES

Practice Quiz
Natural Science 181

1. The observable hereditary characteristic arising from the interaction of the genotype with its environment during development is called the _____. This is the appearance of the individual.

2. The imagined genetic makeup or the genetic formula of the individual is called the _____.

3. If both genes of a pair in the cells of an individual are the same, the genotype of the individual is said to be _____.

4. If the genes of a pair are different, the genotype of the individual is said to be _____.

5. If the genes of a pair are different, and if one gene expresses itself in the phenotype but the other does not, the gene which expresses itself is said to be _____.

6. The gene that does not express itself in the presence of the gene mentioned above is said to be _____.

7. Below is a list of symbols. What is the meaning of EACH?

   Aa x AA

   (1/2A + 1/2a) x (1/2A + 1/2A)

   (1/4AA + 1/4AA + 1/4Aa + 1/4 Aa = 1

8. In some of Mendel's crosses, he found that the gene for purple flowers was dominant over the gene for white flowers. What type of offspring would you expect if you crossed a pure-line purple flower with a white flower? Show both genotype and phenotype in the first and second generations.

9. What results would you expect if you crossed one of the hybrids from the first generation obtained in the above problem, with a plant bearing white flowers? (This is called a test cross. Can you explain why?)

10. In Holstein cattle, the spotting of the coat is due to a recessive gene, while a solid colored coat is dominant. What types of offspring might be produced by a cross between two spotted animals? Show how you reach your conclusion.

Natural Science

GENETICS

Be certain that you can define and use the following terms:

mitosis
meiosis
haploid
diploid
gamete
fertilization
zygote
gene
trait
characteristic
dominant gene
recessive gene
homologous chromosomes
homozygous (dominant or recessive)
heterozygous
genotype
phenotype
gamete probability equation
zygote probability equation
hybrid
back cross
test cross

MENDEL'S THEORY OF INHERITANCE

POSTULATES	LOGICAL PROCEDURES
1. Inherited traits are determined by particles called genes.	1. Let letters of the alphabet represent genes (i.e., A, B, C, etc.)
2. An individual has at least one pair of genes for each trait in each cell except the gametes. These 2 genes can be of the same form or have different forms and are called alleles.	2. Let paired letters stand for paired genes (i.e., AA, BB, etc.); Aa, Bb, etc., for paired alleles, a is allele of A, b of B.
3. Genes are passed from parent to offspring through the sex cells (gametes). During gamete formation paired genes separate. A gamete receives 1 gene of each pair.	3. Let the following symbols represent the concepts: Parent generation (P), Aa Gametes (G), A or a
4. Sometimes one gene of a pair masks the expression of a second gene (postulate of dominance).	4. Let capital letters stand for dominant genes; lower case letters stand for recessive genes (i.e., AA, Aa, aa, etc.)
5. There is an equal probability that a gamete will contain either one of the pair of genes.	5. Let the fractions 1/2 : 1/2 stand for equal chances. If P = Aa Then G = (1/2A + 1/2a)
6. Separated genes recombine at random during the process of fertilization.	6. Let multiplication stand for random recombination of genes. If P = Aa x Aa Then G = (1/2A + 1/2a) x (1/2A + 1/2A) And F_1 = 1/4AA + 2/4Aa + 1/4aa
7. When two traits are determined by 2 pairs of genes, each pair assorts independently and at random to the gametes. (Postulate of independent assortment)	7. Let multiplication stand for random independent assortment (Law of probability) If P = AaBb Then G = (1/2A + 1/2a), (1/2B + 1/2b) = 1/4AB + 1/4Ab + 1/4aB + 1/4ab

THEME EVALUATION

The four short themes you are here asked to evaluate were written during a fifty minute class period. Robert Frost had been discussed as a poet, but the poem on which the students were asked to write, "The Road Not Taken," had not been discussed.

Students were given the following assignment at the start of the period:

1. Write a short essay in which you develop an original thesis relevant to your evaluation of (and reaction to) Robert Frost's "The Road Not Taken."

2. Give an appropriate title to your essay.

3. Follow this organizational pattern:

   a. General introduction: identify the poet and the poem; make a transition to your thesis statement.

   b. State your thesis in a simple, compound, or complex sentence.

   c. Support your thesis by explanation, illustration, references to the poem, general argument.

   d. General conclusion: restate your thesis.

