

1978

A study of the relationship of academic achievement in college courses to the readability of course textbooks and the reading ability of students enrolled in selected classes at Iowa State University

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A STUDY OF THE RELATIONSHIP OF ACADEMIC
ACHIEVEMENT IN COLLEGE COURSES TO THE
READABILITY OF COURSE TEXTBOOKS AND THE
READING ABILITY OF STUDENTS ENROLLED IN
SELECTED CLASSES AT IOWA STATE UNIVERSITY.

IOWA STATE UNIVERSITY, PH.D., 1978

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A study of the relationship of academic achievement in college courses
to the readability of course textbooks and the reading ability of
students enrolled in selected classes at Iowa State University

by

Nora Davenport Lawson

A Dissertation Submitted to the
Graduate Faculty in Partial Fulfillment of
The Requirements for the Degree of
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CHAPTER I. INTRODUCTION

Background¹

Education involves the transmission of culture. Transmission of the culture depends heavily on communication, and reading is one of the important modes of communicating and transmitting culture. Since the invention of the printing press, books have become an important communication medium. Reading today, therefore, plays an integral role in the acquisition of knowledge. In fact, reading is one of the most important skills needed in today's formal learning. Its importance is signaled by the great need for reading in everyday living and work. This emphasis is reflected in the attention given reading beginning several years prior to a child's actual enrollment in school. Parents are encouraged to read to their babies, toddlers and preschool children. Upon entrance to kindergarten, the child spends much time on reading readiness skills. This emphasis on reading as a skill continues throughout elementary school. One question, however, that emerges and has to be addressed in the everchanging context of communication is, "what is reading?"

In this research, the definition of reading was taken from the consensus of findings of the vast amount of research which has been done in this connection (Holmes, Smith and Carrigan, Strang, Spache,

¹This research was approved by the Human Subjects Committee of Iowa State University, November, 1977.

McCullough, Kingston, Walcutt, Gilison, Barrett, Gray and Robinson).¹

Representative of these definitions is that of Bond and Tinker which states:

Reading involves the recognition of printed or written symbols which serve as stimuli for the recall of meanings built up through past experiences. New meanings are derived through manipulation of concepts already in his possession. The organization of these meanings is² governed by the clearly defined purposes of the reader.

Reading as conceptualized by authorities is not limited to the recognition of printed symbols. Reading is a more involved process--a process that requires the reader to relate his past experiences to what is being read. Ruth Strang adds other dimensions to the Bond and Tinker definition. She thinks of the reading process as communication and feels that it involves the abilities--

(1) to decode or decipher the author's printed words; (2) to associate them with meaning gained through the reader's first-hand experience and previous reading; and (3) to express the ideas thus acquired through speaking, drawing, writing or other verbal or motor responses.³

The third aspect of Strang's definition is of major importance as a frame of reference and a point of departure for this research at Iowa State University. In this context, the research here undertaken sets forth reading as comprehending and expressing ideas that have been

¹Theodore Clymer, "What is Reading? Some Current Concepts," in Innovations and Changes in Reading Instruction, in Sixty-Seventh Yearbook of the National Society for the Study of Education, pt. 2 (Chicago: University of Chicago Press, 1968), pp. 19-23.

²Guy L. Bond and Miles A. Tinker, Reading Difficulties: Their Diagnosis and Correction (Englewood Cliffs, N.J.: Prentice-Hall, 1973), p. 22.

³Ruth Strang, Diagnostic Teaching of Reading (New York: McGraw-Hill Book Company, 1969), p. 5.

obtained from the printed page in the content areas as well as a tool for obtaining knowledge and learning. In essence, the student must be able to comprehend what he reads in his textbooks and express the ideas in classroom discussions, research papers, and on tests. Frequently, grades in courses are determined by such classroom procedures and demonstration of inherent skills and measures used to arrive at an evaluation of student achievement. Needless to say, students who attend college have various backgrounds, capabilities, levels of academic potential, and achievement. Moreover, students also vary in their reading ability. It is not unusual to find that (based on test assessments) college students have a wide range of reading grade levels (7.0 to 14+). Research such as that of Wheeler and Wheeler state that

Unfortunately students differ so widely in their reading skills that one text may be too difficult for some and too easy for others in the same class. If the book is too hard, progress will be hindered; if it is too easy, the student may lose interest and have insufficient stimulation to keep him "on his toes."¹

First, Wheeler and Wheeler emphasize that students at the same grade level do vary in their reading skills. Also, studies in this area introduce another concept--readability of materials--which refers to the reading level or difficulty of materials. The Wheelers intimate that a discrepancy between a student's reading ability and the readability of a textbook can hinder the academic progress that a student makes. Reading ability thus appears to be a major correlate to most

¹L. R. Wheeler and V. D. Wheeler, "Selecting Appropriate Reading Materials," Elementary English 25 (December, 1948): 478.

academic achievement. It follows that achievement in subject areas involves comprehension of reading material in the subject area. Wilson and Einbecker found in their study of junior college students that reading ability predicts college performance. Their findings indicate

a positive and significant correlation between reading ability and academic performance of the junior college freshmen used in this study and have, thus, provided evidence that reading ability is related to success in junior college.¹

It would therefore seem that reading skills are significantly important to the academic achievement of college students. With the current "back to basics movement" and current criticisms leveled at college students for their lack of reading and writing skills necessary for success in college, there should be concern for the reading level of college textbooks which are a pertinent part of the learning situation.

Focusing on this concern, a special advisory panel was appointed by the College Examination Board to investigate the sharp deterioration of student performance on the Scholastic Aptitude Tests. The panel reported that it believed that key factors in the decline in test scores are "that less thoughtful reading is now being demanded and done in high school. . . ."² The panel further noted that

Many 11th-grade texts are written at 9th- or 10th-grade reading levels, while the verbal part of the S.A.T. is written at the 11th and 12th, and in some cases at a 13th- to 14th-grade level of readability.³

¹Richard C. Wilson and Polly Godwin Einbecker, "Does Reading Ability Predict College Performance?", Journal of Reading 18 (December, 1974): 237.

²"Why the Big Drop in S.A.T. Scores?", The Chronicle of Higher Education 6 (September, 1977): 13.

³Ibid.

If the panel's ideas about the students not being taught to read thoughtfully is accurate, then one must take into account that these same students enter college with the same lack of skill. It is also evident that the panel believes that a discrepancy between reading grade levels and the readability of material can cause poor academic performance. It follows that if a fuller understanding of academic achievement in college is to be gained, it is necessary to investigate the readability of textbooks as readability relates to course achievement. More specifically, if college textbooks are written on a level significantly different than a student's reading ability, the question posed is what effects does this have on his performance in the courses in which these textbooks are used, and what relationship does this have to the academic achievement of students in the courses.

Statement of the Problem

At Iowa State University, provisions are made for advising and assisting students experiencing academic difficulties and those who wish to avoid difficulties. These students are given assistance through special teaching in areas where deficiencies and difficulties are revealed. Among the areas of recognized difficulty is the area of reading, but more information is needed about the nature of reading difficulties and the significant factors involved in and related to these difficulties. The purpose of this study, therefore, is to determine whether or not students' reading ability and the readability of their college textbooks are related to academic achievement in the courses

which they take at Iowa State University.

It is hypothesized that

1. there is a relationship between college textbook readability and academic achievement in college courses.
2. there is a relationship between students' reading ability and beginning college achievement.
3. there is interrelationship among students' reading ability, readability of college textbooks and academic achievement.

Definitions

For the purpose of this study, the following definitions will be used.

Reading Ability--is defined as competency and proficiency in contextual comprehension of written communication.

Academic Achievement in Courses--is the performance and facility of application in subject areas.

Book Readability--is defined as the level of difficulty of reading material.

Limitations of the Study

This study has the following limitations.

1. The investigation primarily includes freshman students at Iowa State University.
2. The reading level of the students was determined by the Nelson-Denny Reading Test--Form A.
3. The readability of the textbooks was measured by the Fry Readability Scale.

4. The study was conducted during the Fall Quarter, 1977, and only used those students on whom all measures were available and ascertainable.

CHAPTER II. LITERATURE REVIEW

The literature was reviewed for the following purposes: (1) to obtain a comprehensive overview of the nature of research done in the area of textbook readability, in relation to college academic achievement in subject areas; (2) to derive from research findings consensus concepts of readability; (3) to compare the techniques and formulas for measuring and assessing readability; (4) to examine research findings and statistical techniques used in correlating reading ability, readability of textbooks, and academic achievement.

The first section of the review centered on early research studies on readability while the second part focused on the Fry Readability Graph and the third on readability, reading ability, and academic achievement.

Readability

Readability is not a new area of study, but one which remains a concern of educational theorists and researchers because of its practical and changing implications for teachers who are attempting to adopt textbooks that are best suited for their students. As more and more textbooks become available, there is growing concern about the relationship of textbook readability and classroom achievement. This concern is reflected by DeBoer and Whipple:

Heavy reliance still appears to be placed on the use of textbooks in the social studies, science, and other classes in the content fields. It is true that the quality of textbooks,

both as to content and format, has been mostly improved in recent decades and that their reading difficulty has been more nearly adjusted to the average ability of pupils at the respective grade levels. Obviously, however, even the finest textbook cannot fully meet the needs of classes in which the reading ability typically ranges over several grades.¹

Although there have been tremendous improvements in the content, format, writing style, and vocabulary load of textbooks, there is still the question of how well the textbook(s) meet(s) the needs of all students in the average classroom given the diversity of interest and ability usually found in a classroom. This is to a great degree the basis of concern for assessing the students' reading ability and the readability of the textbooks such as those that are used in the college classroom.

Research has played a major role in providing the tools which can be used to assess the readability of instructional materials. The number of research studies on readability is large, however, research findings suggest that there still remains much to be done. Martin summarizes the state of readability research in the following manner:

It is no exaggeration to say that the whole history of research in readability has been an attempt at refinement. There is nearly a half-century of research behind now in this work. First, refinement existed simply in the efforts to devise some method of measurement less variable and subjective than the judgment approach. Earlier research was devoted to vocabulary studies. The next phase was the identification of many elements which influence difficulty. This might be called refinement only in the sense that it was a move away from judgments, because the results got

¹John J. DeBoer and Gertrude Whipple, "Reading Development in Other Curriculum Areas," Development in and Through Reading, in Sixtieth Yearbook of the National Society for the Study of Education, pt 1 (Chicago, Ill.: The University of Chicago Press, 1961), p. 60.

quite elaborate. Some studies identified as many as 80 influential elements. The third period in research saw the elimination of most of these same factors with retention of those few which produced the greatest reliability.¹

The research evidence indicates that the refinement aspect of the readability research is essential, with emphasis pointing to the way in which the knowledge of readability is being used. An examination of the past readability research reveals the extent of knowledge in this area.

As early as 1923, researchers began to examine the readability of material. Notable evidence of this is the Lively and Pressey² study of a method for measuring the vocabulary burden of textbooks. The findings of this study led to the recommendations that material readability could be secured "by taking thousand-word samplings of the vocabularies used and examining these samplings with reference to the types of words employed."³ Lively and Pressey suggested three methods for analyzing word samplings in readability assessment:

(a) Range of vocabulary, or number of different words per 1000 words sampled, (b) number of words not occurring in the Thorndike list of 10,000 most common words, and (c) weighted median Thorndike "Word Book" index numbers.⁴

¹Mavis Martin, "Refinement of a Readability Formula." Problems, Programs and Projects in College Adult Reading in Eleventh Yearbook of the National Reading Conference (Milwaukee, Wisc.: The National Reading Conference, 1962), p. 132.

²B. A. Lively and S. L. Pressey, "A Method for Measuring the 'Vocabulary Burden' of Textbooks," Educational Administration and Supervision 9 (October, 1923): 389.

³Lively and Pressey, p. 398.

⁴Ibid.

Recent research indicates that these methods, though old, are not outdated. Some of the current readability assessments such as the Dale-Chall and Lorge formulas utilize the vocabulary range and word lists as criteria for judging the difficulty of reading materials.

In addition to the Lively and Pressey study, H. Y. McClusky¹ conducted a quantitative analysis of the difficulty of reading materials. In McClusky's study, passages from six books were examined, some of which were college textbooks. The following are among his conclusions:

different types of reading material represent different levels of difficulty. In this investigation the fiction passage occupied the easy level; the social science passages occupied the intermediate level; while the psychology and physics passages in order named appeared at the difficult level. (2) Analysis of the passages indicate that the easy material is characterized by the short simple sentence structure and easy familiar vocabulary; while the difficult material is characterized by a technical, unfamiliar vocabulary and a complex sentence structure.²

Dolch³ reiterates the idea of vocabulary burden making a significant difference in the readability of books. He states:

reading is a unified process, and each element in it is dependent upon every other. Interest may be so great as to overcome meager understanding or vocabulary difficulty. Conversely, vocabulary difficulty may cripple understanding and destroy interest.³

Therefore, as a result of his research, he recommends that vocabulary burden be measured by the percentage of difficult words.

¹H. Y. McClusky, "A Quantitative Analysis of the Difficulty of Reading Materials," Journal of Educational Research 28 (December, 1934).

²McClusky, p. 289.

³E. W. Dolch, "Vocabulary Burden," Journal of Educational Research 17 (March, 1928): 170.

Today's literature on readability and assessment techniques reflect the influence of McClusky's and Dolch's research and their emergent recommendations.

Extending beyond the findings and recommendations of earlier research on readability, Wheeler and Wheeler¹ proposed several additional criteria for assessing readability, those being adaptability, organization, amount and quality of pictorial materials format, sentence structure, and principles of learning. First, the researchers feel that books should be adaptable--adaptability being defined as "meeting the interests and experiences of persons of different abilities, of varying social and economic status, and of urban or rural background."² The second measure was that of organization which indicates how well a book "follows a general outline, or can be readily adapted to a plan."³ A third readability assessment was of the amount and quality of pictorial material--illustrations. A fourth criterion was sentence structure. Regarding this criterion, Wheeler and Wheeler state that

Until a child has learned to see the relationship of phrases and clauses to the rest of the sentence, their presence makes reading difficult. Long involved sentences are difficult and tedious reading even for many students at the university graduate level.⁴

¹L. R. Wheeler and V. D. Wheeler, "Selecting Appropriate Reading Materials," Elementary English 25 (December, 1948): 478-489.

²Wheeler and Wheeler, p. 479.

³Wheeler and Wheeler, p. 480.

⁴Ibid.

Sentence structure was found to have been included in many other studies of readability. The next factor investigated by Wheeler and Wheeler was that of format. Some of the items which were considered under the heading of format were: size of type, columns on a page, gloss of paper, liberal use of headings, subheadings, sections, paragraph titles, chapter outlines. The last factor which Wheeler and Wheeler addressed were principles of learning. These principles included how often an idea is repeated and how vivid the first impression is. They concluded that "of all the factors that contribute to the difficulty of reading materials, vocabulary (also identified in earlier research) appears to be of major importance."¹ Since studies seem to agree on this factor it would seem that vocabulary is the criterion of greatest importance in judging the readability level of materials.

The literature review revealed that most readability assessments do include vocabulary as a criterion, but none include the other factors which the Wheelers studied. It would seem, however, that this does not imply that the other factors are not important, but because they are difficult to measure they are not as useful in the assessment of readability. There was, however, agreement in the findings of the Wheelers and Dolch in a later study. Dolch extended the study of readability assessment by looking into factors which could possibly cause graded reading difficulty. The factors which Dolch listed were (1) physical

¹Wheeler and Wheeler, p. 482.

factors, (2) content factors, and (3) manner of presentation.¹ In Dolch's effort to determine the graded reading difficulty of reading textbooks, three measure were used--these being sentence length, vocabulary level, and number of syllables. He felt that these measures indicated how one book compared with the standard readers, and used these readers as a criterion for assessing readability.

This first section of the review of literature consisted of an examination of the early research studies in readability. The early studies were primarily concerned with isolating the factors which were thought to effect the readability of material. Following these early studies, researchers began to develop readability formulas and other measures to assess the readability level of material.

Readability Assessment Formulas and Techniques

Many formulas and other tools have been developed for measuring the readability of materials. Out of early research, the present readability assessment procedures have emerged. Some of these formulas are still in use today and have been found to be relatively reliable when compared with one another. These measures² include

¹E. W. Dolch, "Graded Reading Difficulty," Problems in Reading (Champaign, Ill.: The Garrard Press, 1948), p. 229.

²For more information on these formulas, see the following publications:

Dale, Edgar and Jeanne S. Chall. "A Formula for Predicting Readability: Instructions." Educational Research Bulletin 27 (January 1948): 11-20, 28.

Lorge, Irving. "The Lorge and Flesch Readability Formulae: A Correction." School and Society 67 (February 21, 1948): 141-142.

Flesch, Rudolf F. "A New Readability Yardstick."

- 1) Dale-Chall Formula
- 2) Lorge Formula
- 3) Farr-Jenkins-Paterson Formula
- 4) Forbes Formula
- 5) Dolch Formula
- 6) Gray-Leary Formula
- 7) Lewerenz Formula
- 8) Yoakam Formula
- 9) Winnetka Formula
- 10) Spache Formula
- 11) Fry Scales

As an approach to readability measurement, Gilliland has found that there are three major factors considered in readability: (i) ease of reading, (ii) interest or compellingness, and (iii) ease of understanding. Most researchers have regarded these aspects as alternatives and the measures which they have developed reflect only one of these factors. Gilliland feels that it is important to know what is measured in each case and he states:

Firstly, when referring to ease of reading, readability has come to be measured by use of word recognition speed, error rates, number of eye fixations per second and so on, all of which relate to primary skills and measures of visibility or legibility. Secondly, when defined as interest or compellingness, readability has been measured by reference to human interest, density of ideas, and aesthetic

Journal of Applied Psychology 32 (June, 1948): 221-233.

Farr, J. N., J. J. Jenkins, and D. G. Paterson. "Simplification of Flesch Reading Ease Formula." Journal of Applied Psychology 35 (October, 1951): 333-337.

Forbes, F. W. and W. C. Cottle. "A New Method for Determining Readability of Standardized Tests." Journal of Applied Psychology 37 (June, 1953): 185-190.

Wheeler, L. R. and E. H. Smith. "A Practical Readability Formula for the Classroom Teacher in the Primary Grades." Elementary English 31 (November, 1954): 397-399.

Spache, George. "A New Readability Formula for Primary-Grade Reading Materials." Elementary School Journal 53 (March, 1953): 410-413.

Fry, Edward. "Fry's Readability Graph: Clarifications, Validity and Extension to Level 17." Journal of Reading 21 (December, 1977): 242-52.

judgments of style. Thirdly, when defined as ease of understanding or comprehension, measures have referred to characteristics of words, sentences, such as their length or frequency of occurrence, in the case of the former, and length and complexity in the case of the latter.¹

It is Gilliland's opinion that of the three alternatives, the third has been most frequently used, probably because it presents "fewer problems and offers greater possibilities for wide and frequent usage."² Of the devices that were listed earlier, only one, the Flesch formula, used interest as a measure. The others used ease of understanding as their basis for estimating the readability of material. This literature review further revealed that no devices took into consideration all three of the factors which Gilliland cited. Therefore, it appears that there still remains a need for research in the area of developing devices to assess readability.

Bormuth,³ in examining new data on readability, felt that the publication of two books on readability research has had effect on the direction of research in this area. The two books, Readability: An Appraisal of Research and Application⁴ and The Measurement of Readability⁵ provided a review of research literature dealing with readability, an analysis

¹Gilliland, John, Readability (London: University of London Press Ltd., 1972.)

²Gilliland, p. 84.

³John R. Bormuth, "New Data on Readability," in Forging Ahead in Reading, ed. J. Allen Figurel (Newark, Del.: International Reading Association, 1968), p. 488.

⁴Jeanne S. Chall, Readability: An Appraisal of Research and Application (Columbus, Ohio: The Ohio State University Press, 1958.)

⁵George R. Klare, The Measurement of Readability (Ames, Iowa: Iowa State University Press, 1963.)

of trends and conclusions based on collected data. Chall has found that for further progress in the prediction of readability, two trends in research are indicated: "the continuation of the present quantitative approach, with emphasis on objectivity and efficiency in application; and the study of those qualitative aspects of readability which so far have been elusive to objective measurement.¹ To be more specific she listed three areas which needed more extensive research and they were:

- (1) To refine existing criteria.--New criteria are needed to cover a wide range of writing, including fiction, and nonfiction, specialized and general, children's and, especially adults' reading matter.
- (2) To refine existing factors.--Answers to the questions can be sought either in prediction studies using new criteria passages in cross-validation studies using the present formulas, or by critical appraisal of formulas in applicational studies.
- (3) To identify qualitative aspects of readability.--There is a need to investigate such elusive aspects of difficulty as organization and logic, directness of approach, abstractness, conceptual difficulty, and the like.²

The research literature indicated that neither of the three areas has been widely investigated and, therefore, are still areas of concern.

Like Chall, Klare has indicated that there are three directions future research might go:

- (1) basic research on critical, underlying variables in the process of reading and learning from print, heading to some kind of theoretical framework for understanding them; (2) attempts to identify and/or incorporate new factors important to accurate readability measurement into formulas; and (3) refinement of factors and methods now used in readability formulas.³

¹Chall, p. 158.

²Chall, pp. 158-160.

³Klare, The Measurement of Readability, p. 182.

Both Chall and Klare had similar ideas about the directions which readability research should take. It can be concluded from their findings that readability formulas and other devices for assessing readability are still in need of refinement and additional research.

Assessment of Textbook Readability

The next major decision in this research was choosing a tool to assess the readability of the textbooks used in the courses which the subjects were enrolled. There are varying concepts of what readability is. Chall discussed some of these in the book, Readability: An Appraisal of Research and Application. She conceptualized readability as legibility, interest and ease of understanding. When she speaks of legibility, she is referring to the size and style of type, length of line, amount of white space (leading and margin), color of paper and print, and illumination.¹ Her next broad element of readability is the content of the reading material and its effect on interest. Chall's last major element of readability is ease of understanding which is determined by such factors as vocabulary and sentence structure. It is important to note, however, that all three of these elements of readability are interrelated, but at this point no objective assessment devices have been developed to measure all three of these elements which Chall considers as readability. Therefore, when there is a need to determine the readability of material, a definite limitation exists. Most readability assessment tools measure the "ease of understanding" or

¹Chall, p. 5.

the vocabulary difficulty and sentence complexity, and are generally formulas. "The 'readability formula' refers to measurement intended as a predictive device that will provide quantitative, objective estimates of the style difficulty of writing."¹

Reviews were made and research on a large number of formulas were examined such as the Gray-Leary, Dale-Chall, Flesch, Farr-Jenkins-Paterson, Gunning Fog Index, Lorge and the Fry Scale. There were several findings on which there seemed to be mutual agreement. The first is that additional variables in readability assessment devices do not seem to add a great deal of accuracy to the estimated readability level. Martin supports this idea in the following observation: "Generally, research shows that additional elements added to the evaluation do not add enough predictive power or cut enough from measurement error to pay for their inclusion."²

A second factor of agreed upon importance was the advantage of using the new formulas (Fry's Scale and McLaughlin's). Pauk said of these new formulas:

What are the advantages of these new formulas over the old ones? The answer is that the new ones have two advantages: ease of calculation and a saving of time; that is, the entire calculation takes about ten minutes when using McLaughlin's formula, and about fifteen minutes using Fry's formula. This is in contrast to forty minutes when using an older formula, say the Dale-Chall.³

¹Klare, p. 3.

²Martin, p. 132.

³Walter Pauk, "A Practical Note on Readability Formulas," Journal of Reading 13 (December, 1969): 207-210.

Furthermore, Pauk noted that the Fry method yielded grade levels which are identical to those obtained when using the Dale-Chall formula. Vaughn's study resulted in similar findings.¹ He states that Fry's more efficient formula agreed consistently with other, more established, measurement devices such as Flesch, Dale-Chall, and Spache.

Because of the general agreement of authorities, it was decided that the Fry Graph would serve as a reliable and valid tool for assessing the readability of textbooks.

A common method for determining the validity of readability devices is through the use of correlations with other formulas. Kenneth Dulin found that Fry's Graph had correlations of ".955 with Flesch, .742 with Farr-Jenkins-Paterson, and .731 with Gunning Fog Index."² It can be concluded that when the grade levels from the Fry Graph are compared to those of other readability measures, the Fry Graph appears to be reliable and valid. Fry found that in comparison with the cloze rankings (Bormuth levels), the Fry Graph correlated .81 with Bormuth.³ In another study, Fry assessed the readability of ten books using his graph and four other formulas. Intercorrelations of the five readability methods ratings were

¹Joseph L. Vaughn, Jr., "Interpreting Readability Assessments," Journal of Reading 19 (May, 1976): 635-639.

²Kenneth Dulin, "Readability Levels of Adult Magazine Material," Multidisciplinary Aspects of College-Adult Reading, in Seventeenth Yearbook of the National Reading Conference (Milwaukee: The National Reading Conference, Inc., 1968), p. 179.

³Edward Fry, "Fry's Readability Graph: Clarifications, Validity and Extension to Level 17," Journal of Reading 21 (December, 1977): 246.

as follows:

Fry	--
SRA	.98
Botel	.78
Dale	.94
Flesch	.96 ¹

Britton and Lampkin compared the Fry Graph and five other formulas plus publishers' designations and obtained the grade levels shown in Table 2.1.

Table 2.1. A Comparison of Publishers' Designations with Six Readability Formulas for the Ginn Reading 720 Series (1976) (Fry, "Fry's Readability Graph," p. 245)

a	b	Readability					
		c	d	e	f	g	h
Preprimer	8	1.0	.5	1.3			
Primer	8	1.0	1.0	1.6			
1	23	1.1	1.2	1.7			
2 ¹	26	2.2	1.8	1.9			
2 ²	26	2.7	2.5	2.3			
3 ¹	26	2.7	2.6	2.5			
3 ²	20	4.0	3.1	2.7			
4 ²	28	4.2	3.7		5.3		
4 ¹	29	4.4	3.8		5.3		
5 ²	26	4.5	5.3		6.7	6.8	8.7
6	37	6.6	5.6		7.5	7.2	8.9

a=Publisher's Book Level.

b=No. of 100 Word Samples.

c=Fry (1-13).

d=Harris-Jacobson (PP-8+).

e=Spache (1-3).

f=Dale-Chall (4-16).

g=Flesch (5-17).

h=Farr-Jenkins-Paterson (5-17).

¹ Edward Fry, "A Readability Formula That Saves Time," Multidisciplinary Aspects of College-Adult Reading, in Seventeenth Yearbook of the National Reading Conference (Milwaukee: The National Reading Conference, Inc., 1968), p. 203.

Readability, Reading Ability, and Academic Achievement

The third objective of this literature review was to examine research findings on the relationship of textbook readability to students' reading ability.

Numerous research studies have been conducted to examine the disparity between textbook readability and students' reading ability. Most of these studies, however, have been limited to junior college students or the community setting. These studies concluded that the greater the disparity between textbook readability and the students' reading ability, the more difficulty students will experience with a college course. Cline, in a study of the readability of college textbooks, observed that

All too frequently the needs and abilities of the clientele are over-looked when textbooks are written . . . it is not uncommon for the finished product to be geared primarily for the approval of the writer's₁ peers and only incidentally for the instruction of students.¹

Cline's study, examining the readability of textbooks, made a comparison of the readability of textbooks used in a community college with the enrolled students' reading ability. Cline's rationale for his study was very similar to that of this study being conducted at Iowa State University, and he reasoned that

students at or above the grade level placement of a textbook should be able to comprehend the material, while those below the grade placement of the textbook₂ would experience difficulty in comprehending the material.²

¹Terry Cline, "Readability of College Textbooks," Journal of Reading 16 (October, 1972): 34.

²Cline, p. 35.

Cline found that 52 percent of the students in all the classes had reading abilities below the textbook levels used in the respective classes.¹ In addition, Cline's assessment indicated that eleven of the seventeen books used in classes were above the reading ability of at least 50 percent of the students in the classes, and of these eleven textbooks, seven were above the reading ability of at least 75 percent of the students.

Another study similar in nature was conducted by Spring² at Seattle Central Community College. The concerns of this study were reflected in a series of questions posed:

- (1) how difficult the textbooks used in a sampling of courses at one urban community college are, but also, (2) if the difficulty that students have in reading their textbooks is a prediction of course failure or low grades. If not, (3) then how are students getting their information, and (4) how do the students themselves subjectively³ perceive the difficulty and usefulness of their textbooks?

Spring's study made use of 154 subjects; the results were summarized as follows: 23% scored on the frustration level; 19% scored on the instructional level; and 58% scored on the independent level.⁴ Two-thirds of the subjects indicated that their main sources of information were not the textbook.

Another study of college readability was made by Major and

¹Cline, p. 35.

²Karen Strom Spring, "How Much Do Community College Students Learn From Their Textbooks," Journal of Reading 19 (November, 1975): 131-136.

³Spring, p. 131.

⁴An explanation of the levels on which students scored is: 1) "preferred criterion" (independent level); 2) "guided reading" (instructional level); and 3) "frustration level."

Collette.¹ Major and Collette's study of the readability of college general biology textbooks supported the findings of Spring. They concluded that the most frequently used and preferred textbooks in the college category are written beyond the reading comprehension level of college freshmen.

Still another study comparing the reading ability of junior college students with the readability of assigned textbooks was conducted by McClellan.² McClellan found that of the 358 subjects tested using the Nelson-Denny Reading Test, 64 subjects (17.9%)³ scored 13.8; 44 subjects (12.3%) scored 14; 120 subjects (33.5%) scored 10-12-12; 115 subjects (32.1%) scored 7-8-9 and 15 subjects (4.2%) scored < 7. Over half of the students were found to be below college reading level (13.0) and the textbooks assigned were on college level. The conclusion was that the tool of reading is useless when the material to be read does not reasonably match the capacity of the reader.

Two other studies involving the readability of textbooks as

¹A. G. Major and A. T. Collette, "Readability of College Biology Textbooks," Science Education 45 (1961): 216-224.

²Dorinda Ann McClellan, "A Comparison of Reading Ability of Junior College Students with the Readability Levels of Assigned Texts," Paper presented at the National Reading Conference, St. Petersburg, Florida, December 3-5, 1970. Twentieth Yearbook of the National Reading Conference, Inc., Marquette University, Milwaukee, Wisconsin. ERIC ED 049 005.

³The percentage scores were computed by the researcher of the present study.

compared with students' reading ability were done by Hagstrom.^{1,2} Both studies consisted of subjects enrolled at Columbia Junior College. His findings were quite similar to those of the previous studies reviewed. All of the textbooks were one or more grade levels above the reading ability of the students. Hagstrom concluded that

It may be argued and correctly so that the text for a course in most colleges and universities are not the only materials used for instruction, but it is also true that texts and other written materials constitute the primary means of instruction for the learner.³

Hagstrom indicated that textbooks appear to be the major source of information for college and university classes, therefore, it is viable to execute research on textbook readability and students' reading ability.

Another study examining the relationship of the readability of textbooks and students' reading ability was conducted by Kurzman⁴ who studied the readability of freshman social sciences textbooks and compared it with freshman students' reading ability. Kurzman used the Nelson-Denny Reading Test to assess the students' reading ability and found the average reading level to be 10.4. Of the twenty-four books

¹Jon Hagstrom, "A Comparison of the Reading Abilities of a Junior College Population and the Readability Levels of Their Texts," Paper presented at Western College Reading Association, Los Angeles, California, April 1-3, 1971. ERIC ED 050 902.

²Jon Hagstrom, "A Comparison of the Reading Abilities of a Junior College Occupational Education Population and the Readability Levels of Their Texts," 1974. ERIC ED 088 028.

³Hagstrom (April, 1971), p. 8.

⁴Maurice Kurzman, "Readability of Freshman College Textbooks in the Social Sciences as Compared to the Reading Ability of Students Who Use Them. A Pilot Study," City University of New York, Bronx, New York, Herbert H. Lehman College, August, 1973. ERIC ED 116 127.

assessed, four were on freshman level; seven on fourteenth level; two on fifteenth level; six on sixteenth level; and two on seventeenth level respectively.

The relationship between college students' reading ability and the readability of their texts was examined by Block, et al.¹ This study was comprised of 215 freshmen composition students and it was found that four out of six freshman textbooks used in the study might be considered inappropriate for use by over one-fourth of the total student sample. They also reiterated the importance of matching the reader to the textbook. In this regard the researchers stated that

If students are having difficulties with the readings, then they will most likely have trouble obtaining high² grades in their courses or even passing their courses.

In light of these findings, it is reasonable to assume then that there is a relationship between reading ability and academic achievement. Research further suggests that reading ability can be used to predict academic achievement.

Further support of this position is given by the study of Wilson and Einbecker³ which tested the hypothesis that there is no significant relationship between reading ability as measured by the Reading Index Score on the Florida Twelfth Grade Test and academic performance as measured by the cumulative grade point average. They found a

¹Alan Block, Karen Blair and Patricia Outlaw, "The Reading Ability of College Students Versus the Readability of Their Texts," Towson State College, Maryland, January, 1976. ERIC ED 127 558.

²Block, et al., p. 1.

³Richard Wilson and Polly Godwin Einbecker, pp. 234-237.

significant and positive correlation between reading ability and academic performance of junior college freshmen in this study.

Another study which investigated the relationship of reading achievement to academic performance was conducted by Henard and Stemming.¹ This study consisted of 117 community college freshmen and six dependent measures of academic performance were correlated with reading achievement. They found reading achievement to be a predictor of grade point average, course load and attitudes. Their findings indicated:

Reading achievement interacted significantly with each of six dependent measures of academic performance; fall and spring course hour load; fall, spring and composite grade point average; and selected attitude variables.²

Further evidence of reading ability predicting academic achievement is provided through Einbecker's³ research which supports the point that there is a relationship between academic performance and reading ability. She conducted a study at Pensacola Junior College using 313 freshmen as subjects. Reading ability was measured by the Reading Index Scores on the Florida Twelfth Grade Test and academic performance was quantified as the cumulative grade point average. Einbecker found the Reading Index Score to be a significant predictor of the cumulative

¹Kay Fields Henard and Walter F. Stemming, "Life Change and Reading Achievement as Predictors of Academic Performance for Selected Community College Freshmen," Paper presented at Annual Meeting of the American Educational Research Association, San Francisco, California, April 19-23, 1976. ERIC ED 122 879.

²Henard and Stemming, p. 7.

³Polly Godwin Einbecker, "The Relationship Between Academic Performance and Reading Ability of Pensacola Junior College Freshmen," Practicum presented to Nova University in partial fulfillment of the requirements for the Doctor of Education Degree. ERIC ED 100 432.

grade point average in freshman year in college. Moreover, she found that

The linear trend showed that 23% of the variation in grade point average could be accounted for by variance in the Reading Index Score.¹

A study by Pedrina and Pedrina² gave similar findings. The researchers compared the reading scores on the Nelson-Denny Reading Test and grades from a junior level psychology course for 120 college students. The results the researchers found showed that

a significant minority of the grade variance was accounted for (about 35%) by the vocabulary score. The Revised Nelson-Denny vocabulary was an adequate predictor when reading ability was, in part, programmed into the course requirements.³

Research studies, such as those by the Pedrinas, Einbecker, Henard and Stemming, Block and Wilson, and Einbecker, support the thesis that reading does relate to academic performance.

When the three variables, reading ability, readability and academic achievement were considered jointly, only one such study was found.

Balser⁴ investigated the readability of selected general studies textbooks

¹Einbecker, p. 3.

²D. T. Pedrina and Bonnie Pedrina, "Reading Abilities and College Grades," College Student Journal 9 (February-March, 1975): 37-42.

³Pedrina and Pedrina, p. 42.

⁴Elizabeth Ann Balser, "The Relationship Between Text Readability and Student Reading Level and Its Effect on College Achievement." Ph.D. dissertation, West Virginia University, 1976, p. 144.

and students' reading ability and the relationship between the two.

The Nelson-Denny Reading Test was used to assess the students' reading grade levels while the Dale-Chall Readability Formula and the cloze test¹ were used to assess the difficulty level of the textbooks. This study yielded the following results.

The factors that significantly correlated with each other for all students and all texts were (1) reading test scores and cloze scores (2) reading test scores and achievement test scores (3) reading test scores and final grades (4) cloze scores and achievement test scores (5) cloze scores and final grades (6) the arithmetic difference between reading test scores and the readability levels of the texts and achievement test scores (7) the arithmetic difference between reading test scores and the readability levels of the texts and final grades.²

Summary

The literature reviewed revealed certain factors upon which there was agreement from which some tentative conclusions can be drawn. Certain conclusions were made based on the research findings reviewed. First, readability measures provide estimates of the level of difficulty of reading materials. Although these measures do not take into account all of the factors that affect reading, they provide valuable

¹The cloze test developed by W. L. Taylor is often used to determine the readability of reading materials. This procedure involves the deletion of a number of words randomly determined or at fixed intervals. Subjects are asked to complete the passages with the exact words and they are scored on the number of correct responses. Those passages with the higher scores are regarded as more readable than those with lower scores. Research on the cloze test will not be reviewed in this study, because it requires having students participate in the readability assessment process. This kind of assessment was not used in this research.

²Balser, p. 135.

information regarding the match or mix-match of the reader and the book.

Further, it can be concluded that the majority of textbooks assigned to college students tend to be above the reading level of these students and the greater the disparity between the two, the more difficulty the student experiences in courses.

Finally, when the three major variables, readability of textbooks, students' reading ability and academic achievement, form the constructs of a situational paradigm, and are to be considered simultaneously, it appears that the smaller the discrepancy between the textbook readability and the students' reading ability, the higher the student can achieve academically. Because of the dearth of information on reading ability, readability and academic achievement, it appears that there is need for more research in this area to validate the printed and tentative findings.

On the basis of these observations and findings from the literature review, the foundation is laid for the hypotheses of the research here undertaken.

CHAPTER III. PROCEDURES

The problem upon which this research focused required determining the relationship of the readability of course textbooks and students' reading ability to academic achievement. The objective of the study was to determine the degree to which textbook readability and students' reading ability are related to students' academic achievement.

To facilitate statistical analysis, null hypotheses were used because the significance of measures was in terms of deviation from zero. The following hypotheses were formulated.

Major:

1. There is no relationship between students' reading ability and academic achievement.
2. The amount of disparity between students' reading ability and the readability of assigned textbooks has no relationship to academic achievement.

Subsidiary

3. There is no relationship between MSAT scores and academic achievement.
4. There is no relationship between students' performance on the Nelson-Denny Reading Test and the Minnesota Scholastic Aptitude Test.
5. There is no relationship between the number of college credit hours and students' academic achievement.
6. There is no relationship between students' high school academic

performance and students' college academic performance.

The conceptual relationships conceived in this study are depicted in Figures 1 and 2.

Definitions and Quantifications

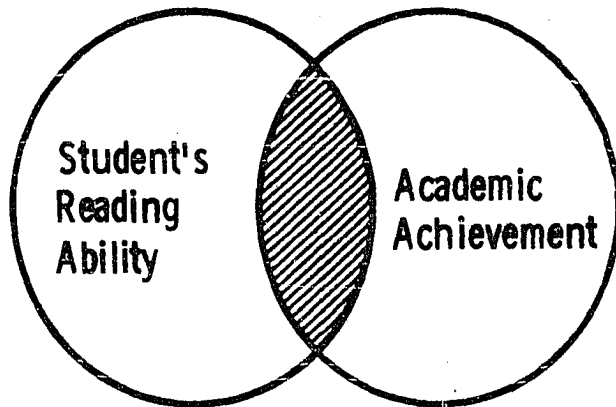
Reading Ability--is defined as competency and proficiency in contextual comprehension of written communication and quantified by the reading grade level as indicated by the student's performance on the Nelson-Denny Reading Test (grade levels are in terms of grade and decimal portion of a year as 7.1 = seventh grade 1 month; 12.5 = twelfth grade fifth month; 13.2 = freshman college level two months).

Academic Achievement in Courses--is the performance and facility of application in subject areas quantified as the grades received in courses. (Numerical equivalent of letter grades--A = 4.00; A- = 3.99-3.67; B+ = 3.66-3.33; B = 3.32-3.00; B- = 2.99-2.67; C+ = 2.66-2.33; C = 2.32-2.00; C- = 1.99-1.67; D+ = 1.66-1.33; D = 1.32-1.00; F = .99-0.)

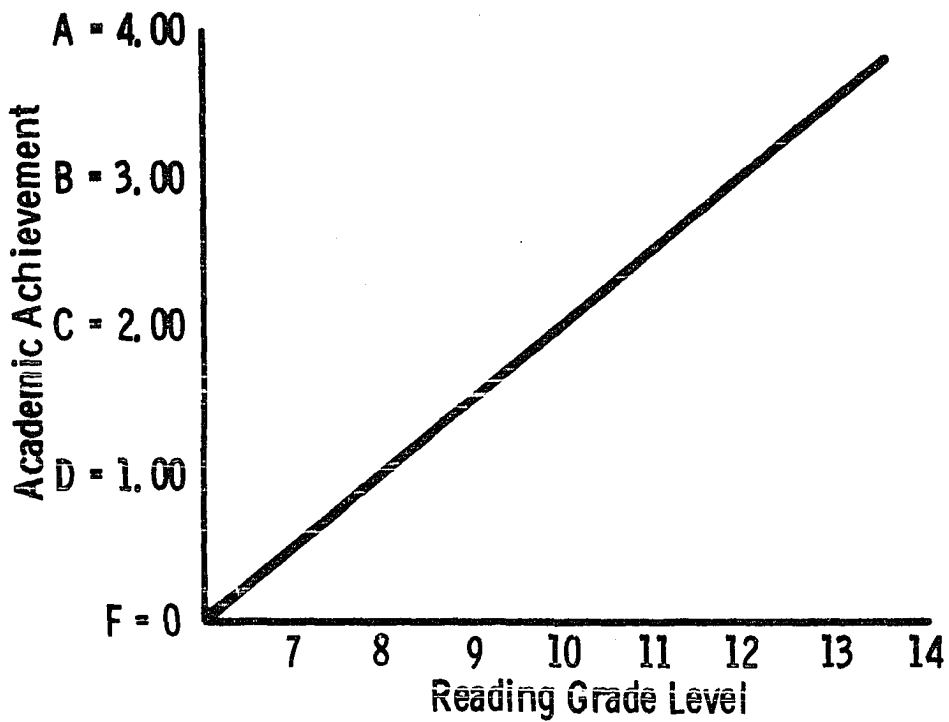
Book Readability--is defined as the level of difficulty of the reading material and quantified as a grade level, as assessed by the Fry Graph.

Discrepancy--is defined as the arithmetic difference between the textbook readability level and the student's reading grade level.

Herein described are the procedures used in collecting the data, the materials, tools of measure, the assessment of textbook readability and a description of methods used for statistical analysis.

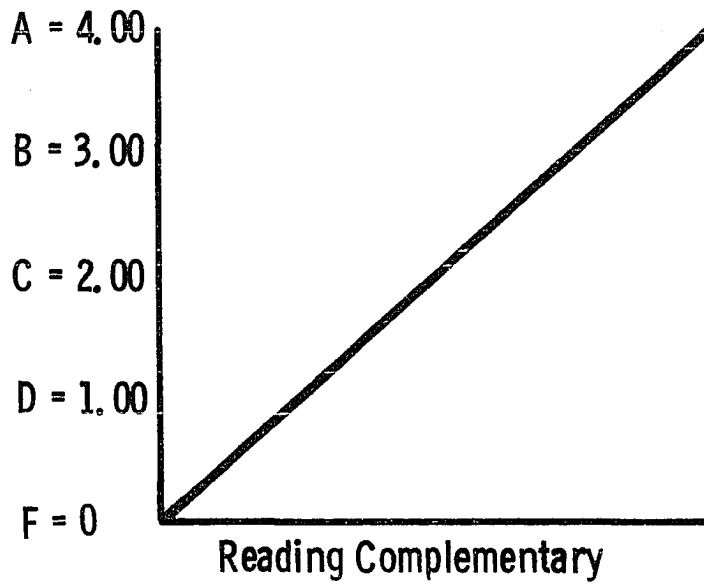


Students reading ability account for some of the variation in academic achievement.

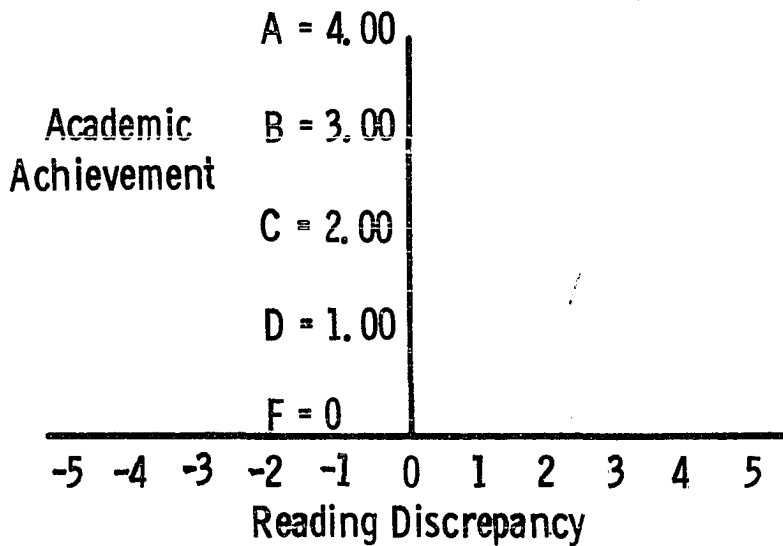


The higher the students' reading ability level, the higher their academic achievement.

Figure 3.1. Models of the relationship of students' reading ability and academic achievement



The smaller the discrepancy between the students' reading ability and the readability of textbooks, the higher the students' academic achievement.



The greater the discrepancy between the students' reading ability and the readability of textbooks, the lower the students' academic achievement.

Figure 3.2. Models of the relationship of students' reading ability and textbook readability to academic achievement

Study Group

The study group consisted of 68 students enrolled in Psychology 131 during the Fall Quarter 1977 at Iowa State University, Ames, Iowa. Psychology 131 is an academic skills course which teaches study and reading skills. The students enrolled in the course were predominantly freshmen. Many of the upperclassmen enrolled in Psychology 131 were on academic probation. All of the subjects were freshmen with the exception of two who were sophomores. Most of the students were Iowans except for eight (five from Illinois, one from Missouri, and two from Kansas).

Methods and Tools Used for Collecting Data

Data were gathered through four sources--questionnaires¹, the Registrar's Office, the Office of Admissions and Records and Student Counseling Services.² The questionnaire was developed to secure basic information from the student about himself and his status. (The questionnaire appears in Appendix A.) The questionnaire was given to each student enrolled in Psychology 131 with the directions to return it on the following class meeting. Follow-up calls were made to students who did not return the questionnaires. Of the one hundred and eight students

¹Before the questionnaires could be administered to the subjects, the Human Subjects Committee reviewed and approved the tool to insure that none of the rights of the subjects would be violated.

²The researcher was required to sign a statement indicating that the students' identity would remain in strict anonymity.

enrolled in Psychology 131, 94 completed and returned the questionnaires which yielded an 87.04 return rate. To conduct the research, there was a need to determine common courses taken by the students. Based on the data gathered from the questionnaires, it was found that sixty-two of the ninety-four students were enrolled in common courses.

Information secured from the Registrar's Office was the courses in which the subjects were enrolled and the grades which the students received during both the fall and winter quarters of the 1977-78 academic year. From the Admissions Office, the students' high school grade point average, high school class rank and ACT score were secured. The students' MSAT scores were obtained through Student Counseling Services.

The test instruments used with the subjects were the Nelson-Denny Reading Test - Form A, the Minnesota Scholastic Aptitude Test and the ACT test.

The Nelson-Denny Reading Test - Form A was administered to the subjects at the beginning of Fall Quarter, 1977, in the Psychology 131 classes. Confidence in the measures of the test are indicated by the reliability and validity of test parts which are as follows:

Reliability Coefficients of¹ the
Nelson-Denny Reading Test

<u>Part</u>	<u>r</u>	<u>n</u>
Vocabulary	.93	110
Comprehension	.81	110
Total	.92	110
Rate (Initial)	.93	74
Rater (After Training)	.82	78

¹M. J. Nelson and E. C. Denny, Examiner's Manual: The Nelson-Denny Reading Test (Boston: Houghton Mifflin Co., 1960), p. 26.

<u>Parts</u>	<u>Number of items</u>	<u>Validity (Form A)¹</u>		<u>Difficulty</u>	
		<u>Range</u>	<u>Mean</u>	<u>Range</u>	<u>Mean</u>
Vocabulary	36	31-71	47.5	27-96	62.3
Comprehension	100	25-64	44.6	29-95	71.2

This test consists of two sections: vocabulary, and comprehension and rate. There are 100 items to measure vocabulary and 36 to measure reading comprehension with time limits of ten minutes and twenty minutes respectively. The test is designed for persons in grades nine through sixteen and yields raw scores, percentile ranks and grade equivalents.² According to the Manual, the raw score must be interpreted with the aid of other derived scores to be most meaningful. "The percentile rank, a figure which places each student somewhere between 1 and 99, lets him know exactly where he stands in the norm group."³ The grade equivalent of a given raw score lets the student know where he stands in terms of grade level, the median score made by students at the level indicated. For example, if a student has a grade equivalent of 13.3, it should be interpreted that that student has the reading ability of a typical student who is at the third month of freshman level in college. A note of caution should be mentioned here. Betts as well as other authorities⁴

¹Ibid., pp. 25-26.

²Nelson and Denny, p. 10.

³Ibid.

⁴Emmett Albert Betts, Foundations of Reading Instruction (New York: American Book Company, 1957), p. 441.

Gus P. Pleassas, "Another Look at the Reading Score," Education 83 (February, 1963): 344-347.

Ruth Strang, Constance M. McCullough and Arthur E. Traxler, The Improvement of Reading (New York: McGraw-Hill, Inc., 1967), pp. 165-166.

have noted that grade-level achievement on a standardized reading test indicates the student's frustration level. The student would be very much in need of assistance to enable him to handle reading material on this level. Thus, the student would need to be assigned material at least a grade or two below the test score to function on the instructional level.

A second measure on the subjects was with the Minnesota Scholastic Aptitude Test. This test was given to the subjects either during the summer or fall orientation period. This test, developed by Wilbur L. Layton and Herbert Toops, covers three areas: reading comprehension, vocabulary and verbal analogies. "The MSAT is most relevant to English and verbal skills rather than mathematically-oriented courses."¹ The Minnesota Scholastic Aptitude Test yields a raw score which can be used to obtain percentiles, T-scores and category groupings.

Percentiles are obtained by arranging all the raw scores in order and then arranging them into 100 ranks with the lowest (poorest) scores as the first percentile and the highest (best) score as the one hundredth percentile. By the use of percentiles, we are able to compare immediately a given student's² score with scores made by other students in the same group.

The second score that is obtained from the MSAT is the T-score. It is computed from the Z or standard score. "The mean T-score is 500, the standard deviation is 100, and T-scores generally range from 200 to 800. The third set of norms is the category groups.

¹"Interpretation of Entering Students' Test Scores," (Ames, Iowa: Iowa State University, Test and Evaluation Services, May 1977), p. 3.

²Ibid., p. 5.