DIRECTIONS TO READER

1. Mark errors in mechanics.

2. Make appropriate marginal notes.

3. At the end of the essay, give a letter grade (from A to F) and explain the grade (a sentence or a short paragraph).

   NOTE: Students could use texts, dictionaries, notes and the poem in their text.

YOU SHOULD BE ABLE TO SPELL, DEFINE AND USE THE FOLLOWING TERMS:

empirical
hypothetical
induction
deduction
generalization
controlled experiment
control
variable
assumption
reality
result
conclusion
postulate
respiration
photosynthesis

testis (testes)
epididymus
vas deferens
seminal vesicle
prostate gland
bulbo urethral gland (Cowper's gland)
scrotum
penis
urethra
seminephrous tubules

Natural Science
Quiz

1. Is there a difference between a result and a conclusion? If so, what?

2. What is a control?
   a variable?
   What is a controlled experiment?

3. Do living things use Oxygen? Why?

4. Do living things produce carbon dioxide? Why?

5. What is respiration?

6. What is photosynthesis?

7. Animals depend on plants for oxygen. Is it possible for plants to exist in the absence of animals? Why?

8. What kind of statement is the following?
   "All living things produce heat."

   What kind of reasoning is involved in reaching it?
   Do fish produce heat?
   What kind of reasoning did you use to arrive at an answer?

9. Green plants photosynthesize. The following answers were obtained when germinating wheat is tested with Phenol and with Winkler's solution:

Test	Germinating Wheat Result	Conclusion
Phenol	Turns yellow	Carbon dioxide present
Winkler	White precipitate	No oxygen present

   Is the table consistent with the underlined statement? Why?

10. When tested with Winkler's solution yeast and water give a brownish-white precipitate while yeast and sucrose give a white precipitate. Why?

BIBLIOGRAPHY

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Barbe, Walter. "Reading Improvement Services in Colleges and Universities." School and Society, Vol. 74, No. 1907 (July, 1951), 6-7.

Barnes, Bart. "College Admission Test Scores Down." Lansing State Journal, December 26, 1973, A-5.

Bentley, Ralph R., and Galloway, R. Edward. "A Comparison of the Readability of Vocational Reference Books With the Reading Ability of the Students Using Them." Journal of Experimental Education, Vol. 29, No. 4 (June, 1961), 373-383.

Bloom, Benjamin S., and Broder, Lois. J. Problem-Solving Processes of College Students. Chicago: The University of Chicago Press, 1950.

Bond, Guy L., and Tinker, Miles A. Reading Difficulties: Their Diagnosis and Correction. 2nd ed. New York: Appleton-Century-Crofts, 1957.

Bormuth, John R. Development of Standards of Readability: Toward a Rational Criterion of Passage Performance. ED 054 233, 1971, 219 pp.

_____. "Readability: A New Approach." Reading Research Quarterly (Spring 1966), 79-132.

Bormuth, John R., ed. Readability in 1968. National Council of Teachers of English, 1968.

Brown, Charles M. "A Case for University Reading Improvement Programs." National Reading Conference Yearbook, No. 14. Edited by Eric L. Thurston and Lawrence E. Hafnen. The National Reading Conference, Milwaukee, Wisconsin, 1965, pp. 175-180.

Brownrigg, Jerry Roy. "Reading Abilities of College Drafting Students Compared With Readability of Drafting Textbooks and With Informational Achievement in Drafting." Dissertation Abstracts, Vol. 23, Part 2, No. 5-7 (1962), p. 2432.

Buffone, Nicholas John. "A Survey of College and University Reading Programs, and an Analysis of the Reading Program at the University of Oklahoma." Dissertation Abstracts, Vol. 26, No. 7 (January, 1966), pp. 3692-3693.

Burford, Ernest. "The Reading Abilities of College Freshmen Earth Science Students Compared With the Readability of Selected Earth Science Textbooks." Unpublished Ph.D. dissertation, East Texas State University, August, 1969.

Cartwright, H. D. "Study Skills for the Severely Retarded College Reader." National Reading Conference Yearbook. Edited by George B. Schick and Merril M. May. No. 19, Vol. 2. The National Reading Conference, Milwaukee, Wisconsin, 1971, pp. 50-53.

Chall, Jeanne S. Readability--An Appraisal of Research and Application. Columbus, Ohio: The Ohio State University, 1958.

Cline, Terry A. A Comparison of the Readability of Community College Textbooks With the Reading Ability of the Students Who Use Them. ED 050 730, 1971, 22 pp.

Crooks, Kenneth B. M., and Smith, Charles H. "The Reading Problem in College Science Instruction." Science Education, Vol. 41, No. 1 (February, 1957), 54-57.

Cross, Patricia. "New Students of the '70s." Reprint from The Research Reporter, Vol. VI, No. 4 (1972).

Dale, Edgar, and Chall, Jeanne S. "The Concept of Readability." Elementary English, Vol. 26, No. 1 (1949), 19-26.

Davis, William C. "Why Every College Needs a Developmental Reading Program." College Reading Association, Vol. 8 (Fall, 1967), 96-102.

Dechant, Emerald V. Improving the Teaching of Reading. 2nd ed. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1970.

Downie, N. M., and Heath, R. W. Basic Statistical Methods. New York: Harper and Row, 1959.

Dubois, Ronald L. "Improvement of Textbook Comprehension in College Reading." Journal of Reading, Vol. 13, No. 2 (November, 1969), 113-118, 165.

Duffy, Gerald G., and Sherman, George B. Systematic Reading Instruction. New York: Harper and Row, 1972.

Farr, Roger. Reading: What Can Be Measured? Newark, Delaware: International Reading Association, 1969.

Fry, Edward. "A Readability Formula That Saves Time." Journal of Reading, Vol. 11, No. 7 (April, 1968), 513-517.

Geyer, James R. "Evaluation of Readability--Prediction of Comprehension?" Journal of the Reading Specialist, Vol. 10, No. 2 (December 1970), 83-87.

Gibson, Walter Dana. "Relationship Between Difficulty Levels of Assigned English Texts and Reading Ability of Community College Students." Unpublished Ph.D. dissertation, University of Southern California, 1971.

Gilbert, Charles D. An Examination of Readability Levels for Selected Basic Science Texts. ED 059 860, 1972, 14 pp.

Gray, William S., and Larrick, Nancy, eds. "Better Readers for Our Times." International Reading Association Conference Proceedings, Vol. 1, 1956. New York: Scholastic Magazine.

Hadley, L. S. "New College Students Lack Study Techniques." School and Society, Vol. 85 (Nov. 9, 1957), 353-354.

Hagstrom, Jon M. A Comparison of the Reading Abilities of a Junior College Population and the Readability Levels of Their Texts. ED 050 902. April, 1971, 13 pp.

Halfter, Irma T., and Douglass, Frances M. "'Inadequate' College Readers." Journal of Developmental Reading, Vol. 1, No. 4 (Summer, 1958), 42-53.

Henshall, Joy Lanier. "An Application of Readability Techniques to Prediction of Difficulty Level of Shorthand Dictation Materials." Dissertation Abstracts International, Vol. 32 No. 3-4, p. 1980-A. North Texas State University, 1971.

Juola, Arvo E. "Freshman Level Ability Tests Versus Cumulative Grades in the Prediction of Successive Terms Performance in College." Paper presented at the Annual Meeting of American Educational Research Association, Chicago, Illinois, February, 1964.

_____. "The Prediction of College Dropout From Freshman Level Ability Test Scores." Paper presented at the Annual Meeting of the National Council on Measurement in Edcuation, Chicago, Illinois, February, 1964.

Klare, George R. The Measurement of Readability. Ames, Iowa: Iowa State University Press, 1963.

Klare, George R., and Buck, Byron. Know Your Reader. New York: Hermitage House, 1954.

Lavin, David E. The Prediction of Academic Performance. New York: Russell Sage Foundation, 1965.

Leedy, Paul D. "A History of the Origin and Development of Instruction in Reading Improvement at the College Level." Dissertation Abstracts, Vol. 19 Part 2, No. 8-12, p. 2841.

Lorge, Irving. "Readability Formulae--An Evaluation." Elementary English, Vol. 26, No. 1 (January-December, 1949), 86-95.

Lowe, A. J. The Rise of College Reading: The Good, the Bad and the Indifferent: 1915-1970. ED 040 013, 1970, 14 pp.

Major, Alexander G. "The Readability of College General Biology Textbooks." Science Education, Vol. 45, No. 3 (April, 1961), 216-224.

Major, Alexander Gregory. "Readability of College General Biology Textbooks and the Probable Effect of Readability Elements on Comprehension." Dissertation Abstracts, Vol. 15, Part 2, 1955, pp. 1573-1574.