Category Groupings. A letter code was used to provide information which may help interpret test results in a very simple way:

1. If the student's raw score fell in the 91st to 100th percentile, the letter "A" will be indicated as a norm.
2. If the student's raw score fell in the 71st to 90th percentile, the letter "B" will be indicated as a norm.
3. If the student's raw score fell in the 31st to 70th percentile, the letter "C" will be indicated as a norm.
4. If the student's raw score fell in the 11st to 30th percentile, the letter "D" will be indicated as a norm.
5. If the student's raw score fell in the 1st to 10th percentile, the letter "E" will be indicated as a norm.¹

Another measure that was obtained on the subjects was provided by the American College Testing Program. The Office of Admissions and Records expects most freshmen entering Iowa State University to present an ACT score when they apply for admission. This test is generally taken during the latter part of the junior year in high school, however, some students take it during the senior year.

The ACT Test Battery contains four tests and yields five scores: English Usage, Mathematics Usage, Social Studies Reading, Natural Sciences Reading and composite.² Discussion of the four tests and what they purport to measure follows. The English Usage test contains 75 items with a 40-minute time limit. The ACT publication states that this test

measures the student's understanding and use of the basic elements in correct and effective writing--punctuation, capitalization, usage, phraseology, style, and organization.³

¹"Interpretation of Entering Students' Test Scores," p. 5.

²The Seventh Mental Measurement Yearbook, Vol. 1, ed. Oscar Krisen Buros (Highland Park, N.J.: The Gryphon Press, 1972), p. 330.

³Buros, p. 330, reviewed by Wimburn L. Wallace.

The mathematics usage test consists of 40 items in arithmetic, algebra, and plane geometry with a 50-minute time limit. The social studies reading test contains 52 items with a time limit of 35 minutes and measures "the evaluative reasoning and problem-solving skills needed in the social studies."¹ The last test is the natural sciences reading test which contains 52 items and has a time limit of 35 minutes. This test "measures the critical reasoning and problem-solving skills required in the natural sciences."² Research done by the Test and Evaluation Services of Iowa State University has indicated that the individual scale scores are not helpful in predicting class grades or freshman grade point at Iowa State University. In addition, the ACT composite score is only a fair predictor of the performance of a student. It has been found that most of the scores fall in the small range of 22 to 29. The Test and Evaluation Services have found that the ACT composite score can be interpreted as follows:

- a. Scores of 22 and above--"Typical ISU student," good chance of academic success.
- b. Scores of 21 and below--indication that the scholastic ability of the student may be lower than typical ISU student. It would be best to note other scores and take special care in advising.³

There were some other measures that were taken on the subjects. They were grades in college courses during fall and winter quarters,

¹Buros, p. 330.

²Ibid.

³"Interpretation of Entering Students' Test Scores," p. 2.

and the cumulative grade point averages for both quarters. The grades in courses and grade point averages served as measures of academic achievement. Grades represent the permanent official record of academic attainments and progress. They are quantified as follows:

1. Student performance or status is recorded by the following grades or marks:

<u>Grade or Mark</u> <u>Points</u>	<u>Description of Performance</u>	<u>Quality</u>
A	Superior, Outstanding	4
B	Very Good, High Quality	3
C	Satisfactory	2
D	Passing, Minimally Acceptable	1
F	Failure	0
P	Passing grade obtained under the Pass-Not Pass system ¹	

These assessments were utilized in the research to help determine if students' reading ability and textbook readability relate to academic achievement.

Assessment of Textbook Readability

The choice of the tool to assess readability in this study was made being mindful of the varying concepts of readability. The Fry Graph is based on a prediction criterion of 50 to 75 percent comprehension. That is, if this device yields a readability score of seven, that score predicts that students reading on a seventh-grade level, however determined, will read that material with 50 to 75% accuracy.²

¹ISU Information Handbook (Ames, Iowa: Iowa State University, September, 1977), p. 47.

²Joseph L. Vaughn, Jr., "Interpreting Readability Assessment," Journal of Reading 19 (May 1976): 635-639.

The Fry Graph uses two variables to assess the readability of materials--average number of syllables per 100-word passage and the average sentence length per 100-word passage. Three samples are to be randomly selected and then each variable is averaged. With these average sentence length and average number of syllables, a dot should be plotted where the two lines intersect and, thus the appropriate grade level will be obtained (see copy of Fry's Graph in Appendix A).

Textbooks were assessed for six different courses. If there were several books used in a course the readability of the textbooks were averaged and that score was used to designate the readability of the books for that particular course. The courses and the textbooks are as follows:

<u>Course</u>	<u>Credit Hours</u>	<u>Textbook & Author</u>
Biology 101-Principles of Biology	3	<u>Biology</u> by Helena Curtis
Child Development 129-Principles of Child Development	3	<u>A Child's World</u> by Diane E. Papalia and Sally Wendkos
Elementary Education 204-The School in American Life	3	<u>The Development of American Education: Selected Readings</u> by Joan K. Smith and L. Glenn Smith; <u>Myth and Reality: A Reader in Education</u> by Glenn Smith and Charles Kniker; <u>You and Value Education</u> by Charles Kniker
Geography 100-World Geography	3	<u>Introduction to World Geography Regions and Cultures</u> by Robert Fuson

<u>Course</u>	<u>Credit Hours</u>	<u>Textbook & Author</u>
History 201- Introduction to Western Civiliza- tion	3	<u>An Introduction to Medieval Institutions</u> by Norman Zacour; <u>The Economic Development of Medieval Europe</u> by Bautier; <u>From the Tigris to the Tiber: An Introduction to Ancient History</u> by Tom Jones; <u>Heritage of Western Civilization Selected Readings, Vol. 1</u> ed. by John Louis Beatty and Oliver Johnson; <u>The Iliad of Homer</u> trans. by Richmond Lattimore; <u>The Song of Roland</u> trans. by Dorothy L. Sayer; <u>Medieval Europe</u> ed. by William McNeill and Schuyler O. Houser; <u>Readings in Ancient History from Gilgamesh to Diocletian</u> ed. by Nels Bailkey; <u>Medieval Europe</u> by C. Warren Hollister; <u>Civilization Past and Present, Vol. One</u> by T. Walter Wallbank, Alastair M. Taylor and Nels Bailkey; <u>Western Literature I The Ancient World</u> ed. by Heinrich Von Staden; <u>Western Civilization 1: Pre-history to the Peace of Utrecht</u> general ed. William L. Langer
Sociology 134- Introduction to Sociology	3	<u>Basic Sociology</u> by Jon Shepard; <u>Sociology Today Readings and Study Guide</u> by Brent T. Bruton and Jon Shepard.

Discrepancy

It was necessary to determine if there were a difference between the student's reading ability and the readability of the textbooks.

This variable was called the "discrepancy" and was determined by obtaining the arithmetical difference between a student's reading ability level and the readability level of the textbook.

Description of Research Design and Statistical Analysis

The factors considered in designing the research were: (1) classes chosen based on the number of subjects enrolled in courses (a minimum of ten students); (2) consideration of the variety of disciplines that the courses encompassed; (3) the degree to which confounding factors could be eliminated such as different teachers, different courses and different textbooks. The following designs were used.

Two classes with the same books and same teachers
 Geography 100 18 students
 Sociology 134 32 students

Two classes with the same books and different teachers
 Biology 100 16 students
 Child Development 129 29 students

Two classes with different books and different teachers
 Elementary Education 204 18 students
 History 201 10 students

A total of 62 subjects were enrolled in these courses which meant that some of the subjects were in two or more of the courses being studied.

The statistical procedures were chosen as follows. The thirty-five variables which are listed were designated and programmed for the study.

Variables

X_1 = Fall College G.P.A.

X_2 = Winter College G.P.A.

X_{3-8} = Textbook Readability for Courses Studied

X_9 = High School G.P.A.

X_{10} = Class Rank

X_{11} = Credit Hours Taken Fall Quarter

X_{12} = Credit Hours Taken Winter Quarter

X_{13} = Nelson-Denny Total Reading Score

X_{14} = Nelson-Denny Vocabulary Score

X_{15} = Nelson-Denny Comprehension Score

X_{16} = MSAT Score

X_{17} = ACT Composite Score

X_{18-23} = Perceived Difficulty of Book

X_{24-29} = Perceived Interest

X_{30-35} = Discrepancy Between Reading Ability and Readability
of Textbook

X_{36-41} = Grades Achieved in Courses

The mean, median and standard deviation were obtained for the students' reading ability levels, the readability levels of the textbooks, and overall grade-point averages for the Fall and Winter Quarters for the 1977-78 academic year. The mean was used to determine the average score for each variable while the median provided the score which 50% of the subjects were below and 50% were above. The standard deviation provided an estimate of the distance in score points, a given

observation is from the mean of the distribution."¹

The relationships between the dependent variables (academic achievement) and the independent variables were obtained by correlation. The basic assumption which underlies this statistical procedure is that the relationship between x and y is rectilinear and that the distribution with a given array has a dispersion.² The group variables that were intercorrelated are listed below (see Table 3.1).

High School G.P.A.
 Fall College G.P.A.
 Winter College G.P.A.
 Textbook Readability
 High School Class Rank
 Credit Hours Taken Fall Quarter and Winter Quarter
 Nelson-Denny Total Reading Score
 Nelson-Denny Vocabulary Score
 Nelson-Denny Comprehension Score
 MSAT Score
 ACT Composite Score

For each class the following variables were correlated (see Table 3.2).

Perceived Reading Difficulty with Actual Readability
 Interest in Book with Actual Readability
 Reading Ability with Grade in Course
 Discrepancy with Grade in Course
 Perceived Difficulty with Grade in Course
 Interest in Book with Grade in Course

A correlational and partial correlational analysis was used to determine the relationship of the students' perception of the reading difficulty of a textbook to the grades achieved in a course. The partial correlation is a statistical procedure which measures the relationship

¹Clinton I. Chase, Elementary Statistical Procedures (New York: McGraw-Hill Book Company, 1976), p. 68.

²Ibid., p. 106.

Table 3.1. Intercorrelations of variables

Variable		Total reading score X_{13}	Comprehension score X_{15}	Vocabulary score X_{14}	MSAT X_{16}
Total reading score	X_{13}	--	$r_{13.15}$	$r_{13.14}$	$r_{13.16}$
Comprehension score	X_{15}	$r_{15.13}$	--	$r_{15.14}$	$r_{15.16}$
Vocabulary score	X_{14}	$r_{14.13}$	$r_{14.15}$	--	$r_{14.16}$
MSAT	X_{16}	$r_{16.13}$	$r_{16.15}$	$r_{16.14}$	--
ACT	X_{17}	$r_{17.13}$	$r_{17.15}$	$r_{17.14}$	$r_{17.16}$
Fall grade point average	X_1	$r_{1.13}$	$r_{1.15}$	$r_{1.14}$	$r_{1.16}$
Winter grade point average	X_2	$r_{2.13}$	$r_{2.15}$	$r_{2.14}$	$r_{2.16}$
Fall credit hours	X_{11}	$r_{11.13}$	$r_{11.15}$	$r_{11.14}$	$r_{11.16}$
Winter credit hours	X_{12}	$r_{12.13}$	$r_{12.15}$	$r_{12.14}$	$r_{12.16}$
High school grade point average	X_9	$r_{9.13}$	$r_{9.15}$	$r_{9.14}$	$r_{9.16}$
High school rank	X_{10}	$r_{10.13}$	$r_{10.15}$	$r_{10.14}$	$r_{10.16}$

ACT X_{17}	Fall grade point average X_1	Winter grade point average X_2	Fall credit hours X_{11}	Winter credit hours X_{12}	High school grade average X_9	High school rank X_{10}
$r_{13 \cdot 17}$	$r_{13 \cdot 1}$	$r_{13 \cdot 2}$	$r_{13 \cdot 11}$	$r_{13 \cdot 12}$	$r_{13 \cdot 9}$	$r_{13 \cdot 10}$
$r_{15 \cdot 17}$	$r_{15 \cdot 1}$	$r_{15 \cdot 2}$	$r_{15 \cdot 11}$	$r_{15 \cdot 12}$	$r_{15 \cdot 9}$	$r_{15 \cdot 10}$
$r_{14 \cdot 17}$	$r_{14 \cdot 1}$	$r_{14 \cdot 2}$	$r_{14 \cdot 11}$	$r_{14 \cdot 12}$	$r_{14 \cdot 9}$	$r_{14 \cdot 10}$
$r_{16 \cdot 17}$	$r_{16 \cdot 1}$	$r_{16 \cdot 2}$	$r_{16 \cdot 11}$	$r_{16 \cdot 12}$	$r_{16 \cdot 9}$	$r_{16 \cdot 10}$
--	$r_{17 \cdot 1}$	$r_{17 \cdot 2}$	$r_{17 \cdot 11}$	$r_{17 \cdot 12}$	$r_{17 \cdot 9}$	$r_{17 \cdot 10}$
$r_{1 \cdot 17}$	--	$r_{1 \cdot 2}$	$r_{1 \cdot 11}$	$r_{1 \cdot 12}$	$r_{1 \cdot 9}$	$r_{1 \cdot 10}$
$r_{2 \cdot 17}$	$r_{2 \cdot 1}$	--	$r_{2 \cdot 11}$	$r_{2 \cdot 12}$	$r_{2 \cdot 9}$	$r_{2 \cdot 10}$
$r_{11 \cdot 17}$	$r_{11 \cdot 1}$	$r_{11 \cdot 2}$	--	$r_{11 \cdot 12}$	$r_{11 \cdot 9}$	$r_{11 \cdot 10}$
$r_{12 \cdot 17}$	$r_{12 \cdot 1}$	$r_{12 \cdot 2}$	$r_{12 \cdot 11}$	--	$r_{12 \cdot 9}$	$r_{12 \cdot 10}$
$r_{9 \cdot 17}$	$r_{9 \cdot 1}$	$r_{9 \cdot 2}$	$r_{9 \cdot 11}$	$r_{9 \cdot 12}$	--	$r_{9 \cdot 10}$
$r_{10 \cdot 17}$	$r_{10 \cdot 1}$	$r_{10 \cdot 2}$	$r_{10 \cdot 11}$	$r_{10 \cdot 12}$	$r_{10 \cdot 9}$	--

Table 3.2. Pearson correlation analysis on class variables

Variable		Perceived reading difficulty X_{18-23}	Perceived interest X_{24-29}	Total reading ability X_{13}	Grade in course X_{30-35}	Reading discrepancy X_{24-29}
Perceived reading difficulty	X_{18-23}	--	r	r	r	r
Perceived interest	X_{24-29}	r	--	r	r	r
Total reading ability	X_{13}	r	r	--	r	r
Grade in course	X_{30-35}	r	r	r	--	r
Reading discrepancy	X_{24-29}	r	r	r	r	--

between two variables after partialling out or controlling for a third variable. In this case, reading difficulty and grades achieved were correlated controlling on interest.

This chapter has provided information on the procedures that have been used in this research. A total of 62 students enrolled in Psychology 131 were used as subjects in the study and Fry's Graph was used to assess the readability of the textbooks assigned in the aforementioned courses. The statistical procedures which were used to analyze the data were the mean, median, standard deviation and correlation. In the following section, the research findings will be given.

CHAPTER IV. RESULTS AND DISCUSSION

The findings of this study are set forth in the following order:

1. Descriptive analysis of general variables
2. Descriptive analysis of course variables
3. Correlational analysis of data
 - a. correlations among general variables
 - b. correlations among course variables
4. Summary of findings presented

Descriptive Analysis of General Variables

The overall picture of the sixty-two (62) students constituting the study group in this research was provided by statistical measures typifying the group for each of the variables. The descriptive measures (the mean, median, and standard deviation) are shown in Table 4.1 (see also Appendix B).

It can be seen that the students in this study had a B- (2.98) level of academic performance as represented by the high school grade point average. The group was fairly homogeneous in this regard upon entering Iowa State University with high school grade point averages ranging from 2.60-3.74 = B- to B+. There was, however, greater apparent variation in high school rank¹-- 35.29 ± 16.531 (51.82 to 15.76).

As freshmen, their academic achievement as represented by the fall

¹High school rank is recorded in descending order. The higher the rank, the lower the number. For example, rank number 1 is assigned to the "best" student in the group.

Table 4.1. Descriptive measures of selected variables

Variable	Mean	Median	Standard deviation	Variance
Total reading score	11.650	11.983	1.753	1.324
Comprehension	11.481	11.900	1.994	1.412
Vocabulary	11.626	12.175	1.604	1.266
MSAT	31.700	31.750	9.441	3.073
ACT	17.862	17.500	4.310	2.076
Fall G.P.A.	2.389	2.498	.689	.830
Winter G.P.A.	2.146	2.150	.752	.867
Fall credit hours	13.952	14.000	2.028	1.424
Winter credit hours	14.780	15.000	1.820	1.349
High school G.P.A.	2.978	3.005	.378	.615
High school rank	35.290	34.167	16.531	4.066
College course textbook readability	12.300	12.700	8.432	2.904

grade point average ($2.389 \pm .69$) and winter grade point average ($2.146 \pm .752$) was not only below their assessed high school academic performance, but showed a declining tendency with greater variation among the students.

During this time their reading ability was reflected by the descriptive measures (the mean, median, etc.) which are reported in Table 4.1 (see Appendix B, Table B.2). On the Nelson-Denny Reading Test-Form A, the scores ranged from 7.0 to 14+. The mean reading score

for the total was 11.650, and 11.481 and 11.626 for the comprehension and vocabulary parts, respectively. The expected reading grade level for those students entering the freshman year of college is 13.0. On the average, the subjects were 1.4 grade levels below the expected reading level. It should be noted that a student's performance on a standardized test is generally on the frustration level and not on the instructional level, which is one or two grade levels below the test score. It was found that the readability level of the textbooks ranged from fifth grade to seventeen plus with an average difficulty of 12.30. Thus, the discrepancy between the average reading ability level and the average readability level of the textbooks was .7.

Students' performance on the Minnesota Scholastic Aptitude Test indicated that scores were in a range of twelve and fifty-seven with a mean score of 31.700. The mean score for this study group was 11.24 scores less than the mean score on which these MSAT scores were normed.¹ A mean score 31.700 yields a percentile rank of 16 and places the student in Category D. On the ACT test, fifty-eight of the students had scores ranging from eight to twenty-nine with a mean score of 17.862. The mean score was at the sixth percentile and was in Category E. However, according to the Test and Evaluation Services of Iowa State University, "most of the scores fall in the range of 22 to 29."² It has been found that students who have scores of 22 and above on the ACT test are "typical ISU students" with a good chance of academic success while

¹"Interpretation", p. 8.

²"Interpretation", p. 2.

those with 21 and below need special care in advising because their "scholastic ability may be lower than the typical ISU student."¹ Based on these observations, of the fifty-eight students in this study taking the ACT test, 47 (81.03%) of them had scores of 21 and below which would indicate that their scholastic ability may be lower than the typical Iowa State University student.

During the Fall Quarter, 1977, the students had a mean college grade point average of 2.389 with an average credit hour load of 13.952. A 2.389 grade point average out of a possible 4.00 grade point average indicated academic achievement a little above the "C" level. It was found that during the winter quarter, 59 of the students were still enrolled at Iowa State University and that these 59 students had a mean credit hour load of 14.780 and obtained a mean grade point average of 2.146 out of a possible 4.00. The study group's academic performance remained a little above the "C" level.

Readability assessments were made on the textbooks which were used in six of the courses in which some of the sixty-two students were enrolled. It was found that the mean readability level of the textbooks was 12.30. Thus, a student would need to have the reading ability of an average twelfth grader who has spent three months in that grade. The mean reading ability of the study group was 11.650 which means that the average student of the sixty-two subjects had reading levels below the readability of the textbooks assessed. The median student reading level was 11.983 which means that fifty percent of the 62 students were

¹"Interpretation", p. 34.

below the 11.983 reading level.

Descriptive Analysis of Course Variables

Descriptive analysis was made of student performance, reading ability and textbook readability for each of the six courses which were used in this study (see Table 4.2). The data collected for each class consisted of the students' total reading ability grade level, readability of textbooks, reading discrepancy, perceived reading difficulty, the extent to which the book was interesting, and the grade received in the course (tables for each of the courses are located in Appendix B).

Biology 101

Fifteen students were enrolled in Biology 101 and it was found that the mean reading ability of the students was 12.833, the textbook readability was 14.0 which yielded a mean discrepancy of 1.167. On a scale of one to five, the students' perception of the reading difficulty of the textbook and the extent to which the book was interesting showed the mean perception of reading difficulty to be 1.857 while the extent of interest was 3.0. The students perceived the book as being very difficult to read and of average interest. The mean grade achieved in Biology was 2.125 or a little above the "C" level of academic performance.

Child Development 129

Child Development 129 was taken by twenty-nine (29) of the students in the study. The means obtained were: 11.55--reading ability, 12.00--textbook readability, .8448--reading discrepancy, 3.071--perceived

Table 4.2. Descriptive measures for six courses

Course	N		Total reading ability	Readability of textbooks	Reading discrepancy	Perceived reading difficulty	Perceived interest	Grade in course
Biology 101	15	\bar{X}	12.8330	14	1.1670	1.857	3.000	2.125
		Med.	13.1000	14	.9000	1.900	3.170	2.167
		s.d.	3.3166	0	.4472	.535	1.038	1.025
Child Development 129	29	\bar{X}	11.1550	12	.9828	3.071	3.667	2.393
		Med.	11.4000	12	.6000	3.056	3.800	2.409
		s.d.	2.6575	0	2.2360	.604	.877	.956
Elementary Education 204	18	\bar{X}	11.7560	13.580	1.7166	2.483	3.019	2.722
		Med.	11.8500	13.712	1.4500	2.078	3.060	2.864
		s.d.	2.9833	.691	.7071	.773	.986	.826
Geography 100	18	\bar{X}	12.0170	15	2.9830	2.847	2.947	2.579
		Med.	12.3500	15	2.6500	3.000	3.063	2.727
		s.d.	2.8930	0	1.0950	.386	1.129	.769
History 201	10	\bar{X}	12.2900	13.306	1.0160	2.460	3.000	2.220
		Med.	12.7500	13.940	.7500	2.500	3.000	2.250
		s.d.	3.0330	2.031	2.3020	.513	.400	1.093
Sociology 134	32	\bar{X}	11.4910	14.500	3.0090	2.625	3.125	2.219
		Med.	11.8500	14.500	2.6500	2.750	3.100	2.300
		s.d.	2.8460	.000	.8944	.672	.967	1.074

reading difficulty, 3.667--extent to which the book is interesting and 2.393--grade in the course. There was not a large discrepancy between the students' reading ability and textbook readability in Child Development 129 which indicated that students should not have had extreme difficulty reading the textbook. The students perceived the book as being of average difficulty and interest. The twenty-nine subjects enrolled in this course performed a little above the "C" level (2.39).

Elementary Education 204

Elementary Education 204 was a third course taken by some of the students in the study. Eighteen subjects were enrolled in this course and they had a mean reading grade level of 11.756. The average readability level of textbooks used in the course was 13.58, thus giving a mean discrepancy of 1.8278. This discrepancy could possibly have been a significant factor in the students' perceived difficulty in reading the textbooks. The textbooks were perceived as being difficult (2.483) to read with average interest (3.019). The mean course grade was 2.722.

Geography 100

A fourth course taken by eighteen (18) of the students was Geography 100. The means obtained were 12.017--total reading ability, 15--readability of textbook, 2.983--reading discrepancy, 2.847--perceived reading difficulty, 2.947--perceived interest, and 2.579--grade in course. These data indicated that the disparity between students' reading ability and the readability of the textbook could have caused problems with the reading assignments. The students perceived the book as being difficult

to read (2.847) and uninteresting (2.947). Both of these measures, however, were very close to the next higher items on the continuum. The mean grade achieved in Geography 100 was 2.579 or "C+".

History 201

Ten of the students were enrolled in History 201. Their mean reading level was 12.29. The textbook, however, had a mean readability level of 13.306 which gave a 1.016 reading discrepancy. The students' perception of the reading difficulty of the textbook was a mean of 2.460 which indicated that they felt that the book was difficult to read. Also, the students assessed the books as being of average interest (3.00). Grade achievement in this course was on an average of 2.22 or "C" level.

Sociology 134

Thirty-two of the subjects were enrolled in Sociology 134 and they were found to have a mean reading grade level of 11.491 while the readability level of the textbooks had a mean of 14.5. The discrepancy between these two items was 3.009 which indicated that the subjects may have experienced difficulty reading assignments. The students felt that the book was difficult to read and rated it 2.625 on a five-point continuum, but when they were asked to assess the extent to which the book was interesting, it was given a score of 3.00 or average.

Implications of descriptive analysis of course variables

Based upon the findings for the class variables, the following summary statements could be made. The students of this study had a mean reading level of 11.650 while the average readability level of the

textbooks was 12.30--not quite a grade level of difference. The average reading discrepancy, however, for the six courses analyzed was 1.812 or nearly two grade levels different. On an average, the subjects perceived the books as being difficult (2.557) to read, but the books were assessed to be of average interest (3.1263). In the six courses analyzed, the students had a mean grade of 2.378 or a little above "C" level work. These were the major descriptive statistics of this study, however, the implications of these findings will follow.

Additional examination of the findings for the courses indicated no apparent pattern. The highest total reading ability ($\bar{X} = 12.833$) was in Biology 101, which had the third highest textbook readability (14) (thus a discrepancy of about one grade level) attended by relatively low perceived reading difficulty (1.857) and high reading interest (3.00). The course grade, however, was low "C" (2.125).

The pattern of achievement was similar in History 201 (mean total reading ability 12.29--second highest) with textbook readability of 13.306 (fifth highest in study)--thus a discrepancy of 1.016-- with high reading interest (3.00) and low average in the course. The one big difference being the reading difficulty was perceived as difficult (2.46).

The lowest exhibited reading ability (11.155) was in Child Development 129. The textbook readability (12) provided a reading discrepancy (.9828) of one grade level--with perceived reading difficulty (3.071) and perceived reading interest (3.667) being similarly high with course achievement being middle average "C" (2.393).

The highest textbook readability (15) was in Geography 100 with the second highest reading discrepancy (2.983) with perceived reading difficulty (2.847) and perceived interest (2.947) being nearly the same --accompanied by above middle average course achievement (2.579).

The highest course achievement was in Elementary Education (2.722). The reading ability of students in this class was 11.756 (fourth of the six classes) with textbook readability 13.58 (fourth in rank) with a discrepancy of 1.7166 (third largest in study).

Grouping courses with some common bases revealed some similarities, however, no conclusive statements can be made. (See Table 4.3.) It was found that the textbooks used in the science courses had the highest readability levels, 14 for Biology 101 and 15 for Geography 100 and that the perceived interest was similar in both of the science courses: 3.00--Biology 101 and 2.947--Geography 100. In the social science courses, it was found that the students' perception of the reading difficulty was similar, 2.460--History 201 and 2.625 for Sociology 134. The perceived interest and grades achieved were also similar for both courses --3.00--History 201 and 3.125--Sociology 134 for interest and 2.220--History 201 and 2.219--Sociology 134. These similarities were found, but no definitive conclusions can be drawn. It does seem, however, that the social science courses had variables which were more similar in nature. It is recommended that additional research is needed in this area.

Table 4.3. Course groups

Groups	Courses	Readability		Reading ability	
		Rank	Level	Rank	Level
Sciences	Biology 101	3	14	1	12.833
	Geography 100	1	15	3	12.017
Educational type	Elementary Education 204	4	13.58	4	11.756
	Child Development 129	6	12	6	11.155
Social sciences	History 201	5	13.306	2	12.290
	Sociology 134	2	14.500	5	11.491

^aRanks

Readability - 1 = highest grade level;
 Reading Ability - 1 = highest grade level;
 Discrepancy - 1 = largest disparity between readability of textbook and students' reading ability;
 Perceived Difficulty - 1 = the most difficult book;
 Perceived Interest - 1 = the most interesting book; and
 Grades Achieved - 1 = highest grade achieved.

<u>Discrepancy</u>		<u>Perceived difficulty</u>		<u>Perceived interest</u>		Ranks ^a of grades	Grades achieved
Rank	Level	Rank	Level	Rank	Level		
4	1.1670	1	1.857	3	3.000	6	2.125
2	2.9830	5	2.847	6	2.947	2	2.579
3	1.8278	3	2.483	5	3.019	1	2.722
6	.8448	6	3.071	1	3.667	3	2.393
5	1.0160	2	2.460	3	3.000	4	2.220
1	3.0090	4	2.625	2	3.125	5	2.219

Correlational Analysis of Data

Correlational analysis of the data was made to determine the nature, extent, and significance of the relationship among the various variables in the study. First, the relationships among the general variables were determined; the second part of the analysis dealt with the relationship of the variables associated primarily with each of the courses.

Correlations among the general variables

Pearson product-moment correlation coefficients were obtained as an index of interrelationship among the general variables. These eleven variables were the total reading scores, comprehension scores and vocabulary scores on the Nelson-Denny Reading Test - Form A, the MSAT scores, the ACT scores, fall and winter quarter grade point averages, fall and winter credit hour loads, high school grade point average and high school rank. These intercorrelations are shown in Table 4.4. The level of significance at which the hypotheses will be accorded empirical support or nonsupport is .10.

It was found that total reading scores correlated directly and significantly with comprehension and vocabulary scores on the Nelson-Denny Reading Test, the MSAT scores, the ACT scores, the fall grade point average. The nature, degree and significance of the correlation between the total reading score and the other ten general variables are as follows:

Table 4.4. Pearson correlation coefficients

Variable ^a	TREAD	COMP	VOCAB	MSAT	ACT	FGPA	WGPA	HSGPA	HSR
TREAD	1.000	.9364***	.8938***	.7480***	.7897***	.3979***	.2261**	.1991*	-.2000*
COMP		1.0000	.6980***	.6495***	.7220***	.3357***	.2347**	.1638	-.1319
VOCAB			1.0000	.7195***	.7328***	.4002***	.1648	.1661	-.2176**
MSAT				1.0000	.7203***	.3459***	.0380	.2147*	-.1718*
ACT					1.0000	.4392***	.1241	.8147***	-.3336**
FGPA						1.0000	.5269***	.4589***	-.4183***
WGPA							1.0000	.3629***	-.2840**
HSGPA								1.0000	-.8602***
HSR									1.0000

^aTREAD=total reading score on the Nelson-Denny Reading Test; COMP=comprehension score on the Nelson-Denny Reading Test; VOCAB=vocabulary score on the Nelson-Denny Reading Test; MSAT=Minnesota Scholastic Aptitude Test; ACT=American College Testing Program; FGPA=fall grade point average; WGPA=winter grade point average; HSGPA=high school grade point average; and HSR=high school rank.

* p < .10.

** p < .05.

*** p < .01.

comprehension	$r = .9364$ at $p < .10$
vocabulary	$r = .8938$ at $p < .10$
MSAT	$r = .7480$ at $p < .10$
ACT	$r = .7897$ at $p < .10$
fall grade point average	$r = .3979$ at $p < .10$
winter grade point average	$r = .2261$ at $p < .10$
fall credit hour load	$r = .1893$ at $p < .10$
winter credit hour load	$r = .3283$ at $p < .10$
high school grade point average	$r = .1991$ at $p < .10$
high school rank	$r = -.2000$ at $p < .10$

Nonsignificant relationships were found between the total reading score on the Nelson-Denny Reading Test and winter grade point average, fall credit hour load, high school grade point average and high school rank.

When the reading comprehension scores and the vocabulary scores were correlated with the other general variables, they proved to have similar correlation coefficients for each of the other variables (these correlations are shown in the following textual table). For example, neither comprehension scores nor vocabulary scores correlated significantly with winter grade point average, fall grade point average, high school grade point average, and high school rank.

Comprehension correlated with

total reading	$r = .9364$ at $p < .10$
vocabulary	$r = .6980$ at $p < .10$
MSAT	$r = .6495$ at $p < .10$
ACT	$r = .7220$ at $p < .10$
fall grade point average	$r = .3357$ at $p > .10$
winter grade point average	$r = .2347$ at $p > .10$
high school grade point average	$r = .1638$ at $p > .10$
high school rank	$r = .1319$ at $p > .10$

Vocabulary correlated with

total reading	$r = .8938$ at $p < .10$
comprehension	$r = .6980$ at $p < .10$
MSAT	$r = .7195$ at $p < .10$
ACT	$r = .7328$ at $p < .10$

fall grade point average	$r = .4002$ at $p > .10$
winter grade point average	$r = .2148$ at $p > .10$
high school grade point average	$r = .1661$ at $p > .10$
high school rank	$r = -.2176$ at $p > .10$

Both comprehension scores and vocabulary scores correlated positively and significantly with total reading scores, with each other, MSAT scores, ACT scores, and fall grade point average. Comprehension scores correlated positively and significantly with winter credit hour load, but the same was not true for the vocabulary scores.

The scores on the Minnesota Scholastic Aptitude Test correlated positively and significantly with total reading scores (.7480), comprehension scores (.6495), vocabulary scores (.7195), ACT scores (.7203), fall grade point average (.3459) and fall credit hour load (.3083). The high correlations between the MSAT scores and the three scores on the Nelson-Denny Reading Test were expected because these tests measure the same type of skills. MSAT scores were not significantly correlated with winter grade point average, winter credit hour load, high school grade point average or rank.

It was further found that the ACT test scores correlated highly with those variables necessitating sophisticated reading skills. Correlations for the ACT scores with the listed variables were as follows:

total reading	$r = .7897$ at $p < .10$
comprehension	$r = .7220$ at $p < .10$
vocabulary	$r = .7328$ at $p < .10$
MSAT	$r = .7203$ at $p < .10$
fall grade point average	$r = .4392$ at $p < .10$
winter grade point average	$r = .1241$ at $p > .10$
fall credit hour load	$r = .1998$ at $p < .10$
winter credit hour load	$r = .2474$ at $p < .10$
high school grade point average	$r = .3147$ at $p < .10$
high school rank	$r = -.3336$ at $p < .10$

It should be noted that the relationship between the ACT scores and the total reading scores, comprehension scores, vocabulary scores, and MSAT scores have correlation coefficients greater than .7000. Also, ACT scores are directly and significantly correlated with fall grade point average, high school grade point average, and high school rank.

The correlations between high school grade point average and the other general variables indicated that high school grade point averages related directly and significantly to four of the variables: ACT scores (.3147), fall grade point average (.4589), winter grade point average (.3629) and high school rank (-.8602). It appears that high school grade point average and high school rank are nearly directly related each to the other.

Correlations between high school rank and the other general variables yielded the following relationships: fall grade point average (-.4183), ACT scores (-.3336) and high school grade point average (-.8602) related positively and significantly to high school rank.

From the relationships obtained in the correlation matrix, the following summary statements can be made. It was found that scores from standardized instruments correlated highly with each other. This might have occurred because these measures, the total reading score, comprehension score, vocabulary score, MSAT score and ACT score, involve reading skills. Another positive and significant relationship existed between fall grade point average and winter grade point average. It was also found that high school grade point average and high school rank had a high correlation coefficient. It should be noted that scores on the

Nelson-Denny Reading Test, MSAT, ACT and fall grade point average were gathered during the first quarter when most of the students were enrolled in college. These students achieved higher (G.P.A.) fall quarter than winter quarter. This occurrence could possibly be due to the cumulative effect of Psychology 131 or to higher motivational levels on the students part at the beginning of the academic year. A further analysis was made to examine the relationships that some of these variables had in each of the courses included in this study.

Correlational analysis of course data

In addition to the various correlations ascertained for the general variables, correlations were obtained between perceived reading difficulty, perceived interest, students' total reading ability, reading discrepancy and grades achieved in the six courses.

The first relationships examined were those between the students' perception of the reading difficulty of their textbooks and the textbook readability level for each course.

It was found that perceived reading difficulty of the textbooks correlated significantly with textual readability in only one course, Elementary Education 204 - The School in American Life. The correlation coefficient was $-.5920$ which indicated a negative and significant relationship. Correlations could not be computed for four of the courses because the readability of the textbooks was constant. Thus, it seems that perceived reading difficulty related inversely to the actual readability of the textbook in Elementary Education 204. The books perceived by the students to be more difficult to read were also assessed

by Fry's Graph as having a high readability level.

The second set of variables correlated was the extent to which the students found the textbooks interesting and the readability level of the textbooks. For four of the courses, no correlation coefficients could be computed, but for History 201 a coefficient of .4049 at the .123 level of significance was obtained. There were no significant correlations between these two variables for either of the six courses.

The third set of relationships were between the students' perception of the reading difficulty and the interest which the textbook generated. In two of the courses, Geography 100 and Sociology 134, there were significant and positive relationships between students' perception of the reading difficulty of the textbooks and the interest generated by the textbooks. The correlations were .4503 and .5707 for Geography 100 and Sociology 134, respectively. Therefore, it can be concluded for these two courses that the easier the books were to read, the greater the extent to which the book was interesting according to the students' ratings.

A partial correlation analysis was made for all courses to determine the relationship between the perceived reading difficulty and the grades achieved in the course after controlling for the interest generated by the textbook. Of the six courses analyzed, there were significant relationships (.4112) between the perceived reading difficulty of the textbook and the grades achieved in Child Development 129.

Analysis was made to determine how students' reading ability, and the readability of textbooks related to academic achievement in the

courses. To determine these relationships, several correlations were used. The first was to ascertain the relationship between students' perception of the reading difficulty of the textbooks and the grades which they achieved in the courses. It was found that the students' perception of the reading difficulty of the textbooks and the grades which they received were positively and significantly related for two of the courses, Child Development 129 and Sociology 134. The correlation coefficients were .4302 for Child Development 129 and .4094 for Sociology 134.

Another group of correlation coefficients was obtained to determine if there was a relationship between the interest generated by the textbooks and the grades achieved in the courses. Interest generated by the books and the grades achieved in the courses were positively and significantly related in Geography 100 and Sociology 134. The coefficients were .3589 and .3765 for Geography 100 and Sociology 134, respectively.

The next relationship examined was that between reading discrepancy and grades achieved in the courses (see Scattergrams in Appendix C). Discrepancy was obtained by getting the arithmetical difference between the readability level of the textbooks and the students' reading ability. It was found that correlation coefficients were significant at three courses. Discrepancy and grades achieved in courses were negatively and significantly related in Biology 101 (-.5950), Elementary Education 204 (-.4055) and Sociology 134 (-.3585). It can be said that for these three courses that the smaller the reading discrepancy, the higher the students' grades were.

Two other correlation analyses were done to (1) determine if there was a relationship between textbook readability levels and the grades achieved in the courses (see Scattergrams in Appendix C), and (2) determine if there was a relationship between the students' total reading ability as measured by the Nelson-Denny Reading Test and the grades achieved in the courses. There were no significant relationships between textbook readability levels and grades achieved in the courses. It was found, however, that some significant and positive relationships existed between students' total reading ability and the grades achieved in four courses. This was true of Biology 101 (.5950), Elementary Education 204 (.3474), History 201 (.5071) and Sociology 134 (.3585). This indicated that of the six courses analyzed, reading ability is positively related to the academic success a student experiences in three of the courses.

Summary of Findings Presented

Six hypotheses in this research were set forth to be tested to determine the relationship of students' reading ability, textbook readability and students' academic achievement.

The first hypothesis was: "There is no relationship between students' reading ability and their academic achievement." Positive and significant relationships were found between the total reading ability, and measures of achievement (MSAT scores, ACT scores and fall and winter grade point averages). Therefore, this hypothesis was rejected. Total reading ability accounted for .5595 of the variability in the MSAT scores,

.6236 of the variability in the ACT scores, and .1593 of the variability in the fall grade point average. In addition to these findings, total reading ability was found to be related to grades achieved in Biology 101, Elementary Education 204, History 201 and Sociology 134. These findings not only supported the models presented in Figure 3.1 of this study, but they also agree with the findings of previous research done by Cline, Block et al., Wilson and Einbecker, and Pedrina and Pedrina¹ who also found that there were direct relationships between students' reading ability and their academic achievement.

The second hypothesis was: "The amount of disparity between students' reading ability and the readability of assigned textbooks has no relationship to academic achievement." In three of the courses examined, the correlation coefficients for the discrepancy and academic achievement yielded negative and significant relationships. These courses were Biology 101, Elementary Education 204, and Sociology 134. These findings support Model 3.2. Since three of the six courses showed no significant relationship, the second hypothesis is inconclusive. Balser² however, did find significant relationships between the same two variables.

The third hypothesis was: "There is no relationship between MSAT scores and academic achievement." There were significant and positive relationships between MSAT scores and the ACT scores, fall quarter grade

¹Block et al., p. 1; Cline, pp. 33-37; Pedrina and Pedrina, pp. 37-42; and Wilson and Einbecker, pp. 234-237.

²Balser, p. 135.

point average and high school grade point average. The relationship between MSAT scores and winter quarter grade point average was not significant, thus, this hypothesis cannot be rejected when MSAT scores and winter grade point average are the variables in the hypothesis.

The fourth hypothesis tested was "There is no relationship between students' performance on the Nelson-Denny Reading Test and the Minnesota Scholastic Aptitude Test." A high relationship (.7480) existed between the two variables, and this hypothesis must be rejected. This is to be expected since the two tests measure similar skills.

Fifth, "There is no relationship between the number of credit hours and students' academic achievement." There was no significant relationship between the two variables for fall quarter, however, during the winter quarter, there was a very small relationship (.1815) between the two. This hypothesis was not rejected.

Sixth, the hypothesis: "There is no relationship between students' high school academic performance and students' college academic performance." This hypothesis was rejected because when high school grade point average and college fall and winter quarter averages were correlated, there were positive and significant relationships of .4589 and .3629 for fall grade point average and winter grade point average, respectively.

The findings indicated that reading ability does relate to academic achievement and that in some courses the discrepancy between students' reading ability and textbook readability is related with the grades achieved in the course. It appears that of the two variables,

discrepancy and total reading, the former seems to be a better predictor of academic achievement. This is evidenced by the more significant relationship found between discrepancy and grades achieved in Elementary Education 204 (-.4055) as compared to the total reading ability and grades achieved in Elementary Education 204 (.3474). Further, it was found that MSAT scores do relate to reading scores on the Nelson-Denny Reading Test and also that MSAT scores do relate to some measures of academic achievement. Contrary to the findings of the Test and Evaluation Services of Iowa State University, ACT scores appear to be good predictors of academic achievement (see Table 4.2) for this population. The ACT scores correlated higher and with more of the academic achievement variables than did those of the MSAT scores. Another relationship which was found to be significant and positive was high school academic performance and college academic performance. The empirical findings in this area agree with some of the findings of prior research such as those relating reading skills to academic achievement.

CHAPTER V. SUMMARY

The Problem and Its Design

The purpose of this research was to determine if there was a relationship between students' reading ability, textbook readability, and students' academic achievement, and to measure and examine the extent of the relationship among these three major variables. This study was conducted at Iowa State University with sixty-two (62) students, who were enrolled in Psychology 131--Academic Learning Skills, comprising the study group. The two major variables in this research study were the students' reading ability and textbook readability while the dependent variable was academic achievement.

There were six hypotheses postulated in this study. They were:

Major

1. There is no relationship between students' reading ability and academic achievement.
2. The amount of disparity between students' reading ability and the readability of assigned textbooks has no relationship to academic achievement.

Subsidiary

3. There is no relationship between Minnesota Scholastic Aptitude Test and academic achievement.
4. There is no relationship between students' performance on the Nelson-Denny Reading Test and the Minnesota Scholastic Aptitude Test.

5. There is no relationship between the number of college credit hours and students' academic achievement.
6. There is no relationship between students' high school academic performance and students' college academic performance.

The testing of these hypotheses required (1) determining the grade level of the students' reading ability; (2) determining the readability of the textbooks used in selected courses by the subjects; (3) determining the students' level of academic achievement at the high school and college levels; and (4) determining the discrepancy between the students' reading ability levels and the readability of the textbooks assigned in their courses.

The students in this study were given the Nelson-Denny Reading Test - Form A to determine their reading ability. The following scores were used in this study: vocabulary, comprehension and total reading scores.

Readability assessments were made using Fry's Readability Graph on the textbooks assigned in the six courses. Three criteria were used for selecting courses and they were (1) a minimum of ten students enrolled in the classes; (2) consideration of the variety of disciplines that the courses encompassed; and (3) the degree to which confounding factors could be eliminated, such as different teachers, different courses and different textbooks. The courses selected were Geography 100 with 18 students, Sociology 134 with 32 students, Biology 101 with 16 students, Child Development 129 with 29 students, Elementary Education 204 with 18 students and History 201 with 10 students. Some of the students were enrolled in two or more of the courses analyzed.

Several statistical procedures were used in the study. The first were descriptive statistics such as the mean, median and standard deviation of the variables. The inferential measures used in the study were correlations and partial correlation analyses.

Summary of Findings

From the data analysis in this study, the following results were found. The students in this study group had a mean high school grade point average of 2.978 or "B-" level. The mean high school rank was 35.290 which was below average for the "typical" Iowa State University student. On the Minnesota Scholastic Aptitude Test and the ACT test, their scores varied widely, but the mean scores on these tests were below average for Iowa State University students. The mean scores were 31.700 for the MSAT and 17.862 for the ACT test. When the students were given the Nelson-Denny Reading Test - Form A, the total score was 11.650 which place them 1.6 years below the level at which they should have functioned. Further, it was found that the average readability level of the textbooks analyzed in this study was 12.30 with a range of fifth grade to seventeen plus. The findings indicated that the reading discrepancy ranged from zero to 6.5 grade levels. The Fry Graph estimates the readability level with fifty to seventy-five percent comprehension. If a reading discrepancy is one or more grade levels, then the percentage of material comprehended declines.

For the class variables, it was found that students in this research had an average reading discrepancy of 1.812 or nearly two grade levels

difference. The students perceived the books as being difficult (2.557) to read, but they assessed the books as being of average interest (3.1263). The students had a mean grade of 2.378 or a little above "C" level performance in the six courses analyzed.

The relationships of the general variables in this study were in terms of correlations. The correlation coefficients for the total reading scores, comprehension scores, vocabulary scores, MSAT scores and ACT scores ranged from .6495 to .9364. This might have been due to the reading-oriented activities on each measure. A positive and significant relationship existed between fall grade point average and winter grade point average. It was also found that high school grade point average and high school rank highly correlated each with the other.

Significant relationships were found for the following variables:

- (1) perceived reading difficulty and the textbook readability in Child Development 129. The relationship was inversely related which indicated that when the students perceived the book as being difficult, the readability level was high.
- (2) perceived reading difficulty and the extent of interest generated by the book were positively and significantly related for Geography 100 and Sociology 134. For those courses, the easier the books were to read, the higher the students rated the extent of interest.
- (3) perceived reading difficulty and the grades achieved in the courses after controlling for interest correlated significantly and positively in Elementary Education 204.
- (4) perception of reading difficulty of the textbooks and the grades

achieved in courses were positively and significantly related for Child Development 129 and Sociology 134.

(5) interest generated by the book and the grades achieved in courses were positively and significantly related in Geography 100 and Sociology 134.

(6) discrepancy and grades achieved in courses were negatively and significantly related in Biology 101, Elementary Education 204, and Sociology 134.

(7) students' total reading ability and grades achieved were positively and significantly related in Biology 101, Elementary Education 204, History 201, and Sociology 134. This indicated that as reading ability increased, so did academic achievement.

Recommendations and Implications

Several recommendations are given for future research in this area. First, there is need for additional research on students' reading ability and textbook readability and their relationship to academic achievement, especially at the college level. Because some of the correlations could not be computed due to no variation in the textbook readability in the group, it is recommended that studies be conducted using a greater variety of textbooks.

Second, it is suggested that future studies use freshmen as well as upperclassmen and a greater variety of textbooks, such as mathematics, physics, and other textbooks. Perhaps these studies will provide more definitive conclusions, not only regarding the relationship of students' reading ability, readability, and academic achievement, but it will

provide specific information on the various disciplines as well as the various college grade levels.

It can be concluded that reading skills do have a relationship to academic achievement and also that the amount of discrepancy between a student's reading ability and textbook readability does relate to the grades achieved in some courses. Based on the findings of this study, there are several implications for teachers. First, teachers should become aware of the reading grade levels of the students whom they teach. Second, teachers should be aware of the readability levels of their chosen textbooks. They should either write publishers for this information or learn techniques for assessing the readability of books. Teachers should then see that the discrepancy between the students' reading ability and the textbook readability is at a minimum. If not, provisions should be for the student with low reading skills. These provisions may include (1) choosing another textbook of commensurate readability (2) using textbooks of various reading levels (3) providing study-guides for the students and/or (4) introducing new lessons or having a readiness period for each reading assignment (mentioning the purpose of the lesson, the main points to be covered and the unfamiliar terms included in the reading). It is with these findings in mind that the teacher should consider alternatives to an adverse situation.¹

¹For suggestions on aiding students whose reading ability is not adequate for the textbooks used in courses, the following references may be of help.

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ACKNOWLEDGMENTS

Sincere appreciation is extended to Dr. William A. Hunter, major professor, for his patience and guidance with this dissertation research. Also, special appreciation is extended to the members of the advisory committee--Drs. Milton Brown, Larry Ebbers, Bill Fowler, George Kizer and Richard Warren.

I am deeply appreciative for the consultation on computer programming provided by Dr. Rex Thomas.

The writer wishes to express her gratitude to her parents, Dessaree Davenport, Elmetta Davenport, and Sadie and William Lawson, for their continued interest and support.

The writer is especially grateful to her husband, William, and children, Sonya and Nicole, for their understanding during the hours expended on this research.

**APPENDIX A: DATA COLLECTION DEVICES--QUESTIONNAIRE, LETTERS,
FRY'S GRAPH AND ONE SAMPLE FROM EACH TEXTBOOK**

Attachment to Survey

Instructions concerning your rights as subjects.

1. You have the right to refuse to participate in the research.
2. You have the right to ask questions concerning the research procedure.
3. You have the right as a subject to withdraw consent and discontinue at any time.
4. You have the right to expect complete confidentiality.

SURVEY OF STUDENTS ENROLLED IN PSYCHOLOGY 131

You are requested to complete this survey so that more information may be obtained about the textbooks which you are required to read for your courses, and their effect on the grades which you achieve. This information will be used for doctoral research, however, there will be strict anonymity.

PART I

Directions: Please be precise in completing this survey.

Date _____
 Month Day Year

Name _____ Social Security Number _____

Hometown _____
 City State

Year in College - ___ Freshman ___ Sophomore ___ Junior ___ Senior
 (Check the appropriate space)

High School Grade Point Average _____ = ___ A ___ B ___ C

College Grade Point Average _____

Number of credit hours you are taking this quarter _____

PART II

Directions: Please be accurate in completing part two. This section is on the next three pages. Simply fill in the blanks or place check marks on the lines adjacent to the appropriate choices. If you have more than one book per course, then you will use two or three of the following sheet. For example, if you are taking Psychology 230 which has two textbooks, then you would designate that course to be Course 1, Course 2, Course 3, Course 4 or Course 5. If you choose Psychology 23 to be Course 2, then you will have two sections entitled Course 2 completed, because you have two textbooks for the course. If you have three textbooks for the course, then you would have three sections entitled Course 2 completed.