Martin, Peter B. Freshmen Reading Ability: Fall 1967-Day Session Nelson-Denny Reading Test. ED 021 528, November 1967, 10 pp.

McClellan, Dorinda Ann. A Comparison of Reading Ability of Junior College Students With the Readability of Assigned Texts. ED 049 005, December 1970, 12 pp.

McDaniel, Marjorie C. An Enrichment and Learning Skills Center for Student Aid, ED 049 851, December, 1971, 8 pp.

McDonald, Arthur S. "What Current Research Says About Poor Readers in High School and College." Improving Reading in Secondary Schools. Edited by Lawrence E. Hafner. New York: The Macmillan Co., 1967, pp. 249-259.

McLaughlin, G. Harry. "Clearing the SMOG." Journal of Reading, Vol. 13, No. 3 (December, 1969), 210-211.

_____. "Proposals for British Readability Measures." The Third International Reading Symposium: Today's Child and Learning to Read. Edited by John Downing and Amy L. Brown. London: Cassell, 1966, pp. 186-205.

_____. "SMOG Grading--A New Readability Formula." Journal of Reading, Vol. 12, No. 8 (May, 1969), 639-645.

Michigan State University. 1972 Catalog. Vol. 66, No. 6 (December, 1971). East Lansing: Michigan State University.

Nacke, Phil. L., ed. Programs and Practices for College Reading, Twenty-Second Yearbook of the National Reading Conference, Vol. II. Boone, North Carolina: The National Reading Conference, Inc., 1973.

National Report. "Open Admissions of College Students and Poor Reading Skills." Reprint, November, 1972, p. 7.

Nelson, M. J., and Denny, E. C. The Nelson-Denny Reading Test Examiner's Manual. Revised edition. Boston: Houghton Mifflin Co., 1960.

Office of Evaluation Services. The Development of Test Norms for the 1963 English and Reading Tests. Reprint. East Lansing: Office of Evaluation Services, Michigan State University.

_____. The Orientation Tests and Long-Range Predictions: A One Year Follow-Up of New Freshmen. Reprint. East Lansing: Office of Evaluation Services, Michigan State University.

Pauk, Walter. "A Practical Note on Readability Formulas." Journal of Reading, Vol. 13, No. 3 (1969), 207-210.

_____. "Another Practical Note on Readability Formulas." Journal of Reading, Vol. 9, No. 4 (May, 1970), 141-143.

Peterson, Eleanor M. Aspects of Readability in the Social Sciences. New York: Bureau of Publications, Teachers College, Columbia University, 1954.

Powers, R. D.; Sumner, W. A.; and Kearl, B. E. "Recalculations of Readability Formulas." Journal of Educational Psychology, Vol. 49, No. 2 (1958), 99-105.

Rakes, Dr. Thomas. A Readability Analysis of Reading Materials Used in Adult Basic Education. ED 067 627, 1972, 93 pp.

Ratekin, Ned. The Effect of Two Different Reading Programs on Culturally Disadvantaged College Freshmen. ED 053 867, April, 1971, 15 pp.

Roscoe, John T. Fundamental Research Statistics for the Behavioral Sciences. New York: Holt, Rinehart and Winston, Inc., 1969.

Sax, Gilbert. Empirical Foundations of Educational Research. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1968.

Schick, George B. "Diversity in College Reading Skills." College-Adult Reading Instruction. Newark, Delaware: International Reading Association, 1971, pp. 14-25.

Seels, Barbara, and Dale, Edgar, compilers. Readability and Reading. An Annotated Bibliography. 1971 Revision. ED 075 789, 1971, 20 pp.

Smith, Nila Banton. "The Good Reader Thinks Critically." Developing Comprehension Including Critical Reading. Compiled by Mildred A. Dawson. Newark, Delaware: International Reading Association, 1969, pp. 6-15.

Spencer, Gary D. A Reading Program for Open Enrollment. ED 048 998, December, 1970, 7 pp.

Walker, Helen M., and Lev, Joseph. Elementary Statistical Methods. New York: Holt, Rinehart and Winston, Inc., 1969.

Wall, Sinclair. "Readability--A Neglected Criterion in Secondary Textbook Selection." The Journal of the Reading Specialist, Vol. 9, No. 1 (October, 1969), 12-16.

Whitney, Frederick Lamson. The Elements of Research. New York: Prentice-Hall, Inc., 1942.