Question	Course 1	Course 2
Name of Course		
Dept. and Course Number		
Section		
Time and Day of Course		
Credit Hours for Course		
Name of Textbook		
Author of Textbook		
Did you read the textbook?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Do you think that you could have completed the course successfully without having read the textbook?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
How do you rate the reading difficulty of this textbook?	<input type="checkbox"/> very difficult <input type="checkbox"/> difficult <input type="checkbox"/> average <input type="checkbox"/> easy <input type="checkbox"/> very easy	<input type="checkbox"/> very diffi <input type="checkbox"/> difficult <input type="checkbox"/> average <input type="checkbox"/> easy <input type="checkbox"/> very easy
To what extent did you find the book interesting?	<input type="checkbox"/> very uninteresting <input type="checkbox"/> uninteresting <input type="checkbox"/> average <input type="checkbox"/> interesting <input type="checkbox"/> very interesting	<input type="checkbox"/> very uninter <input type="checkbox"/> uninteresting <input type="checkbox"/> average <input type="checkbox"/> interesting <input type="checkbox"/> very interes
Grades in the course were based on	<input type="checkbox"/> test(s) <input type="checkbox"/> projects <input type="checkbox"/> papers <input type="checkbox"/> attendance <input type="checkbox"/> other	<input type="checkbox"/> test(s) <input type="checkbox"/> projects <input type="checkbox"/> papers <input type="checkbox"/> attendance <input type="checkbox"/> other
What percentage of the grade for the course was determined by tests?	_____	_____
What kind of tests were given?	<input type="checkbox"/> essay <input type="checkbox"/> objective <input type="checkbox"/> combination of both	<input type="checkbox"/> essay <input type="checkbox"/> objective <input type="checkbox"/> combination
Were the tests based primarily on	<input type="checkbox"/> textbook readings <input type="checkbox"/> lectures <input type="checkbox"/> combination of both <input type="checkbox"/> other	<input type="checkbox"/> textbook rea <input type="checkbox"/> lectures <input type="checkbox"/> combination <input type="checkbox"/> other

	Course 3	Course 4	Course 5
	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
lt	<input type="checkbox"/> very difficult <input type="checkbox"/> difficult <input type="checkbox"/> average <input type="checkbox"/> easy <input type="checkbox"/> very easy	<input type="checkbox"/> very difficult <input type="checkbox"/> difficult <input type="checkbox"/> average <input type="checkbox"/> easy <input type="checkbox"/> very easy	<input type="checkbox"/> very difficult <input type="checkbox"/> difficult <input type="checkbox"/> average <input type="checkbox"/> easy <input type="checkbox"/> very easy
ing	<input type="checkbox"/> very uninteresting <input type="checkbox"/> uninteresting <input type="checkbox"/> average <input type="checkbox"/> interesting <input type="checkbox"/> very interesting	<input type="checkbox"/> very uninteresting <input type="checkbox"/> uninteresting <input type="checkbox"/> average <input type="checkbox"/> interesting <input type="checkbox"/> very interesting	<input type="checkbox"/> very uninteresting <input type="checkbox"/> uninteresting <input type="checkbox"/> average <input type="checkbox"/> interesting <input type="checkbox"/> very interesting
ig	<input type="checkbox"/> test(s) <input type="checkbox"/> projects <input type="checkbox"/> papers <input type="checkbox"/> attendance <input type="checkbox"/> other	<input type="checkbox"/> test(s) <input type="checkbox"/> projects <input type="checkbox"/> papers <input type="checkbox"/> attendance <input type="checkbox"/> other	<input type="checkbox"/> test(s) <input type="checkbox"/> projects <input type="checkbox"/> papers <input type="checkbox"/> attendance <input type="checkbox"/> other
both	<input type="checkbox"/> essay <input type="checkbox"/> objective <input type="checkbox"/> combination of both	<input type="checkbox"/> essay <input type="checkbox"/> objective <input type="checkbox"/> combination of both	<input type="checkbox"/> essay <input type="checkbox"/> objective <input type="checkbox"/> combination of both
ngs	<input type="checkbox"/> textbook readings <input type="checkbox"/> lectures <input type="checkbox"/> combination of both <input type="checkbox"/> other	<input type="checkbox"/> textbook readings <input type="checkbox"/> lectures <input type="checkbox"/> combination of both <input type="checkbox"/> other	<input type="checkbox"/> textbook readings <input type="checkbox"/> lectures <input type="checkbox"/> combination of both <input type="checkbox"/> other
both			

Vice President for Research
Dean, The Graduate College
201 Beardshear Hall
Ames, Iowa 50010

IOWA STATE
UNIVERSITY

Telephone: (515) 294-4531

Date: November 4, 1977

To: Nora Lawson

From: Irene Corbett, Secretary
University Human Subjects Review Committee

Re: Human Subjects Review of Project entitled: "The Relationship
of Academic Achievement to Readability of College Course Text-
books and Reading Ability of Students Enrolled in Psychology
131 at Iowa State University"

Your research project was reviewed and approved by the Human
Subjects Review Committee on November 4, 1977. Materials submitted
by you for the review are enclosed. One copy has been retained for
our files.

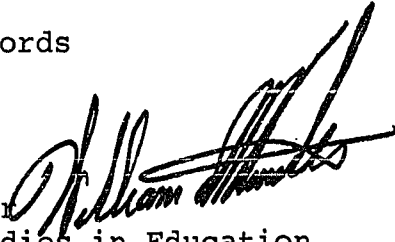
Interoffice Communication

IOWA STATE UNIVERSITY
93
of Science and Technology

DATE 8 March 1978

TO Mr. Fred C. Schlunz
Dean of Admissions and Records
109 Beardshear

FROM William A. Hunter, Director
Research Institute for Studies in Education
108N Quadrangle



Nora Davenport Lawson, who is a doctoral student in the College of Education, is making a study of the relationship of academic achievement in college courses to the readability of course textbooks and the reading ability of students enrolled in special programs at Iowa State University. As her major professor, I am requesting permission for her to get some academic information about involved students from records in the Office of Admissions and Records. The students' identity will be needed only to collect the data and their names will not be used or revealed in the research.

The following information will be needed:

1. High school G.P.A.,
2. MSAT scores,
3. ACT scores,
4. Grades for Fall Quarter '77 and Winter Quarter '78, and
5. College G.P.A. for Fall Quarter '77 and Winter Quarter '78.

We shall be pleased to work at your convenience and in the manner you prescribe for securing this information. We thank you for your assistance in this endeavor.

WAH:bp

cc: Nora Lawson

Interoffice Communication


IOWA STATE UNIVERSITY

94

of Science and Technology

DATE March 17, 1978

TO William A. Hunter, Director
Research Institute for Studies
in Education
108N Quadrangle

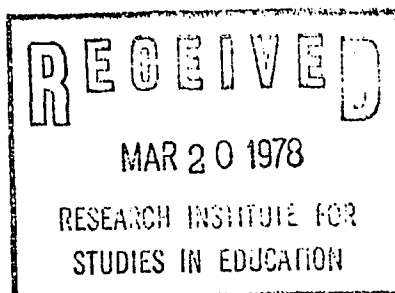
FROM  John V. Sjoblom
Registrar

Fred Schlunz referred to me your memo concerning the request for Nora Lawson to obtain certain student data from our records. If Ms. Lawson would stop in to visit with me we can go over the information she needs in detail. We should have all the information except the MSAT scores in our files. I believe it may be possible to obtain the MSAT scores elsewhere on campus.

I have also attached a copy of a form we ask graduate students using our data to read and sign. I will visit with Ms. Lawson about this when she stops in to see me.

JVS:ms

Enc.



STATEMENT CONCERNING USE OF STUDENT RECORDS
FOR GRADUATE STUDENT RESEARCH

A graduate student who has the written approval of his/her major professor may have access to information from the permanent record files if he/she has obtained the written permission of each individual student who is part of the sample or, without such permission, if the information compiled for release is not identifiable as to an individual student.

We insist upon confidentiality standards from such users. It is our aim, while opening our files for research purposes, to exert any precaution to preserve the privacy of the individual student.

I have read the above and agree to abide by the stated rules.

Signature of Researcher

Date of Signature

NOTICE: For any research involving human subjects the approval of the Committee on the Use of Human Subjects in Research is required.

Signature of Chairperson of Committee on Use
of Human Subjects in Research

Date of Signature

Dates Worked:

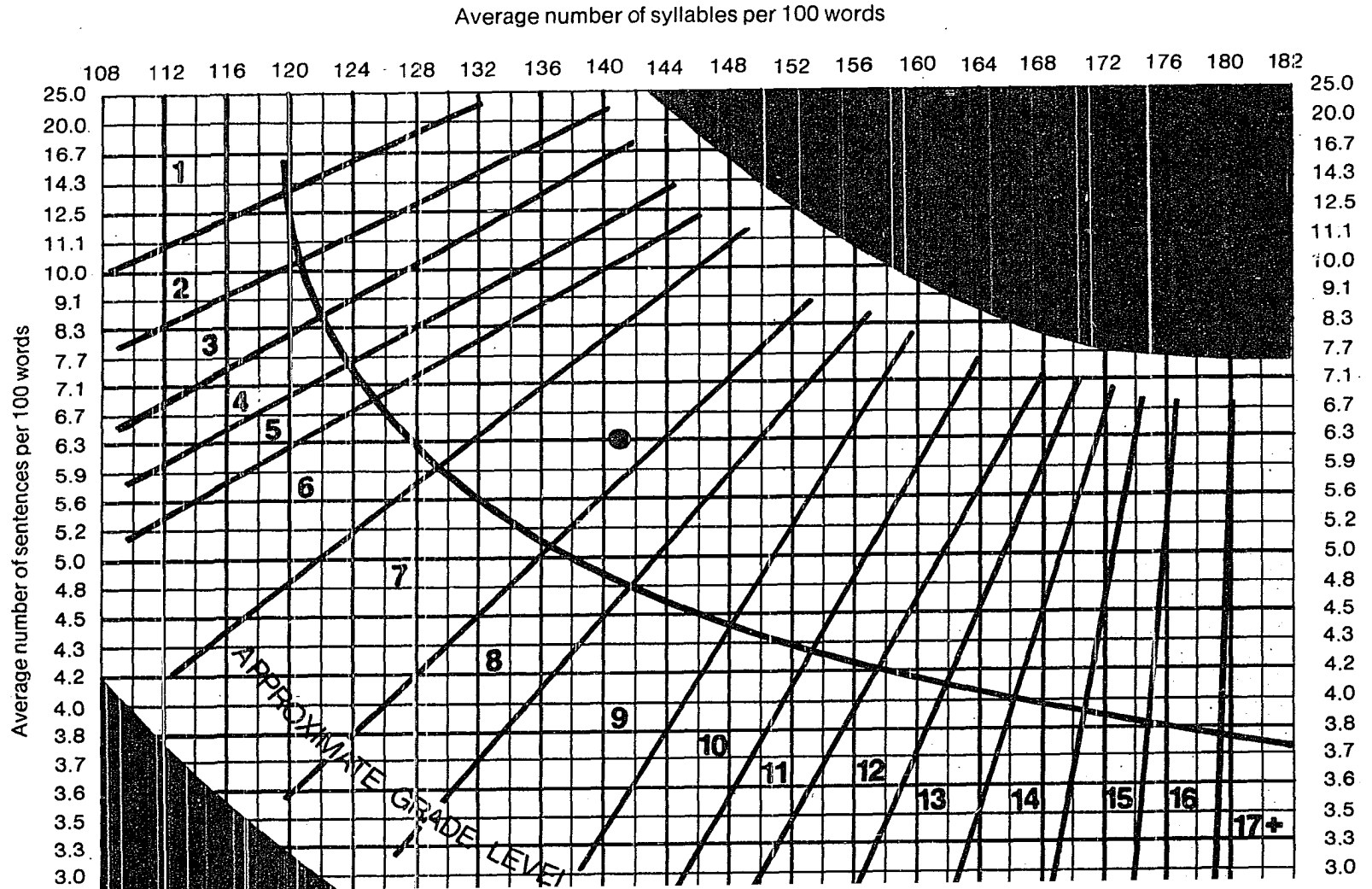
Estimated Time Required to Complete
Project

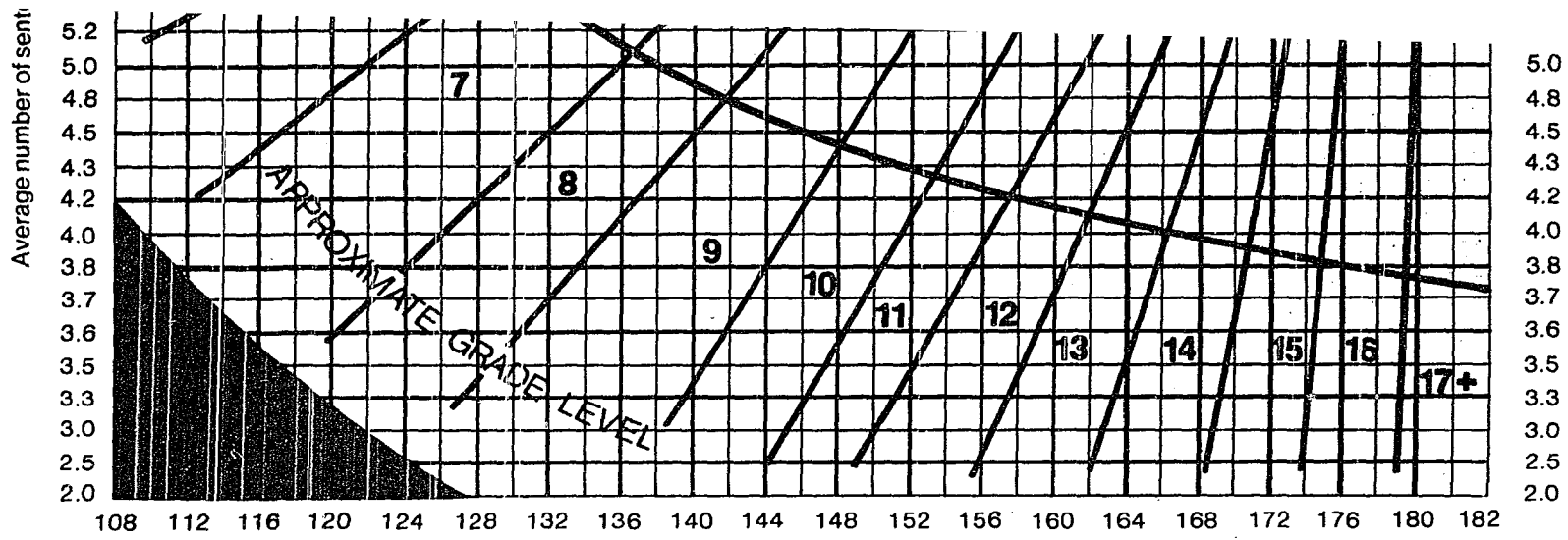
Approved by _____

GRAPH FOR ESTIMATING READABILITY -- EXTENDED

by Edward Fry, Rutgers University Reading Center, New Brunswick, N.J. 08904

96





DIRECTIONS: Randomly select 3 one hundred word passages from a book or an article. Plot average number of syllables and average number of sentences per 100 words on graph to determine the grade level of the material. Choose more passages per book if great variability is observed and conclude that the book has uneven readability. Few books will fall in gray area but when they do grade level scores are invalid.

Count proper nouns, numerals and initializations as words. Count a syllable for each symbol. For example, "1945" is 1 word and 4 syllables and "IRA" is 1 word and 3 syllables.

EXAMPLE:	<u>SYLLABLES</u>	<u>SENTENCES</u>
1st Hundred Words	124	6.6
2nd Hundred Words	141	5.5
3rd Hundred Words	158	6.8
	<hr/>	<hr/>
AVERAGE	141	6.3

READABILITY 7th GRADE (see dot plotted on graph)

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For further information and validity data see the Journal of Reading December, 1977.

EXPANDED DIRECTIONS FOR WORKING READABILITY GRAPH

1. Randomly select three (3) sample passages and count out exactly 100 words beginning with the beginning of a sentence. Do not count proper nouns, initializations, and numerals.
2. Count the number of sentences in the hundred words estimating length of the fraction of the last sentence to the nearest 1/10th.
3. Count the total number of syllables in the 100-word passage. If you don't have a hand counter available, an easy way is to simply put a mark above every syllable over one in each word, then when you get to the end of the passage, count the number of marks and add 100. Small calculators can also be used as counters by pushing numeral "1", then push the "+" sign for each word or syllable when counting.
4. Enter graph with average sentence length and average number of syllables; plot dot where the two lines intersect. Area where dot is plotted will give you the approximate grade level.
5. If a great deal of variability is found in syllable count or sentence count, putting more samples into the average is desirable.
6. A word is defined as a group of symbols with a space on either side; thus, "Joe," "IRA," "1945," and "&" are each one word.
7. A syllable is defined as a phonetic syllable. Generally, there are as many syllables as vowel sounds. For example, "stopped" is one syllable and "wanted" is two syllables. When counting syllables for numerals and initializations, count one syllable for each symbol. For example, "1945" is 4 syllables and "IRA" is 3 syllables, and "&" is 1 syllable.

FOOTNOTE: This "extended graph" does not outmode or render the earlier (1968) version inoperative or inaccurate; it is an extension.

98
Fry's Scale

Title of Book _____
Edition _____

Author _____

Place of Publication _____ Publishers _____

Date of Publication _____

Location of Sample in text _____

Number of Syllables per 100 words _____

Number of Sentences per 100 words _____

Reading Level of Passage _____

Title of Book _____

Edition _____

Author _____

Place of Publication _____ Publishers _____

Date of Publication _____

Location of sample in text _____

Number of Syllables per 100 words _____

Number of Sentences per 100 words _____

Reading Level of passage _____

Title of Book _____

Edition _____

Author _____

Place of Publication _____ Publishers _____

Date of Publication _____

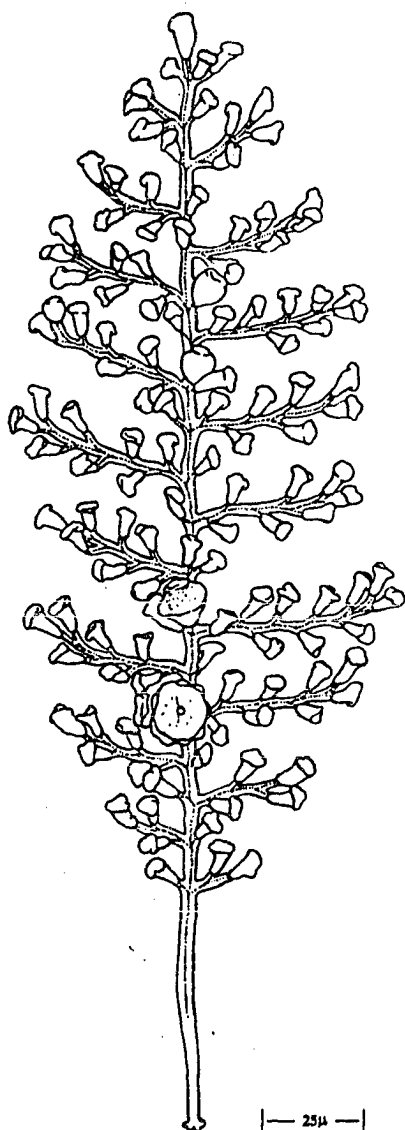
Location of sample in text _____

Number of Syllables per 100 words _____

Number of Sentences per 100 words _____

Reading Level of passage _____

2-70 The ciliated cells that make up *Zoothamnium* are interconnected by contractile threads (shown here by the dotted lines) that run through the trunk and branches of the "tree." The cells at the tip of the stalk and the ends of the branches divide to increase the size of the colony. The larger cells (near the main stalk) break loose to found new colonies.



Some kinds of ciliates as well as flagellates form colonies, some of which are very precise and well ordered. One such ciliate colony is *Zoothamnium*, of which there are several species, both marine and freshwater, all of which have an elegant treelike shape. The cells that make up the colony are interconnected by a thread of protoplasm running through the stalk. If one of the ciliates is touched, even slightly, either the whole branch or the entire colony, depending on the species, will contract right down to the base. As with *Volvox*, only certain cells of the colony are reproductive.

THE SPOROZOA

The fourth group of Protozoa are the Sporozoa, almost all of which are parasitic. The Sporozoa include *Plasmodium*, which causes malaria. As recently as 1937, there were at least a million cases of malaria annually in the United States, and although the disease has now virtually disappeared from North America, there are still some 250 million cases annually throughout the world. *Plasmodium*, like other Sporozoa, has no natural means of locomotion but is passed back and forth between man and the *Anopheles* mosquito. The female mosquito requires blood for the development of her eggs—the male lives on a more sybaritic diet of nectar—and if she draws her blood from a person with malaria, she will pick up *Plasmodium* cells, which multiply within her body, although they do not harm her, and travel to her salivary glands. When she bites her next victim, she will inject a droplet of salivary fluid under his skin, which may serve to anesthetize him against the bite or to keep the blood from clotting so that it will flow freely through her fine proboscis, and ultimately, through an allergic reaction, will raise the familiar welt. This drop of salivary fluid also carries *Plasmodium*, which eventually enter the blood cells and begin to multiply. The *Plasmodium* break out of the blood cells at regular intervals—usually every 48 or 72 hours, depending on the species—which is why malaria is characterized by recurrent bouts of chills and fever.

REPRODUCTION

In general, reproduction in the single-celled organisms is by mitotic division into two separate daughter cells. There are some exceptions, such as the Sporozoa, in which a single cell may divide into as many as 1,000 individuals before they separate. The flagellates form mirror images as they divide. The amoeba pulls apart into two new, equally shapeless amoebas. The ciliates divide transversely, with a new one forming below the old. Some of the Protozoa, such as *Euglena* and the common amoebas, have no sexual cycle, but others have means for combining and exchanging hereditary material, as in *Chlamydomonas* (Chapter 2-4). The ciliates have an unusual form of sexual recombination: Two individuals conjugate, fusing along their ventral surfaces, and exchange genetic material. After conjuga-

appear to be affected at all by a child's sex, geographical residence, or the level of parental education (Bayley, 1965). At certain age levels (six, seven, twelve, fourteen, and fifteen months), first-born children score slightly better than later-born children on the California Infant Scale of Motor Development (Bayley, 1965), which may be due to the fact that parents spend more time with their first children and probably stimulate them to greater activity. In any case, these small differences are probably temporary (Bayley, 1965).

Race

A number of different studies (Bayley, 1965; Geber, 1958; Geber & Dean, 1957) have shown that black babies appear to be more advanced in motor development than white babies, at least until the first year or first fifteen months of life. It is possible that some genetic factor accounts for the motor precocity of black babies. It is also possible that black parents may handle their infants in a way that stimulates motor development. Perhaps they are less likely to dress their babies in constricting clothing or to put them in playpens, or perhaps they encourage motor activity in some other way.

In Table 4-6 we can see some of the differences in motor development between black and white babies. These data illustrate differences in performance in some of the sixty items on the Bayley Infant Scale of Motor Development. In one study (Bayley, 1965), 1,409 babies, aged one to fifteen

Table 4-6 Scores of the Bayley Infant Scale of Motor Development for Babies by Race (Bayley, 1965)

Age (months)	White Babies			Negro Babies			Puerto Rican Babies		
	No.	Mean	Standard Deviation	No.	Mean	Standard Deviation	No.	Mean	Standard Deviation
1	41	6.34	2.03	41	6.39	2.98	5	7.00	1.00
2	45	9.31	2.20	37	9.89	2.22	6	11.17	2.40
3	42	12.12	2.57	41	13.39	2.82	5	13.20	1.79
4	47	14.57	3.20	31	16.29	2.92	8	14.88	1.36
5	41	18.83	3.32	40	21.25	3.46	4	20.75	1.50
6	44	25.73	4.40	42	25.76	4.78	5	27.80	3.77
7	47	28.47	4.88	41	30.46	4.64	9	30.33	5.50
8	61	34.41	5.27	51	35.67	5.02	5	39.00	3.00
9	54	37.13	4.06	44	38.95	4.17	4	37.25	8.18
10	53	40.11	3.62	40	41.32	3.93	5	42.80	1.30
11	43	42.84	3.06	26	44.00	2.99	8	44.13	1.36
12	49	44.22	3.16	43	45.88	4.42	5	46.20	1.64
13	44	46.45	6.49	36	47.08	3.27	7	46.14	2.41
14	48	48.33	3.01	38	48.68	4.03	3	49.00	1.73
15	46	49.35	3.08	36	48.39	3.42	4	50.00	.82

[George] begins by asking the participants to relax, close their eyes, and "in fantasy go away someplace, someplace where you really would like to be, alone or with someone you like." (Two-minute pause.) "Now come back to the group, open your eyes, look around, and be aware not only of what you see but of how you see—how clear or bright colors are, for example." (One-minute pause.) "Close your eyes and go away again. You might go to the same place or perhaps someplace new. Do as you wish." (One-minute pause.) "Come back again and look around. Again be aware of how you are perceiving." (One-minute pause.) "Now in your own rhythm withdraw or stay here. You may want to withdraw for the rest of the time in this exercise, or you may want to stay here. Just allow yourself to tune in to what *you* really want, from moment to moment."

This process can be revealing for a number of participants. For others it is not cognitive enough.

9. Values Investment

Goal To systematically aid students to explore value issues through a combination of cognitive and affective activities which require periodic action decisions.

Human nature This perspective begins with the assumption that all people wish to have some meaning or significance in their lives. How they act depends on how they perceive the meaning of the world and themselves. While this approach celebrates the variety of human actions, it avoids stating categorically that all humans are basically good or basically sinful.

Teacher role/learning styles As stated earlier, the teacher is like an *investment counselor*. That means you would have a wide range of experiences and should be able to guide students into making the wisest choices considering their potential.

The broker does not function haphazardly but systematically. You would not only arrange for investments to be made, but you would continuously help students assess their yields. Compared with the other approaches, this one is most similar to the action approach, although it does not require quite as much "active" participation.

I have found five general arenas of life which appear to be most fruitful as constellations around which values education can be organized. These include feelings as well as cognitive activities, private concepts as well as attitudes to be expressed in public.

Values investment encourages deep student involvement, and it favors those teaching styles which Olson documented were most effective

sponse from the student. A teacher can be generally warm, but still react critically or indifferently to a child's answers or comments. Feedback refers specifically to how much active teaching occurs: often the teacher rewards a desired response, corrects a wrong answer, asks for the student's further thoughts, and so on. The studies explored this factor, of which eight supported it.

Jere Brophy and Tom Good asked first-grade teachers to name their high and low achievers. The researchers then watched the teachers work with the children. The teachers ignored only three percent of the high achievers' answers but they ignored 15 percent of the low achievers' answers. The good students, then, get more feedback, whether their responses are right or wrong.

Teachers give more feedback to apt undergraduates as well as to apt first-graders. John Lanzetta and T. E. Hannah offered college students the chance to play teacher, and gave them the choice of five kinds of feedback for use in teaching a concept task: a strong electric shock, a mild shock, a neutral light, a small amount of money, and a larger amount of money. The "learner," who was a confederate of the experimenters, gave 36 correct and 84 incorrect answers in all cases.

When the student teachers thought the learner had a "high potential," they rewarded him with the larger sum of money when he was right, and shocked him more severely when he was wrong. When they thought that the learner had a "low learning potential," however, they gave him the lesser reward or punishment. In other words, teachers send clearer, stronger evaluations to students for whom they have greater expectations.

But another experiment found that children believed to be bright got more praise, but not more criticism; criticism was reserved for children believed to be dull. Yet a third study found that supposedly "gifted" children get more praise from their teachers, but found no difference between "gifted" and "regular" children in the criticism they got. The matter is complicated. Perhaps criticism for a wrong answer needs to be accompanied by enough praise and support on other occasions; otherwise the student may see the teacher as overly critical and cold. We can say with modest certainty that praise is a factor in achieving the Pygmalion effect, but the role of criticism is less clear.

The Input Factor

There are only five studies that directly deal with this factor, but all five find that teachers literally teach more to children of whom they expect more.

300 PART FOUR: TEACHERS AND THE LEARNING PROCESS

Myth and Reality: A Reader in Education by Glenn Smith and Charles Kniker

only gradually and in the face of a good deal of opposition. At first some towns were cautious enough to arrange that the boys should be sent home earlier in the forenoon and afternoon to give the girls a chance to come in for the time remaining; but the girls could attend all of Thursday afternoon, for that was the boys' holiday. Even these slender schooling privileges were cut off in the winter out of consideration for "the female health." Thus the summer district schools in many instances continued to be, if not the only educational reliance of the girls, at least a very important one. There they were taught reading, writing, and spelling, and great attention was paid to polite behavior. The scholars "made their manners"—that is, the girls dropped a courtesy and the boys bowed, to the teacher when they came into the schoolroom and when they left it. They made their manners while out at play to passing strangers; and if the minister or some other prominent person went by, they formed in line and bowed and courtesied all together. At the end of the school day the teacher would tell them that as soon as they reached home they must remember to make their manners to their parents.

Besides studying their books, the girls did regular stints at school of sewing and knitting, and each made an elaborate sampler which was expected to be a household treasure ever after. The sampler was a square or oblong of coarse linen, or possibly silk, on which it was customary to stitch the alphabet in capitals and small letters, the digits, a verse of sentiment appropriate to a child student, and the worker's name, age, and place of abode. There were also decorations—borders, conventional trees, and flowerpots, and sometimes abnormal animals and people—all resplendent in many-colored silks or worsteds. Not only was the sampler intended to be a thing of beauty, but the alphabet portion of it was useful for reference to show the proper formation of the letters when clothing was to be marked. It was in fact this reference feature that made the article a "sampler...."

When the girls began to go to the masters' schools, the more aspiring of them adventured a little way into geography, grammar, and mathematics. The ignorant derided them for so doing and, with regard to the arithmetic, would ask them if they expected to carry pork to market, else why should they want to take up such a study. Some of the girls attended private schools—"finishing schools," they were called—which had been established at the dictate of fashion to cultivate ladylike accomplishments. All the larger towns had schools of this kind. Boston gentlewomen were accustomed from very early times to eke out their incomes by taking into their homes little girls and misses from the country and from the southern colonies and the Barbadoes who wanted to attend the finishing schools of the city. Salem and Newburyport were also favorite towns for acquiring feminine polish. The finishing schools taught a smattering of French, the art of embroidery and other fancy needlework, considerable dancing, and many elegant manners. Dancing seems to have had an especially important place among the young misses' attainments, though in early colonial days it was inveighed against by both magistrates and ministers. Increase Mather loudly proclaimed its evils just as he did the evils of wearing wigs—"Horrid Bushes of Vanity," he called those head ornaments. But perverse human nature adopted both wigs and dancing, and presently "ordination balls" were given when a new minister was installed.

About the beginning of the last century, girls' schools of genuinely serious aims and purposes came into being, and their high character and the success of their pupils, and the like success won by the girls in the academies, were very effective in breaking down the opposition to feminine education. The higher institutions of learning for girls established in those early years shone with added lustre because their novelty attracted workers with the enthusiasm of pioneers, and with a keenness of appreciation and exhilaration that could be elicited by no other circumstances. These schools were in a marked way religious, their pupils absorbed moral earnestness, and they had a deep and lasting influence on New England life. They furnished heroines of the mission field and some of the most ardent workers against intemperance. From them, too, came such numbers of wives for the clergy that the humorous appellation "ministers' rib factories" was not wholly amiss. This nickname was the more telling, owing to the fact that the buildings themselves were apt to be great barren barracks with very much of the factory look.

Academies

I have incidentally referred to the academies. Their waxing and waning form a curious phase of our educational development. In the eighteenth century the growth of the scattered villages, and the division of the towns into school districts, was attended by a gradual discontinuance of the grammar schools. Indeed, the law requiring grammar schools was relaxed, until we find in Massachusetts only seven towns where they were obligatory in 1824. The people preferred to spend all the money raised for education on the district schools; but some channel of more advanced instruction was a necessity, and there began to come into being many private schools and incorporated academies. The first of the latter was established in 1780 at Andover; others soon followed, and by 1840 the state had nearly one hundred of them. The purpose of the founders was primarily to provide a means by which young men could be fitted for college. They were imperatively needed. For instance, when Leicester Academy began its work, there was not in all Worcester County an educational institution higher than the district schools. The few boys who were determined to attend college conned their Latin and Greek by their own firesides, and recited to the parish ministers.

The standard studies in the academies were English, Latin, Greek, and French; writing, arithmetic, and geography; the art of speaking, logic, geometry, and philosophy. Some of the academies were little more than day schools for town pupils; others drew from a wide constituency, not alone in their own state, but from other states

The Development of American Education: Selected Readings by Joan K. Smith and L. Glenn Smith

Mediterranean littoral. Rainfall values range from 50-75 cm, generally decreasing from west to east.

The entire area enjoyed wetter conditions during the last Ice Age, but the climate has changed little in the past 10,000 years. Overgrazing and deforestation since the rise of civilization have had the effect, however, of creating wastelands. Many of the great canals of the Sumerians and Babylonians began to fill with silt and weedy growth by 1000 B.C. This was a direct result of erosion, triggered by misuse of the land upstream. What appear to have been deteriorating climatic conditions were merely the fruits of civilization.

As a general rule, the mountainous areas (such as in northwestern Africa and southwestern Arabia) receive more rainfall. In the lowlands water is available only in natural or artificial oases, or in the valleys of exotic streams. Fresh artesian water is found trapped under layers of impervious rock in many places, and will rise to the surface if the cover is penetrated. In places where seepage occurs naturally, we find the classic oasis. Some fresh-water seepage even occurs on the floor of the Persian Gulf (called Arabian Gulf by the Arabs) and Arab sailors fill their waterbags from these springs at the bottom of the sea.

In a number of places across the Sahara and Arabia, wells have been dug by hand as deep as 70 meters. Sometimes, good and abundant water may be had by drilling to a depth of 150-250 meters, but wells often must be drilled 1,800 meters. Often it is easier to obtain water in the lowlands than in the highlands, despite the fact that rainfall is heavier in the latter. Water collects in the lowlands, especially in areas of interior drainage.

Temperatures are formidable in the summer, often exceeding 50° C in the shade. The spring and fall months, on the other hand, are rather pleasant, and nowhere on earth are the stars, planets, and moon as brilliant as in the desert sky. Temperatures

may drop below freezing in the winter, snow is not uncommon in Morocco and Algeria, and snow may occur in the higher reaches of the mountains in Arabia and the rest of the Near East.

Most of the landscape consists of sedimentary rocks that cover ancient shields, though the shields themselves are exposed in several broad areas (such as the Hoggar of southern Algeria and the zone on either side of the Red Sea graben). Considering the size of the area, most of the land would be classified as plains. If a single geological-topographic area had to be singled out, it would have to be the sedimentary basin lying from the Persian (Arabian) Gulf northward to the Taurus Mountains of Turkey; and bounded on the west by the mountains of Syria, Lebanon, and Saudi Arabia; and, on the east by the mountains of Iran and Oman. This structural (and topographic) basin contains the world's largest reserves of petroleum. Approximately 60 percent of the known reserves of the planet are located there.

Because the oil is located near the sea, and because most of the wells are free flowing, production costs are the lowest in the world. Average daily production of an oil well in the vicinity of the Persian Gulf is 600 metric tons, compared to less than 40 metric tons in Venezuela, and only two metric tons in the United States. One well at the Gach Saran field (in Iran) is able to produce an incredible 100,000 metric tons a day.

Though a variety of minerals is located in North Africa and the Near East (and will be mentioned later), oil is of overwhelming importance. Other significant oil deposits occur in Algeria and Libya, and Egypt is producing from what might prove to be a major oil field on the Gulf of Suez.

The Berbers

The modern Berbers are descended from Hamitic-speaking, Caucasian tribes that entered North Africa from Asia sometime be-

might have in his own home an aid to acquaintance with his country's ancient traditions. He declares that his son's presence put him on his guard against indecencies of speech as much as that of the so-called Vestal Virgins, and that he never bathed with him. This, indeed, would seem to have been a general custom with the Romans, for even fathers-in-law avoided bathing with their sons-in-law, because they were ashamed to uncover their nakedness. Afterwards, however, when they had learned from the Greeks their freedom in going naked, they in turn infected the Greeks with the practice even when women were present.

So Cato wrought at the fair task of molding and fashioning his son to virtue. . . .

21. . . . However, as he applied himself more strenuously to money-getting, he came to regard agriculture as more entertaining than profitable, and invested his capital in business that was safe and sure. He bought ponds, hot springs, districts given over to fullers, pitch factories, land with natural pasture and forest, all of which brought him in large profits, and "could not," to use his own phrase, "be ruined by Jupiter." He used to loan money also in the most disreputable of all ways, namely, on ships, and his method was as follows. He required his borrowers to form a large company, and when there were fifty partners and as many ships for his security, he took one share in the company himself, and was represented by Quintio, a freedman of his, who accompanied his clients in all their ventures. In this way his entire security was not imperilled, but only a small part of it, and his profits were large. He used to lend money also to those of his slaves who wished it, and they would buy boys with it, and after training and teaching them for a year, at Cato's expense, would sell them again. Many of these boys Cato would retain for himself, reckoning to the credit of the slave the highest price bid for his boy. He tried to incite his son also to such economies, by saying that it was not the part of a man, but of a widow woman, to lessen his substance. But that surely was too vehement a speech of Cato's, when he went so far as to say that a man was to be admired and glorified like a god if the final inventory of his property showed that he had added to it more than he had inherited.

"HE MADE MOCK OF ALL GREEK CULTURE"

22. When he was now well on in years, there came as ambassadors from Athens to Rome, Carneades the Academic, and Diogenes the Stoic philosopher. . . . Upon the arrival of these philosophers, the most studious of the city's youth hastened to wait upon them, and became their devoted and admiring listeners. The charm of Carneades especially, which had boundless power, and a fame not inferior to its power, won large and sympathetic audiences, and filled the city, like a rushing mighty wind, with the noise of his praises. Report spread far and wide that a Greek of amazing talent, who disarmed all opposition by the magic of his eloquence, had infused a tremendous passion into the youth of the city, in consequence of which they forsook their other pleasures and pursuits and were "possessed" about philosophy. The other Romans were pleased at this, and glad to see their young men lay hold of Greek culture and consort

and the majority of urban fortunes were made up from a large number of assigned rents: the patrician was more often than not a man of property.

There were, in addition, an infinite number of other ways of making capital yield a profit, and the Italians were apparently the pioneers in every type of investment. Associations were formed between sleeping partners and craftsmen or shopkeepers who carried on their trade with or without holding shares in the business, the profits being divided according to agreements made between them; the arrangement was often that each party took equal shares. There were contracts of *commenda*, by which a financial backer handed over merchandise, or a sum in cash, to a traveller who obtained a return on it in a prearranged commercial operation, on condition that he kept a quarter of the profits for himself. There was maritime exchange. There were contracts of cattle-lease or *soccida*, making beasts over to a peasant who took care of them on his own land; the increase in the herd and their produce was shared between the interested parties in varying proportions according to the contract. Rents were assigned from urban exchequers. Tolls, salt-taxes, duty on corn or salt, etc., were leased. Ecclesiastic tithes and manorial dues, even the total revenue of a given estate were put out to rent; the king of France himself leased out the offices of provost, castellan, or scrivener for a limited period or for life.

Finally, in certain areas there appeared true joint-stock companies, that is, groups of capitalists who pooled their personal wealth in cash, acquired shares in a collective enterprise, divided the proceeds in proportion to their investment and were free to transfer their share to their heirs or sell it. From the end of the twelfth century this practice was common in the shipping business; the charter shares, the *loca*, were usually divided into 'carats' ($1/24$) or 'half-carats' ($1/48$), which were freely negotiable. It was extended in the thirteenth century to the component parts of equipment under commission, and subsequently, at Genoa, to loans made to the militia ('column') and to the 'Mahones', which were syndicates formed in the first instance to recover debts in overseas countries and which in the end severely exploited the colonial provinces of the Republic. A similar method of financing operated in the case of large industrial concerns requiring a high concentration of capital, such as the mills of the Garonne which supplied the great city of Toulouse – or the salt-works of Franche-Comté, the most important 'factory' of the Middle Ages, with its pits, its boilers, its conduits for salt water, its enormous requirements for fire-wood, and its parking-yard accommodating a hundred carts. In the fourteenth century, associations of capitalists were formed specializing in marine insurance, which was a source of considerable profits since at this time the fantastic risks from privateering and piracy were at their height.

Renaissance And Reformation

The Renaissance was a cultural and intellectual revival that had its beginnings in the city-states of northern Italy during the fourteenth and fifteenth centuries. The gradual change from the medieval outlook was probably caused by several factors—the great economic prosperity of these city-states, their contacts through trade with other cultures, the reduction of the papacy to the role of an Italian principality, and the Church's loss of emotional prestige. These elements combined to produce the highly secular outlook that is the essence of the Renaissance.

*Benvenuto Cellini
and the Pope*
Charles Phelps
Cushing

This secular outlook is commonly referred to as "humanism," a term that may be defined in two ways. According to the narrower definition, humanism was a rebirth, or renaissance, of interest in classical antiquity. Men turned to a rereading of the great (and not so great) works of Greek and Roman literature, a reexamination and preservation of classical architecture and sculpture, and a

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to the English monarchy, but at the time it was a symbol of humiliation. In 1016 Ethelred fled the country altogether, and in the following year King Canute of Denmark became the monarch of England.

Canute (1017–1035)

Canute has been described as nearly a dwarf and nearly a genius. He conquered Norway as well as England, and joining these two lands to his kingdom of Denmark, he became the master of a huge empire centering on the North Sea. A product of the new civilization forces at work in eleventh-century Scandinavia, Canute was no bloodthirsty Viking. He issued law codes, practiced Christianity, and kept the peace. Devoting much of his time to England, he cast himself as an English king in the old Wessex tradition. He respected and upheld the ancient customs of the land and gave generously to the monasteries. Despite his Danish background, he was a far better English monarch than Ethelred. His reign was a continuation of the past, and he added luster to the crown that Alfred's dynasty had forged. English religion and culture prospered as before: "Merry sang the monks of Ely as Canute the king rowed by."

Canute's Danish-Norwegian-English empire was hopelessly disunited and failed to survive his death in 1035. When the last of his sons died in 1042 the English realm fell peacefully to Edward the Confessor, a member of the Old Wessex dynasty who had grown up in exile in Normandy.

The Aftermath

Though a poor general and a mediocre administrator, Edward the Confessor was a man of piety who won the support of his people despite his political ineptitude. His childless marriage ensured a disputed succession upon his death in 1066 and set the stage for the Norman conquest. When William the Conqueror, duke of Normandy, invaded England and won its crown in 1066, he inherited a prosperous kingdom with strong, well-established political and legal traditions—a kingdom still divided by differences in custom but with a deep-seated respect for royal authority. Ethelred the Unready notwithstanding, the Wessex dynasty had done its work well. With the

Medieval Europe by C. Warren Hollister

may be apochryphal, but he was also an astronomer, a mathematician, a master of mechanics, and the inventor of numerous machines for use in war and peace. He devised a planetarium; by a laborious process he computed the value of π to a new point of exactitude; he nearly became the discoverer of the calculus. Archimedes devised an irrigation machine, called the screw, and his "helix" utilized the principle of the compound pulley to move huge weights by the exertion of comparatively little force. The ingenious war machines of Archimedes became so much of a legend that it is difficult now to separate fact from fancy, but the Romans always admitted that their siege of Syracuse was prolonged for many months because Archimedes defended the town with his novel weapons.

Medicine made great strides: both the cause and cure of disease were studied, and there were marked improvements in diagnosis, medication, and surgery. In the third century, Herophilus, the great anatomist, studied the brain and the nervous system, while his contemporary, Erasistratus, founded the science of physiology and did important work on the nervous and circulatory systems. Major centers for medical research and training were Alexandria and Pergamum.

It is customary to stress the Hellenistic Age as one of invention although few of the gadgets produced by mechanics and craftsmen were put to practical use. A world that had no labor shortage and thus no need for machines was amused and sometimes amazed by toys and novelties—water clocks, water organs, machines operated by pneumatic pressure, a rudimentary steam engine. Archimedes was virtually the only scientist to promote "useful knowledge," yet it should be said that there were improvements in agricultural and pastoral activity with the use of fertilizer, rotation of crops, the introduction of new plants and trees, and the more scientific breeding of animals.

In literature, volume and variety compensated in some measure for lack of conspicuous achievement. The new affluence and urbanization enlarged educational opportunities so that literacy was more widespread than in earlier periods. With more people able to read and write, there was a larger reading public, and there were many who were anxious to express themselves in writing; thus, literary production was bound to increase in volume although



Sultan Mohammed II, the conqueror of Constantinople, in an eminently peaceful pose; by a Turkish artist. [Topkapi Palace Museum, Istanbul; Skira]

under the magnificent new dome designed by Brunelleschi, the solemn ceremony of union took place. But despite the promises of the Greek delegation, on its return to Constantinople the union was repudiated by the great majority of the Byzantine people. The popular opposition was due not only to the belief that the union had been obtained under duress, but, more important, to the Byzantines' deep-rooted mistrust, their nearly fanatical hatred of the Latins. The memory of the atrocities committed in 1204 still rankled, and they feared that through union with Rome not only would the Greek Church lose its independence, but the Greeks would in time lose even their political identity. So vehement, in fact, was the Orthodox opposition to the union that it persisted until the very capture of Constantinople by the Turks in 1453. Some antiunionists were so extreme in their fear of Latin influence that they openly declared their preference for "the turban of the Turk in Constantinople to the tiara of the Pope."

As for the Latins, their historic antagonism toward the Byzantines was further inflamed by the Greek repudiation of the Florentine union. As a result Byzantium secured no effective aid from the West. The final determined attempt to help Constantinople was made only by Eastern European powers. The Poles and Hungarians, acting in concert, attempted to launch a crusade against the Turks. But at the Battle of Varna in 1444 the Turks routed this army, effectively ending the last hope of Byzantium. Thus by 1453 East and West were cut off from each other almost as much by mutual antagonism as they were to be by the Turkish conquest of Constantinople itself.

When the new Ottoman sultan, Mohammed II ("the Conqueror"; 1451-1481), came to the throne, he was already consumed by an overpowering ambition to take Constantinople. His first step was to build a castle on the European side of the Bosphorus (Bayazid had already erected one on the Asiatic side), studding this fortress with cannon in order to cut off the approach to the city from the Black Sea area. Finally, after intensive planning, the sultan began his attack in early April, 1453, massing a huge Ottoman army of more than 150,000 men against the 4,000 or 5,000 military defenders of the city. Mohammed had at his disposal the first real artillery in history, heavy cannon (cast by a renegade Hungarian) with which he constantly bombarded the walls. By the stratagem of transporting Turkish vessels overland he managed to corner the Greek fleet in the Constantinopolitan harbor of the Golden Horn, behind the great defensive chain stretched across the mouth of the harbor. The bombardment lasted for fifty days; it exhausted the defenders, who each night would rush to repair the damaged walls. Mohammed, exasperated, ordered a final assault. Anticipating the attack, the Greeks, on the night before what was to be the death of their capital city, gathered together in St. Sophia for divine services. It was to be the last Christian service in Christendom's most beautiful cathedral, "a liturgy of death before the last agony of the empire," as one scholar has put it.

On Tuesday, May 29, about one o'clock in the morning, the final assault began. After two attacks had been repulsed, Mohammed stormed the weakened gate where the Emperor Constantine XI Palaeologus was fighting. Making a breach, the Turks poured in through the walls. Constantine himself died fighting; his body was never found.

For three days the Turks looted and pillaged the city. All of the churches were robbed, holy images were burned, and many old and valuable Greek

Western Civilization: Prehistory to the Peace of Utrecht by General Ed.

William L. Langer

is figured upon it, and passion of sex is there, and the whispered
 endearment that steals the heart away even from the thoughtful.
 She put this in Hera's hands, and called her by name and spoke to her:
 'Take this zone, and hide it away in the fold of your bosom.
 220 It is elaborate, all things are figured therein. And I think
 whatever is your heart's desire shall not go unaccomplished.'
 So she spoke, and the ox-eyed lady Hera smiled on her
 and smiling hid the zone away in the fold of her bosom.
 So Aphrodite went back into the house, Zeus' daughter,
 225 while Hera in a flash of speed left the horn of Olympos
 and crossed over Picria and Emathia the lovely
 and overswept the snowy hills of the Thracian riders
 and their uttermost pinnacles, nor touched the ground with her feet. Then
 from Athos she crossed over the heaving main sea
 230 and came to Lemnos, and to the city of godlike Thoas.
 There she encountered Sleep, the brother of Death. She clung
 fast to his hand and spoke a word and called him by name: 'Sleep,
 lord over all mortal men and all gods, if ever
 before now you listened to word of mine, so now also
 235 do as I ask; and all my days I shall know gratitude.
 Put to sleep the shining eyes of Zeus under his brows
 as soon as I have lain beside him in love. I will give you
 gifts; a lovely throne, imperishable forever,
 of gold. My own son, he of the strong arms, Hephaistos,
 240 shall make it with careful skill and make for your feet a footstool
 on which you can rest your shining feet when you take your pleasure.'
 Then Sleep the still and soft spoke to her in answer:
 'Hera, honoured goddess and daughter of mighty Kronos,
 any other one of the gods, whose race is immortal,
 245 I would lightly put to sleep, even the stream of the River
 Okcanos, whence is risen the seed of all the immortals.
 But I would not come too close to Zeus, the son of Kronos,
 nor put him to sleep, unless when he himself were to tell me.
 Before now, it was a favour to you that taught me wisdom,
 250 on the day Herakles, the high-hearted son of Zeus, was sailing
 from Ilion, when he had utterly sacked the city of the Trojans.
 That time I laid to sleep the brain in Zeus of the aegis
 and drifted upon him still and soft, but your mind was devising

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Article 23. All galleys bound for the Byzantine Empire or from the Empire to Syria or from Syria to the Empire are to put in at the port of Chios and remain there for 24 hours. No payment is to be made for the use of the port facilities.

Article 24. Genoese are to pay no duty on goods carried from Chios except on native produce of the island. In Old and New Phocaea the Genoese are to be treated as they were under the Greeks.

Article 25. [Chios, Old and New Phocaea are to be fortified against all contingencies.]

Article 26. The Commune of Genoa has the right within the next 20 years to purchase and acquire the title to said places which will be established from the returns and revenues of said places and from the returns and revenues of Chios and Old and New Phocaea. Rather than purchasing the entire lot, the Commune may purchase in lots not less than $\frac{1}{6}$ the value of the entire capital which is valued at 203,000 lire. The patrons and shareholders are obliged to sell $\frac{1}{6}$ of the shares or more depending on how much the Commune wishes to buy and to transfer to the Commune, upon payment, the amount agreed upon. But the patrons and shareholders are to be the real and legitimate owners of said places until all the aforementioned shares are sold to and payment has been made by the Commune.

Article 27. The treasurers are responsible to the Commune of Genoa for the payment of interest on those shares which the Commune may purchase. After all the shares equivalent to 203,000 lire have been purchased by the Commune, all ownership, power, privileges and interest of said forts and cities, both on the islands and lands, is to belong to the Commune of Genoa, nothing remaining in the hands of the shareholders.

Article 28. If, however, payment is not made to the shareholders within the 20 year period, the ownership and control of the forts of Chios, the island itself, and both Old and New Phocaea with all the privileges and returns of those places, is to remain in the hands of the shareholders with the Commune exercising only supreme jurisdiction. And only in the above form can ownership of said places be transferred to the Commune of Genoa.

[1778-804] THE SONG OF ROLAND

So he swilled down the field – a brave device
 To keep the bloodstains from coming to your eyes!
 For one small hare he'll blow from morn till night;
 Now to the Peers he's showing-off in style.
 Who dare attack him? No man beneath the sky!
 Ride on, ride on! Why loiter here the while?
 Our Fathers' land lies distant many a mile."

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Count Roland's mouth with running blood is red;
 He's burst asunder the temples of his head;
 He sounds his horn in anguish and distress.
 King Carlon hears, and so do all the French.
 Then said the King: "This horn is long of breath."
 "'Tis blown", quoth Naimon, "with all a brave man's
 strength;
 Battle there is, and that I know full well.
 He that would stay you is but a traitor fell.
 To arms! let sound your battle-cry to heav'n!
 Make haste to bring your gallant household help!
 You hear how Roland makes desperate lament!"

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The Emperor Charles lets sound his horns aloft.
 The French light down and arm themselves anon
 With helm and hauberk and gilded swords girt on;
 Goodly their shields, their lances stiff and strong,
 Scarlet and white and blue the gonfalons.
 Straightway to horse the warrior lords have got;
 Swift through the passes they spur and never stop.
 Each unto other they speak and make response:
 "Might we reach Roland ere he were dead and gone,

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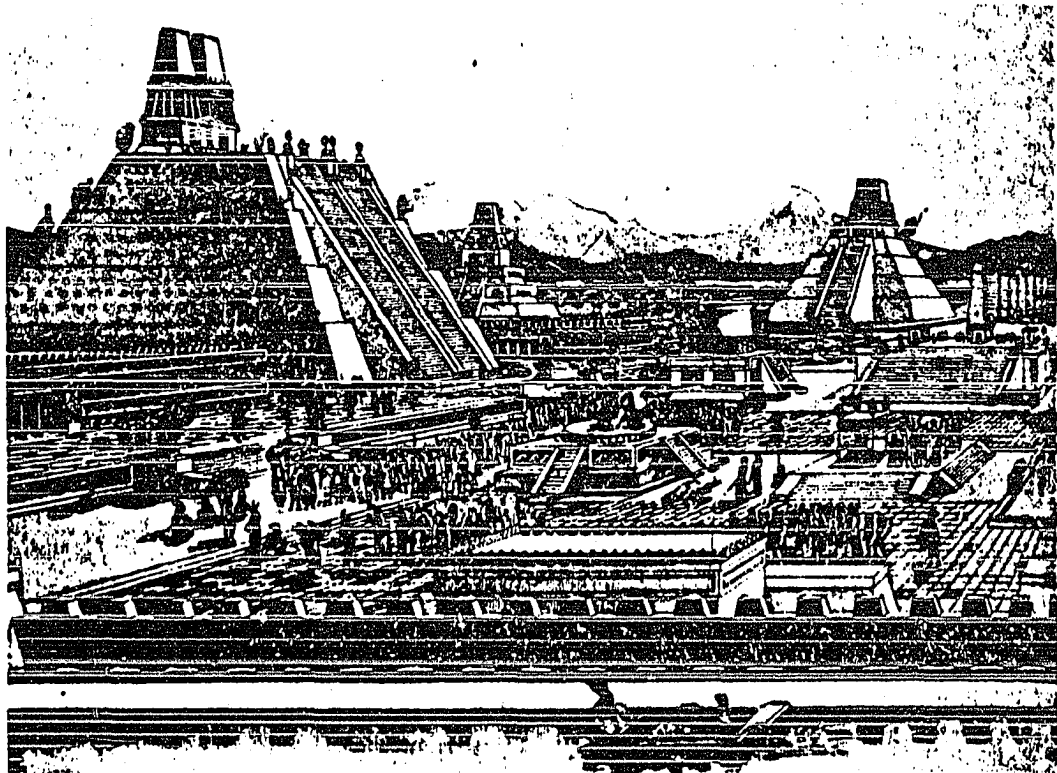
war whereby prisoners could continue to be taken.

Latter-day historians and moralists have vigorously condemned the Aztecs for conducting human sacrifices on such a grand scale, but the Aztecs were themselves horrified at the individual tortures to which the Spaniards subjected their enemies and the wholesale slaughter to which they condemned the conquered Aztecs. There are some indications that the Aztecs' sacrificial victims may have considered their fate not only inevitable but even an honor, for by the sacrifice they became the god himself. As cruel and barbaric as this practice may seem to us, we should keep in mind that our own century has seen some of the most "civilized" nations of the world massacre millions of people for purely racial or political reasons, and that we have developed weapons capable of wiping out instantly more people than the Aztecs sacrificed in their entire history.

The Aztec capital of Tenochtitlán was a thriving metropolis with well-regulated great market places, immaculately clean streets, running water, great gardens, and magnificent buildings, all constructed without the aid of the wheel or any beast of burden other than man. It was a young city, not quite two hundred years passed between its foundation in 1325 and its destruction at the hands of the Spaniards.

At the time of the Spanish conquest this young Aztec society was in the process of rapid social change. The upper civil classes—the emperor, nobility, bureaucracy, and military officers—were increasingly wealthy and ostentatious. At the beginning of the sixteenth century, during the reign of the famed Montezuma II, an aristocratic reaction apparently set in against those of common birth who were rising in society, and measures were taken to exclude them from high office and social position. Had Aztec society not been destroyed by the *conquistadores*,

Dominating the one-quarter-square-mile Great Temple precinct in the Aztec's capital city of Tenochtitlán was the huge double pyramid sacred to Uitzilopochtli, sun god and god of war, and Tlaloc, the rain god. The precinct was separated by a "serpent wall" and a moat from the rest of the city.



Civilization Past and Present by T. Walter Wallbank, Alastair M. Taylor and Nels M. Bailkey

MYRRHINE. Heavens, no! Bad as you are, I won't let you lie on the bare ground. [*She goes into the Acropolis.*]

CINESIAS. Why, she really loves me; it's plain to see.

MYRRHINE [*returning with a bed*]. There! Now hurry up and lie down. I'll just slip off this dress. But—let's see: oh yes, I must fetch a mattress.

CINESIAS. Nonsense! No mattress for me.

MYRRHINE. Yes indeed! It's not nice on the bare springs.

CINESIAS. Give me a kiss.

MYRRHINE [*giving him a hasty kiss*]. There! [*She goes.*]

CINESIAS [*in mingled distress and delight*]. Oh-h! Hurry back!

MYRRHINE [*returning with a mattress*]. Here's the mattress; lie down on it. I'm taking my things off now—but—let's see: you have no pillow.

CINESIAS. I don't want a pillow!

MYRRHINE. But I do. [*She goes.*]

CINESIAS. Cheated again, just like Heracles and his dinner! ⁸⁸

MYRRHINE [*returning with a pillow*]. Here, lift your head. [*To herself, wondering how else to tease him.*] Is that all?

CINESIAS. Surely that's all! Do come here, precious!

MYRRHINE. I'm taking off my girdle. But remember: don't go back on your promise about the truce.

CINESIAS. Hope to die, if I do.

MYRRHINE. You don't have a blanket.

CINESIAS [*shouting in exasperation*]. I don't want one! I WANT TO—

MYRRHINE. Sh-h! There, there, I'll be back in a minute. [*She goes.*]

CINESIAS. She'll be the death of me with these bedclothes.

MYRRHINE [*returning with a blanket*]. Here, get up.

CINESIAS. I've got this up!

MYRRHINE. Would you like some perfume?

CINESIAS. Good heavens, no! I won't have it!

MYRRHINE. Yes, you shall, whether you want it or not. [*She goes.*]

CINESIAS. O lord! Confound all perfumes anyway!

MYRRHINE [*returning with a flask*]. Stretch out your hand and put some on.

CINESIAS [*suspiciously*]. By God, I don't much like this perfume. It smacks of shilly-shallying, and has no scent of the marriage-bed.

MYRRHINE. Oh dear! This is Rhodian perfume I've brought.

CINESIAS. It's quite all right, dear. Never mind.

MYRRHINE. Don't be silly! [*She goes out with the flask.*]

⁸⁸ In the Greek Cinesias compares his male organ to Heracles at a dinner-table—a reference to the mythical glutton hero who, in comedies, is often raving with hunger but never gets enough from his hosts.

drawn out at the right time if the water should receive him as innocent [i.e., if he should sink] so that he does not drown. In this ordeal of cold water whoever, after the invocation of God who is the Truth, seeks to hide the truth by a lie, cannot be submerged in the waters, for the pure nature of the water recognizes as impure and therefore rejects as inconsistent with itself such human nature as has once been regenerated by the waters of baptism and is again infected by falsehood.¹

There were other kinds of ordeals, all sanctified by the church with masses, communions, benedictions, special prayers, and adjurations to the defendant to tell the truth. In the ordeal of hot water the priest blessed a cauldron of water, which was then boiled; a stone was put in it, and the accused had to reach in and get it out, after which his hand was bound up for three days. If, after the wrapping was removed, his hand showed signs of healing, his innocence was established; if not, then his guilt. The ordeal of hot iron required the accused to pick up a piece of red hot iron, take two steps, drop it, and then hasten to the altar to have his hand bound for three days before examination. Sometimes the accused was required to walk barefoot on hot metal plowshares or through a large fire, as Peter the Hermit did while on the First Crusade to verify his story that he had found the lance that had pierced the side of Christ during the crucifixion.

The ordeal was usually the last resort of a court unable to establish the credibility of accused or witness in highly suspicious cases. In the twelfth century the growth of legal studies and the development of a more systematic approach to the rules of evidence led to the condemnation of the ordeal as irrational and ineffective, while churchmen increasingly tended to look upon it as sacrilegious. In the Fourth Lateran Council (1215), Pope Innocent III forbade any priest's participating in an ordeal, thus depriving such tests of that divine sanction without which they could hardly be said to reveal God's judgment. The decision came just a year too late for a certain William Trenchebot in England, who was accused before the king's

¹ Adapted from University of Pennsylvania, *Translations and Reprints*, Vol. VI, no. 4, p. 11.

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were considered to be hesitant or doubtful followers of the views and ideology of the President. In terms of the top-level political appointees, the transition between the first and second Nixon terms was as extreme as most transitions from one party to the other. Many experienced Republicans in key posts were replaced by others, usually younger, in whom the Administration presumably had greater confidence of personal and ideological loyalty, and who were innocent of prior allegiances to the agency of the appointment or its associated clientele. In this and other ways the Administration undertook to carry out and enforce its electoral "mandate" even before the inauguration in 1973.

The administrative climate was, to some extent, a product of the political climate: aggressive efforts were made to use administrative machinery to carry out political and policy ends, and growing frustration and exasperation developed over alleged bureaucratic impediments. In part, it was a further step in the evolution of a strong Presidency — a movement which had begun generations earlier and which students of American government have generally approved, at least since the report of the President's Committee on Administrative Management (the Brownlow Report) submitted in 1937.

Taken individually, the majority of changes that the Administration instituted or sought were consistent with sound administrative practices; indeed, a good many leaders in public administration had recommended some of them earlier and specifically endorsed them after they were proposed by the President. They included:

1. formation of regions with common head-quarters and boundaries to encompass many of the domestic field agencies and activities;
2. establishment of regional councils to provide better coordination of federal activities in regions and areas;
3. delegation of federal powers from Washington to the field;
4. unconditional grants to state and local governments (called general revenue sharing);
5. broader categories of, and fewer strings on, functional grants to state and local governments (called special revenue sharing);
6. formation of a Domestic Council to parallel, in domestic affairs, the National Security Council in foreign affairs;
7. strengthening of the managerial role of the Bureau of the Budget (which became the Office of Management and Budget), and vesting of all of its statutory powers in the President;
8. consolidation of the activities of most of the domestic departments in four "superdepartments," rationally organized according to subject matter areas;
9. formation of a "Federal Executive Service" to encompass all super-

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What are some of the specific conditions, then, that may erode the viability of the bureaucratic model? Among the most prominent are the increasingly high level of education of the population in general, the changing nature of work tasks within organizations, and the tremendous influx of professionals into the ranks of the bureaucratically employed. Professionals, of course, perform relatively nonprogrammed and unpredictable work tasks, precisely the types of work tasks that clash with bureaucratic rigidity. A movement toward a less bureaucratic formal organizational structure may occur as the proportion of professionals in the organization increases.

It is projected that the creation of a highly educated work force will alter the orientation toward work. Education and a predisposition for responsibility and autonomy tend to go hand in hand. As the educational level rises, therefore, the work orientation may encompass a desire and capability for autonomy, responsibility, and participation. A second major condition threatening bureaucracy is the change toward more complex, technical, and nonroutine work. Of course, these two factors are intertwined. As work tasks become more complex and unprogrammed, increasing numbers of highly educated people are needed. At the same time, the existence of a pool of highly educated employees permits organizations to pioneer in sophisticated areas of production and service that would otherwise remain unexplored.

Consensus regarding the future of bureaucracy does not exist. The current majority opinion projects the persistence of the bureaucratic model into the distant future; however, there is a definite parting of the ways on the question of the *degree* of organizational change that will occur as a result of the factors discussed above. Nonetheless, a part of the majority stance clearly emphasizes the necessity of modifying and qualifying the bureaucratic model. And these modifications and qualifications are in an important sense consistent with the ideas of those predicting the demise of bureaucracy. These more conservative analysts agree with Bennis that certain kinds of organizations operate best along nonbureaucratic lines. Research and development firms and advertising agencies are prime examples.

Those envisioning radical organizational change project the emergence of an entirely nonbureaucratic organizational format. Others contend that only segments of bureaucratic organizations will be based on nonbureaucratic principles. According to this view, segments within a bureaucratic organization that perform routine tasks will continue to adhere to the principles of hierarchy of authority, rules and regulations, universalism, and minute division of labor. Within this same organization, units handling nonprogrammable and unpredictable work tasks will minimize bureaucratic principles.

Undoubtedly, complete democracy in the armed forces, as Buchwald humorously depicts, would lead to unimagined absurdities. Subordinate participation in decision-making does have to be tailored to such limiting factors as organizational goals, subordinate capabilities, existing technology,

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APPENDIX B: TABLES OF FINDINGS

Table B.1. Academic achievement

Subject	MSAT	ACT (composite)	Fall G.P.A.	Winter G.P.A.	High school G.P.A.	High school rank
1	26	18	1.67	2.53	3.14	27
2	34	16	1.63	1.77	3.21	31
3	30	17	3.25	2.92	3.50	21
4	34	18	1.54	1.65	3.02	36
5	52	26	2.75	0.57	3.61	17
6	25	13	2.50	2.07	2.81	48
7	20	14	1.63	1.00	2.59	55
8	45	27	3.21	3.75	3.79	06
9	25	12	1.85	--	2.53	54
10	31	17	3.00	--	2.56	51
11	39	22	2.62	2.69	2.84	42
12	29	23	2.70	2.25	3.41	15
13	24	13	1.64	2.44	--	34
14	--	--	3.79	3.80	3.49	10
15	28	16	3.00	1.85	3.12	29
16	22	15	2.00	0.25	3.16	24
17	36	16	2.25	1.83	3.00	38
18	40	23	2.50	1.47	2.69	54
19	35	22	2.50	1.88	2.39	57
20	39	18	2.15	1.67	3.01	34
21	42	20	1.25	1.00	2.56	35
22	57	28	3.25	2.73	3.59	09
23	28	12	2.33	1.77	2.69	53
24	24	18	3.00	2.35	3.09	20
25	22	19	2.40	2.92	2.58	56
26	32	21	3.00	3.00	3.38	13
27	35	18	1.25	2.46	2.78	41
28	32	18	3.08	2.21	3.38	20
29	24	13	2.57	2.15	3.33	52
30	14	--	0.92	1.27	2.59	47
31	40	19	3.14	2.54	2.60	52
32	34	14	2.25	1.92	3.10	29
33	41	21	2.90	3.56	3.67	15
34	55	29	3.43	2.07	3.13	26
35	30	--	2.25	0.80	2.49	57
36	30	18	3.56	3.00	3.24	15
37	32	20	3.50	3.27	3.15	24
38	38	17	2.75	2.40	--	21
39	21	15	2.77	2.23	2.42	62
40	29	17	2.71	--	3.30	51
41	27	17	2.67	2.25	2.78	49

Table B.1 (Continued)

Subject	MSAT	ACT (composite)	Fall G.P.A.	Winter G.P.A.	High school G.P.A.	High school rank
42	35	17	1.90	0.69	2.99	21
43	28	17	2.31	1.46	2.68	42
44	22	21	2.00	2.00	2.77	29
45	12	13	0.93	2.00	3.06	31
46	99	15	1.69	2.10	2.25	69
47	32	22	2.69	2.69	2.83	33
48	38	18	2.17	1.93	2.77	34
49	43	16	2.53	2.27	3.06	41
50	31	17	2.50	2.00	3.50	22
51	35	12	1.00	2.33	2.44	71
52	22	16	2.50	2.80	3.74	05
53	21	19	3.25	3.07	3.22	15
54	40	18	2.50	2.00	2.64	39
55	42	25	1.58	0.73	2.76	43
56	36	18	3.25	2.93	2.79	43
57	15	09	2.40	1.86	--	12
58	12	08	1.14	2.10	--	44
59	40	--	2.50	2.00	3.07	25
60	33	16	2.15	2.70	2.57	62
61	31	23	2.14	2.20	2.83	44
62	33	16	1.83	2.44	3.05	33
Mean	31.700	17.862	2.389	2.146	2.978	35.290
Standard deviation	9.441	4.310	0.689	0.752	0.378	16.531

Table B.2. Nelson-Denny Reading Test scores for Form A

Case No.	Vocabulary		Comprehension		Total		Rate	
	Perce- tile	Grade	Perce- tile	Grade	Perce- tile	Grade	Perce- tile	Grade
1	20	10.1	51	13.1	33	12.1	70	14+
2	31	12.2	17	9.8	23	11.0	38	10.3
3	34	12.3	25	10.7	28	11.6	56	13.6
4	22	11.0	35	11.9	22	11.4	17	8.4
5	67	13.9	40	12.4	56	13.4	26	9.3
6	20	10.7	7	7.9	9	9.2	74	14+
7	16	9.9	4	7.0	6	8.1	19	8.4
8	76	13.3	85	13.8+	81	14+	45	11.2
9	16	9.2	7	7.9	8	9.0	26	9.3
10	31	12.2	40	12.4	35	12.2	17	8.4
11	67	13.9	74	13.8+	71	14+	56	13.6
12	65	13.8	45	12.7	57	13.5	50	12.4
13	20	10.7	21	10.2	19	10.4	44	11.2
14	80	14+	74	13.8+	78	14+	56	13.6
15	39	12.5	30	11.1	51	12.1	38	10.3
16	11	8.8	47	9.8	16	9.2	56	13.6
17	51	13.1	63	13.8+	57	13.5	97	14+
18	42	12.6	82	13.8+	57	13.5	97	14+
19	42	12.6	74	13.8+	69	13.2	38	10.3
20	42	12.6	25	10.7	32	12.0	38	10.3
21	22	11.0	40	12.4	30	11.7	21	8.8
22	80	14+	92	13.8+	87	14+	70	14+
23	26	11.6	21	10.2	22	10.9	21	8.8
24	28	11.9	21	10.2	23	11.0	62	14+
25	26	11.6	35	11.9	30	11.7	16	8.0
26	42	12.6	57	13.5	49	13.1	56	13.6
27	55	13.2	68	13.8+	60	13.7	91	14+
28	20	10.7	14	9.3	15	9.9	38	10.3
29	6	8.8	25	10.7	13	9.7	13	8.0
30	18	10.4	5	7.5	8	8.9	6	-7.0
31	34	12.3	45	12.7	39	12.5	65	14+
32	18	10.4	21	10.2	18	10.3	38	10.3
33	59	13.5	51	13.1	56	13.4	44	11.2
34	52	13.1	92	13.8+	74	14+	85	14+
35	37	12.4	57	13.5	46	12.9	50	12.4
36	37	12.4	21	10.2	27	11.4	17	8.4
37	39	12.5	30	11.1	33	12.1	62	14.0
38	24	11.3	51	13.1	37	12.3	66	14+
39	7	9.0	17	9.8	10	9.3	13	8.0
40	22	11.0	35	11.9	27	11.4	60	14.0
41	12	9.6	21	10.2	15	9.9	--	--
42	31	12.2	30	11.1	30	11.7	44	11.2

Table B.2 (Continued)

Case No.	Vocabulary		Comprehension		Total		Rate	
	Perce- tile	Grade	Perce- tile	Grade	Perce- tile	Grade	Perce- tile	Grade
43	52	13.1	35	11.9	43	12.7	62	14.0
44	37	12.4	40	12.4	38	12.4	70	14+
45	9	9.2	14	9.3	9	9.2	10	7.5
46	26	11.6	21	10.2	22	10.9	38	10.3
47	24	11.3	35	11.9	28	11.6	66	14+
48	37	12.4	30	11.1	32	12.0	44	11.2
49	31	12.2	57	13.5	43	12.7	56	13.6
50	18	10.4	74	13.8+	43	12.7	74	14+
51	20	10.7	21	10.2	19	10.4	44	11.2
52	7	9.0	11	8.9	8	8.9	17	8.4
53	22	11.0	45	12.7	32	12.0	62	14.0
54	65	13.8	45	12.7	57	13.5	80	14+
55	52	13.1	50	13.1	38	13.2	38	10.3
56	37	12.4	45	12.7	40	12.6	93	14+
57	3	8.1	4	7.0	3	7.5	--	--
58	1	7.3	-1	-7.0	-1	-7.0	17	8.4
59	47	12.9	17	9.8	30	11.7	38	10.3
60	22	11.0	35	11.9	27	11.4	38	10.3
61	50	13.0	57	13.5	53	13.3	44	11.2
62	28	11.9	74	13.8+	51	13.1	70	14+

N = 62

Total Reading Mean = 11.650 Median = 11.983 Standard Deviation = 1.753

Comprehension Mean = 11.481 Median = 11.900 Standard Deviation = 1.994

Vocabulary Mean = 11.626 Median = 12.175 Standard Deviation = 1.604

Table B.3. Readability levels of textbooks

Course	Book	Readability level		
Biology 101	<u>Biology</u>	14		
Child Development 129	<u>A Child's World</u>	12		
Elementary Education 204	<u>The Development of American Education: Selected Readings</u>	14		
Elementary Education 204	<u>Myth and Reality A Reader in Education</u>	13		
Elementary Education 204	<u>You and Values Education</u>	12		
Geography 100	<u>Introduction to World Geography Regions and Cultures</u>	15		
Sociology 134	<u>Basic Sociology</u>	15		
Sociology 134	<u>Sociology Today Readings and Study Guide</u>	14		
History 201	<u>An Introduction to Medieval Institution</u>	12		
History 201	<u>The Economic Development of Medieval Europe</u>	13		
History 201	<u>From the Tigris to the Tiber: An Introduction to Ancient History</u>	17+		
History 201	<u>Heritage of Western Civilization: Select Readings</u>	13		
History 201	<u>The Iliad of Homer</u>	10		
History 201	<u>The Song of Roland</u>	5		
History 201	<u>Medieval Europe</u>	12		
History 201	<u>Readings in Ancient History from Gilgamesh to Diocletian</u>	12		
History 201	<u>Medieval Europe</u>	12		
History 201	<u>Civilization Past and Present</u>	13		
History 201	<u>Western Literature I The Ancient World</u>	5		
History 201	<u>Western Civilization I: Prehistory to the Peace Utrecht</u>	13		
N = 20	Mean = 12.30	Median = 12.70	Standard deviation = 8.435	Variance = 2.9037
*N = 18 not including the two fifth-grade books-- <u>Song of Roland</u> and <u>Iliad of Homer</u>				
Mean = 13.111	Median = 13.2	Standard deviation = 2.457	Variance = 1.5676	

Table B.4. Descriptive data--Biology 101

Student	Total reading ability	Readability of textbook	Reading discrepancy	Perceived reading difficulty	Perceived interest	Grade in course
1	13.8	14	.20	2.0	4.0	2
2	11.7	14	2.30	1.0	4.0	1
3	13.4	14	.60	--	--	3
4	12.3	14	1.70	2.0	2.0	1
5	12.5	14	1.50	2.0	4.0	3
6	12.4	14	1.60	1.0	3.0	2
7	13.2	14	.80	2.0	3.0	2
8	11.7	14	2.30	2.0	2.0	2
9	13.3	14	.70	3.0	3.0	2
10	12.9	14	1.10	2.0	2.0	2
11	11.0	14	3.00	2.0	4.0	1
12	13.2	14	.80	2.0	4.0	3
13	14.0	14	.00	2.0	2.0	4
14	13.1	14	.90	1.0	1.0	1
15	14.0	14	.00	2.0	4.0	3
Mean	12.833	14	1.167	1.857	3.00	2.125
Median	13.1	14	.90	1.900	3.17	2.167
Standard deviation	3.316	0	.4472	.535	1.038	1.025

Table B.5. Descriptive data--Child Development 129

Student	Total reading ability	Readability of textbook	Reading discrepancy	Perceived reading difficulty	Perceived interest	Grade in course
1	12.7	12	-.70	3.0	4.0	1
2	11.4	12	.60	3.0	4.0	4
3	11.4	12	.60	3.0	5.0	2
4	11.0	12	1.00	4.0	5.0	3
5	12.0	12	.00	2.0	3.0	2
6	10.9	12	1.10	3.0	--	1
7	10.4	12	1.60	2.0	4.0	0
8	11.7	12	.30	3.0	4.0	2
9	8.9	12	3.10	3.0	1.0	1
10	12.3	12	-.30	3.0	3.0	3
11	13.5	12	-1.50	3.0	3.0	3
12	12.6	12	-.60	4.0	4.0	3
13	13.7	12	-1.70	3.0	4.0	2
14	12.4	12	-.40	4.0	3.0	2
15	9.9	12	2.10	4.0	3.0	3
16	7.5	12	4.50	3.0	5.0	2
17	8.1	12	3.90	3.0	4.0	3
18	13.2	12	-1.20	--	--	4
19	11.4	12	.60	4.0	4.0	2
20	11.4	12	.60	3.0	4.0	2
21	12.1	12	-.10	3.0	3.0	4
22	9.0	12	3.00	3.0	4.0	2
23	11.6	12	.40	3.0	4.0	3
24	12.0	12	.00	3.0	4.0	3
25	13.5	12	-1.50	2.0	2.0	2
26	10.9	12	1.10	3.0	4.0	3
27	7.0	12	5.00	2.0	3.0	1
28	11.7	12	.30	3.0	4.0	3
29	9.3	12	2.70	4.0	4.0	3
Mean	11.155	12	.8448	3.071	3.667	2.393
Median	11.4	12	.6000	3.056	3.800	2.409
Standard deviation	2.6575	0	2.2360	.604	.877	.956

Table B.6. Descriptive data--Elementary Education 204

Student	Total reading ability	Readability of textbook	Reading discrepancy	Perceived reading difficulty	Perceived interest	Grade in course
1	12.7	14	1.30	2.0	2.0	3
2	11.4	14	2.60	2.0	4.0	4
3	11.0	12.5	1.50	3.5	1.0	3
4	13.4	14	.60	2.0	--	3
5	8.9	14	5.10	3.0	4.0	1
6	13.5	14	.50	2.4	4.0	3
7	12.6	14	1.40	2.0	3.0	3
8	13.7	14	.30	1.0	3.0	2
9	8.9	12.5	3.60	3.5	3.5	3
10	11.6	12.5	.90	4.0	4.0	3
11	13.1	12.5	-.60	3.0	4.0	3
12	12.1	14	1.90	2.0	3.0	4
13	9.0	14	5.00	2.0	--	2
14	11.6	14	2.40	2.0	1.0	3
15	12.0	12.5	.50	2.0	2.5	3
16	13.5	14	.50	2.0	3.0	2
17	10.9	14	3.10	3.0	3.3	3
18	11.7	14	2.30	3.0	3.0	2
Mean	11.756	13.58	1.8278	2.483	3.019	2.722
Median	11.85	13.712	1.45	2.078	3.060	2.864
Standard deviation	2.9833	.691	.7071	.773	.986	.826

Table B.7. Descriptive data--Geography 100

	Total reading ability	Readabil- ity of textbook	Reading discrep- ancy	Perceived reading difficulty	Perceived interest	Grade in course
1	13.8	15	1.20	4.0	3.0	3
2	12.7	15	2.30	3.0	5.0	2
3	12.0	15	3.00	2.0	3.0	2
4	11.4	15	3.60	--	--	3
5	11.0	15	4.00	3.0	4.0	3
6	13.5	15	1.50	3.0	3.0	2
7	12.6	15	2.40	3.0	4.0	3
8	13.7	15	1.30	1.0	1.0	1
9	8.9	15	6.10	3.0	3.0	3
10	13.3	15	1.70	3.0	4.0	4
11	12.9	15	2.10	3.0	2.0	3
12	13.1	15	1.90	3.0	3.0	3
13	12.1	15	2.90	4.0	3.0	3
14	9.0	15	6.00	3.0	4.0	2
15	11.6	15	3.40	2.0	2.5	1
16	12.0	15	3.00	1.0	1.0	3
17	13.5	15	1.50	3.0	4.0	3
18	9.2	15	5.80	3.1	1.0	2
Mean	12.017	15	2.983	2.847	2.947	2.579
Median	12.35	15	2.65	3.00	3.063	2.727
Standard deviation	2.983	0	1.095	.836	1.129	.769

Table B.8. Descriptive data--History 201

Student	Total reading ability	Readability of textbook	Reading discrepancy	Perceived reading difficulty	Perceived interest	Grade in course
1	13.5	14	0.50	3.0	2.6	3
2	9.7	15	5.30	2.5	3.2	1
3	14.0	14	0.00	2.1	2.8	3
4	10.9	14	3.10	2.5	2.0	2
5	12.2	13	0.80	1.6	3.6	3
6	14.0	10.66	-3.34	2.0	3.5	4
7	9.2	10.40	1.20	3.0	3.0	--
8	14.0	14	0.00	3.0	3.3	2
9	13.3	14	0.70	2.9	3.0	1
10	12.1	14	1.90	2.0	2.5	1
Mean	12.29	13.306	1.016	2.460	3.00	2.220
Median	12.75	13.940	.75	2.50	3.00	2.250
Standard deviation	3.033	2.031	2.302	.513	.40	1.093

Table B.9. Descriptive data--Sociology 134

Student	Total reading ability	Readability of textbook	Reading discrepancy	Perceived reading difficulty	Perceived interest	Grade in course
1	12.7	14.5	1.80	3.0	5.0	3
2	11.0	14.5	3.50	2.5	3.5	3
3	12.0	14.5	2.50	2.0	2.0	2
4	10.9	14.5	3.60	1.0	1.0	0
5	13.4	14.5	1.10	2.0	2.0	3
6	11.7	14.5	2.80	4.0	--	2
7	8.9	14.5	5.60	3.0	4.0	1
8	12.3	14.5	2.20	3.0	3.5	3
9	13.5	14.5	1.00	3.0	2.0	2
10	12.6	14.5	1.90	2.5	2.5	4
11	13.7	14.5	.80	1.0	3.0	0
12	9.9	14.5	4.60	2.5	3.0	1
13	14.0	14.5	.50	3.5	4.5	3
14	12.7	14.5	1.80	3.5	4.5	3
15	8.1	14.5	6.40	3.0	3.0	1
16	13.2	14.5	1.30	2.0	1.0	2
17	12.1	14.5	2.40	2.5	2.0	3
18	11.4	14.5	3.10	3.0	4.5	3
19	9.2	14.5	5.30	3.5	3.0	1
20	8.9	14.5	5.60	3.0	4.0	3
21	9.2	14.5	5.30	2.5	3.5	1
22	12.7	14.5	1.80	2.5	2.5	2
23	13.1	14.5	1.40	3.0	4.0	3
24	12.1	14.5	2.40	3.0	3.0	3
25	9.0	14.5	5.50	2.0	3.5	2
26	11.6	14.5	2.90	4.0	4.0	4
27	13.5	14.5	1.00	3.0	3.0	1
28	10.4	14.5	4.10	3.0	3.0	2
29	10.9	14.5	3.60	2.0	3.0	2
30	10.3	14.5	4.20	2.5	3.0	2
31	13.4	14.5	1.10	2.0	4.0	4
32	9.3	14.5	5.20	3.0	3.0	2
Mean	11.491	14.5	3.009	2.625	3.125	2.219
Median		14.5		2.750	3.100	2.300
Standard deviation		0.0		.672	.967	1.074

APPENDIX C: SCATTERGRAMS OF CORRELATIONS

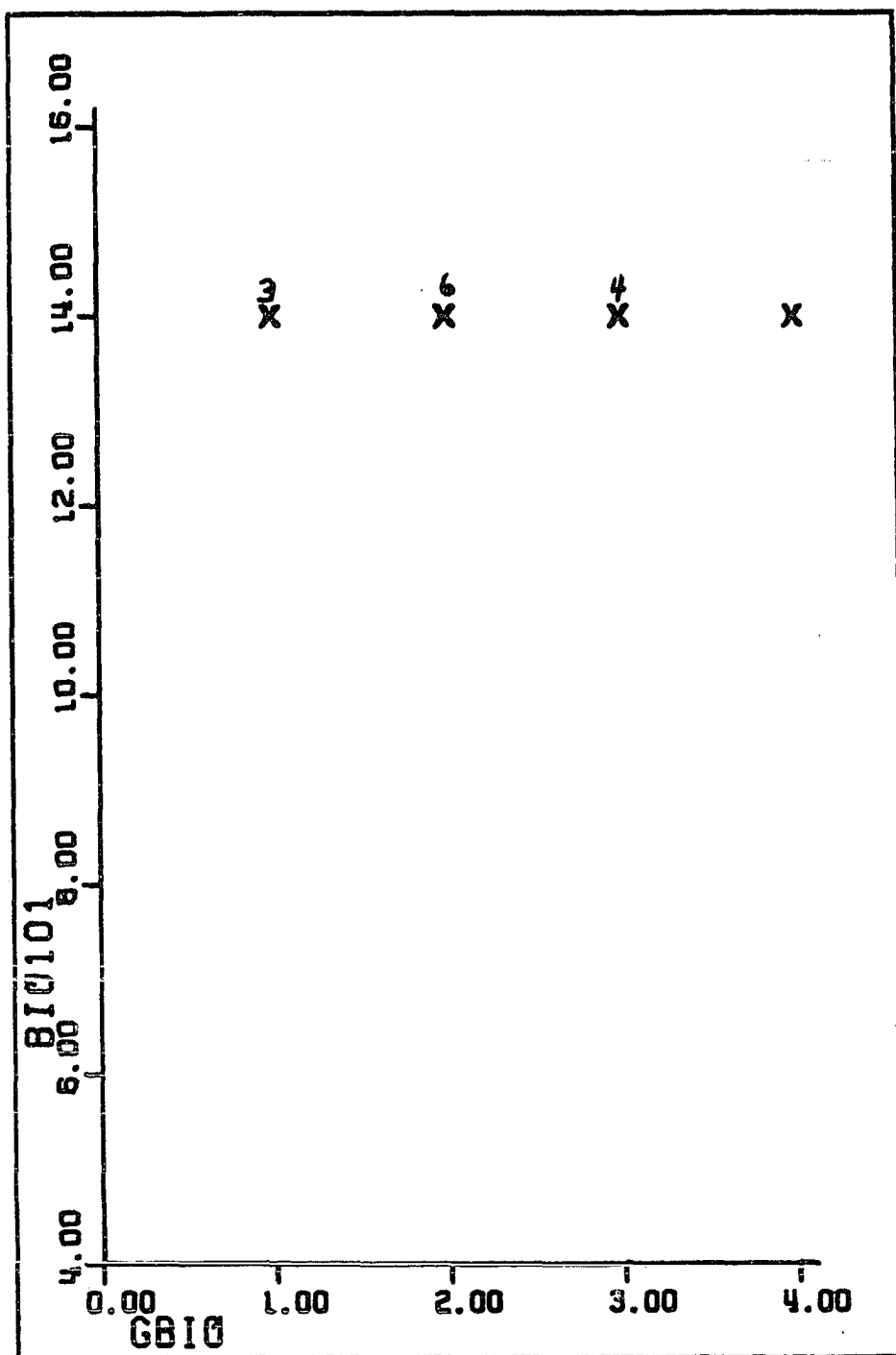


Figure C.1. Textbook readability with grade achieved--Biology 101
(1.00 = 4; 2.00 = 4; 3.00 = 4)

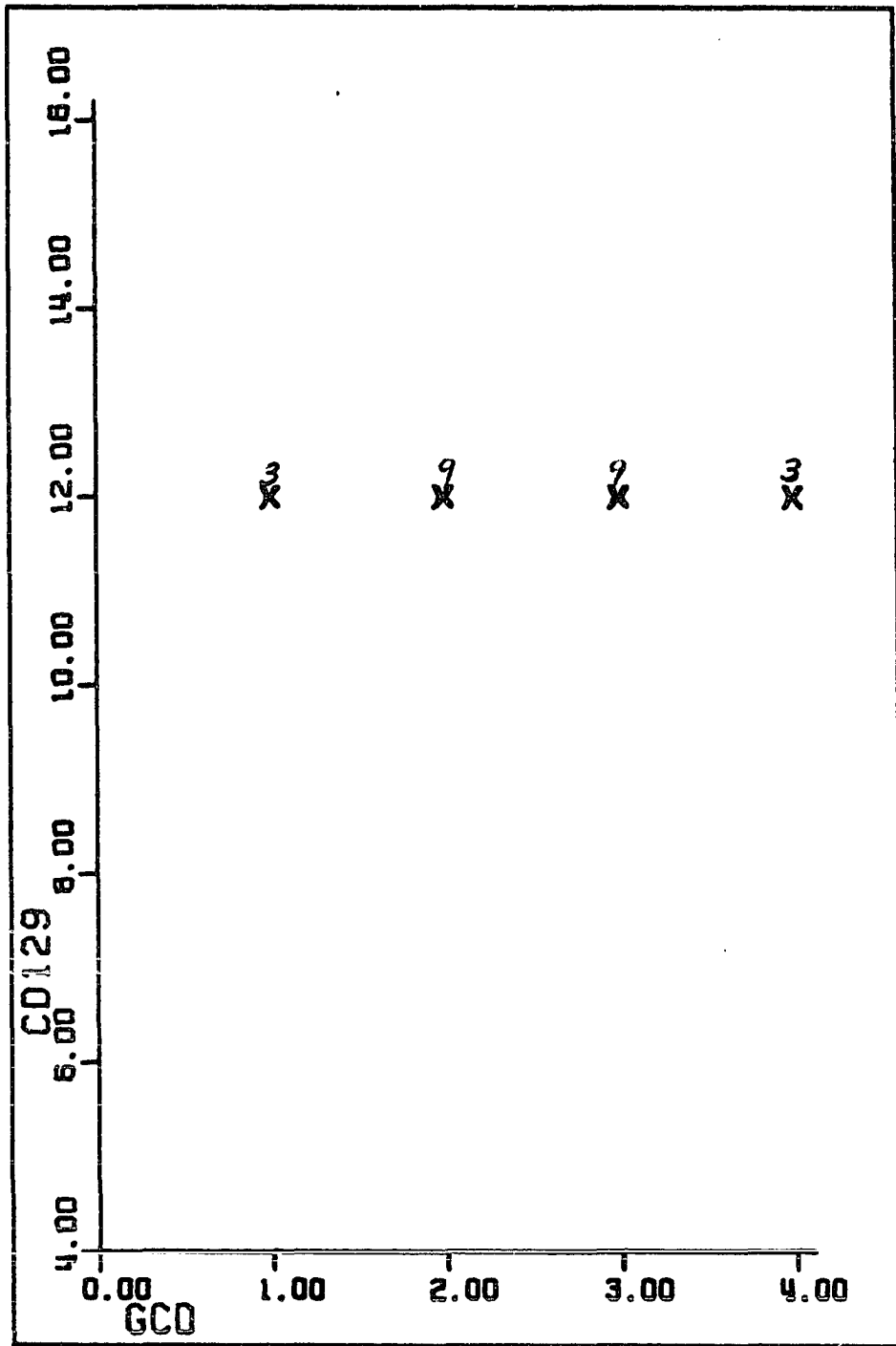


Figure C.2. Textbook readability with grade achieved--Child Development 129 (0.00 = 1; 1.00 = 4; 2.00 = 10; 3 = 11)

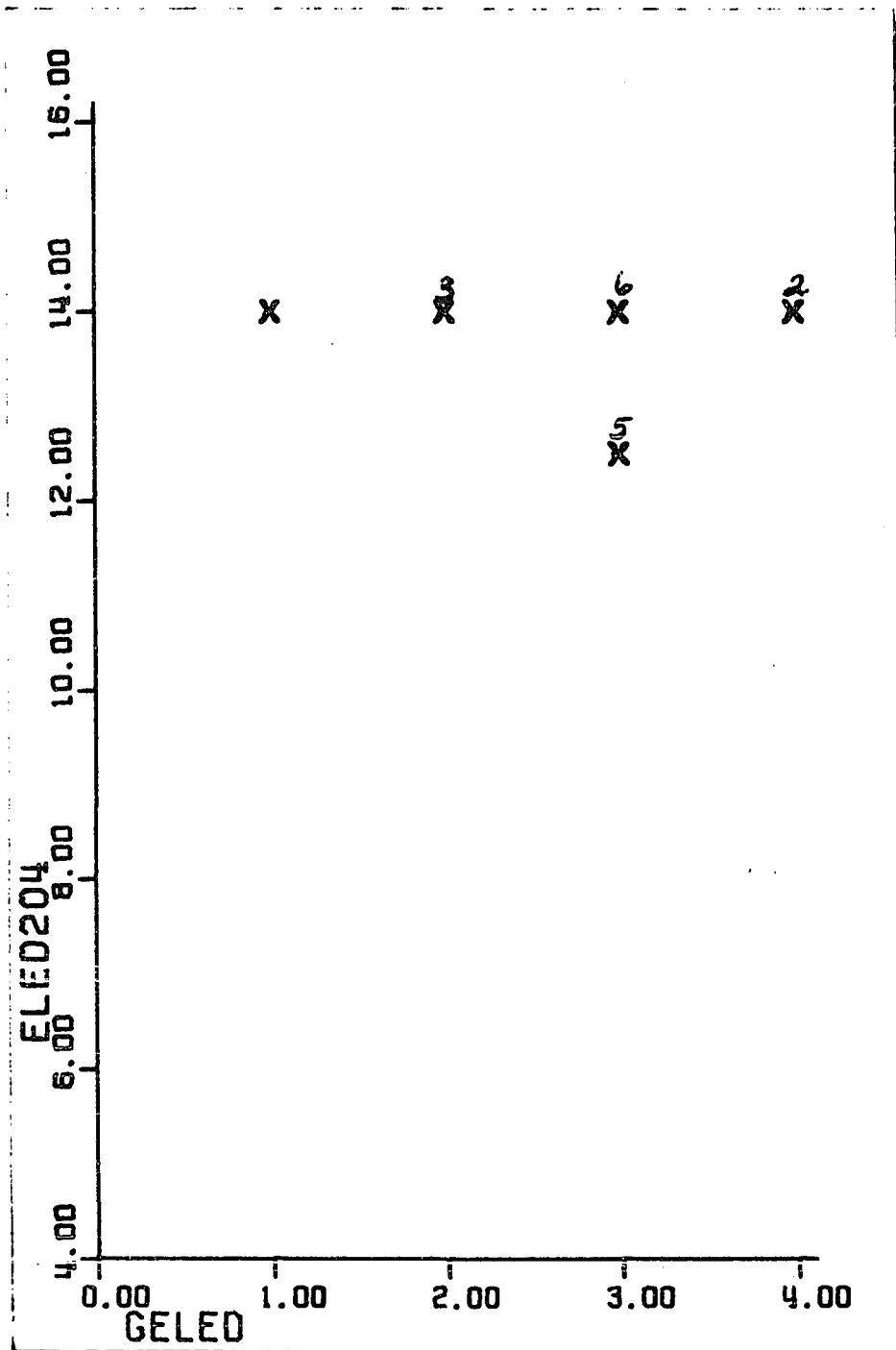


Figure C.3. Textbook readability with grade achieved--Elementary Education 204 (2.00 = 4)

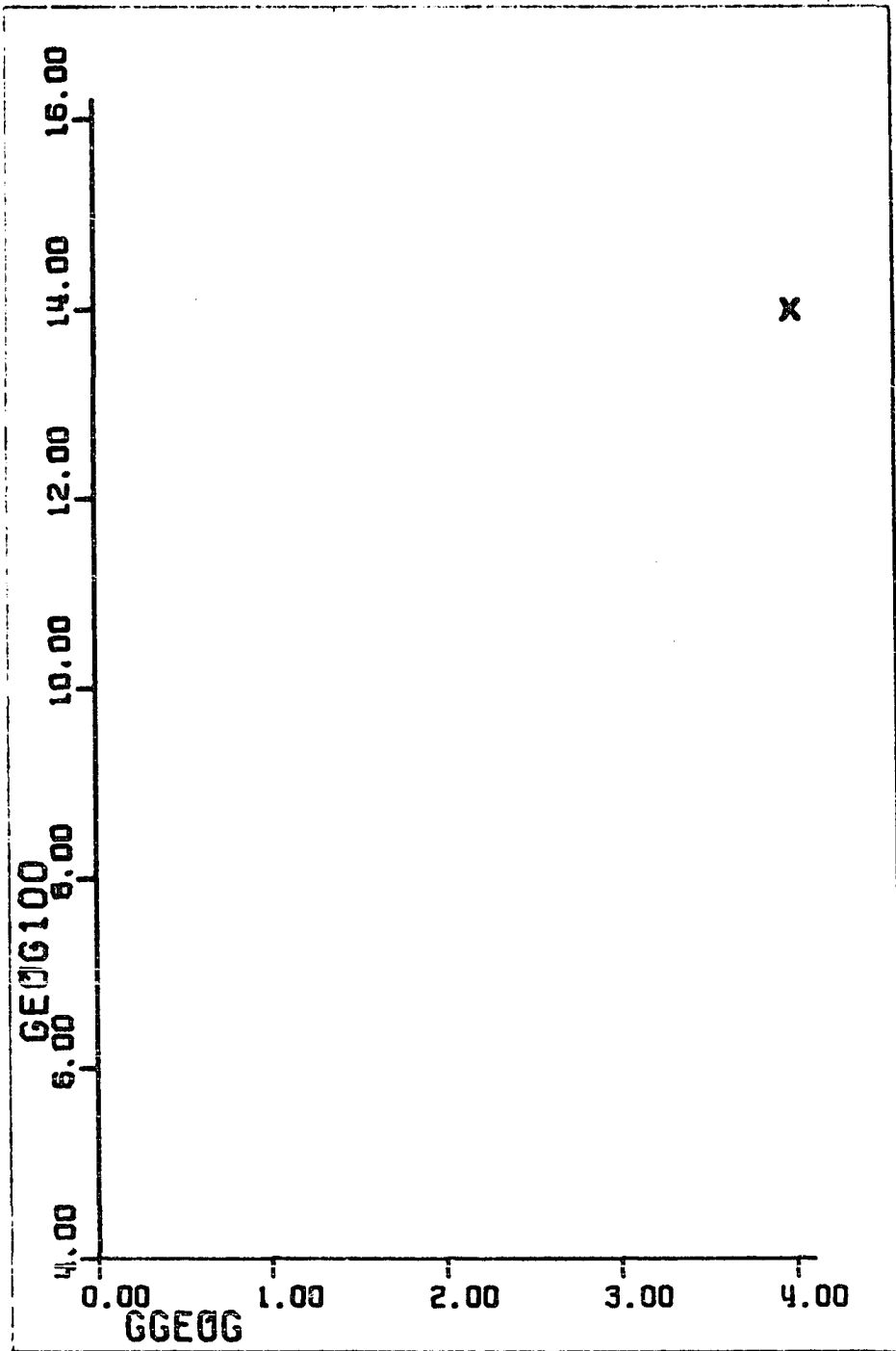


Figure C.4. Textbook readability with grade achieved--Geography 100
(1.00 = 2; 2.00 = 5; 3.00 = 10)

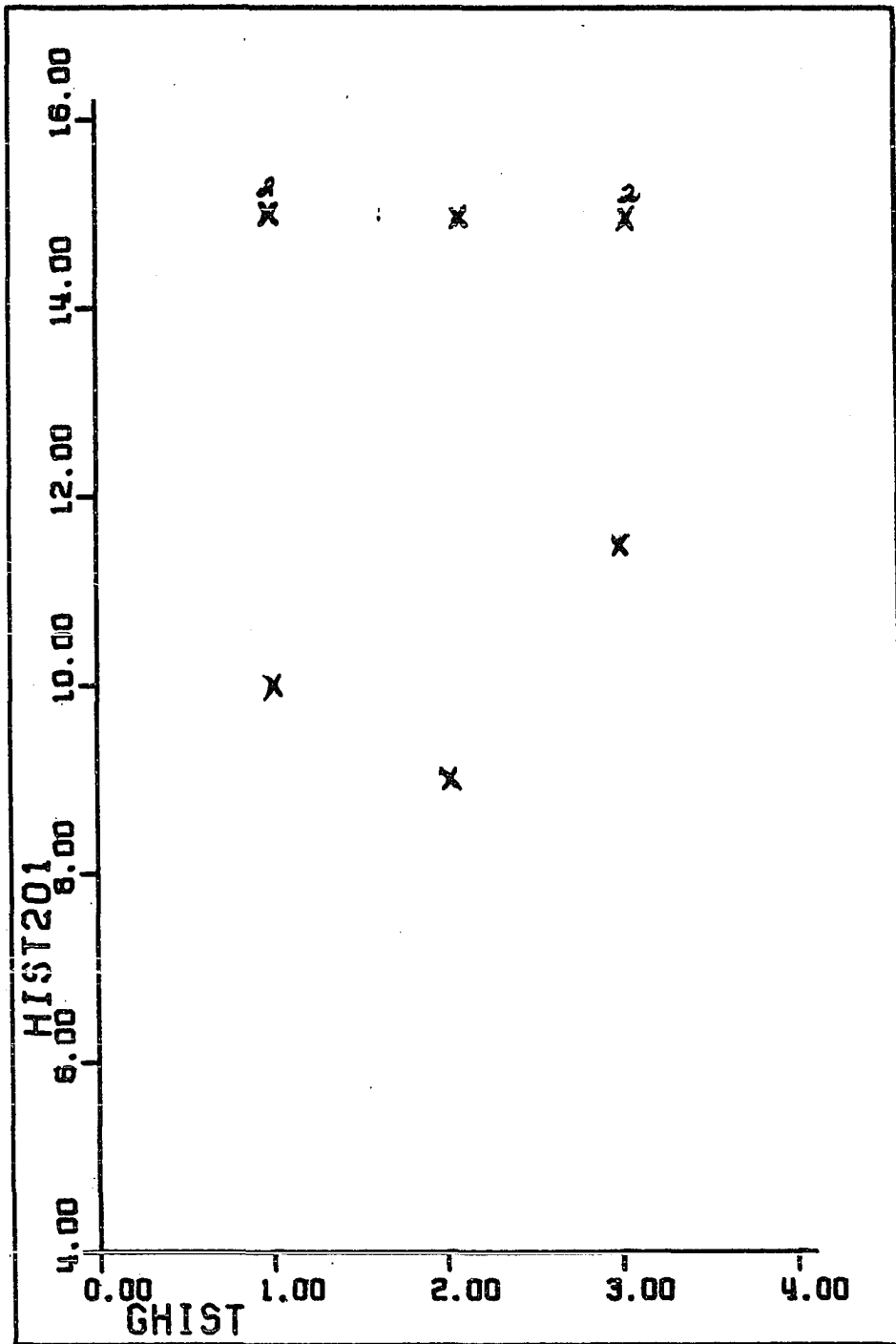


Figure C.5. Textbook readability with grade achieved--History 201

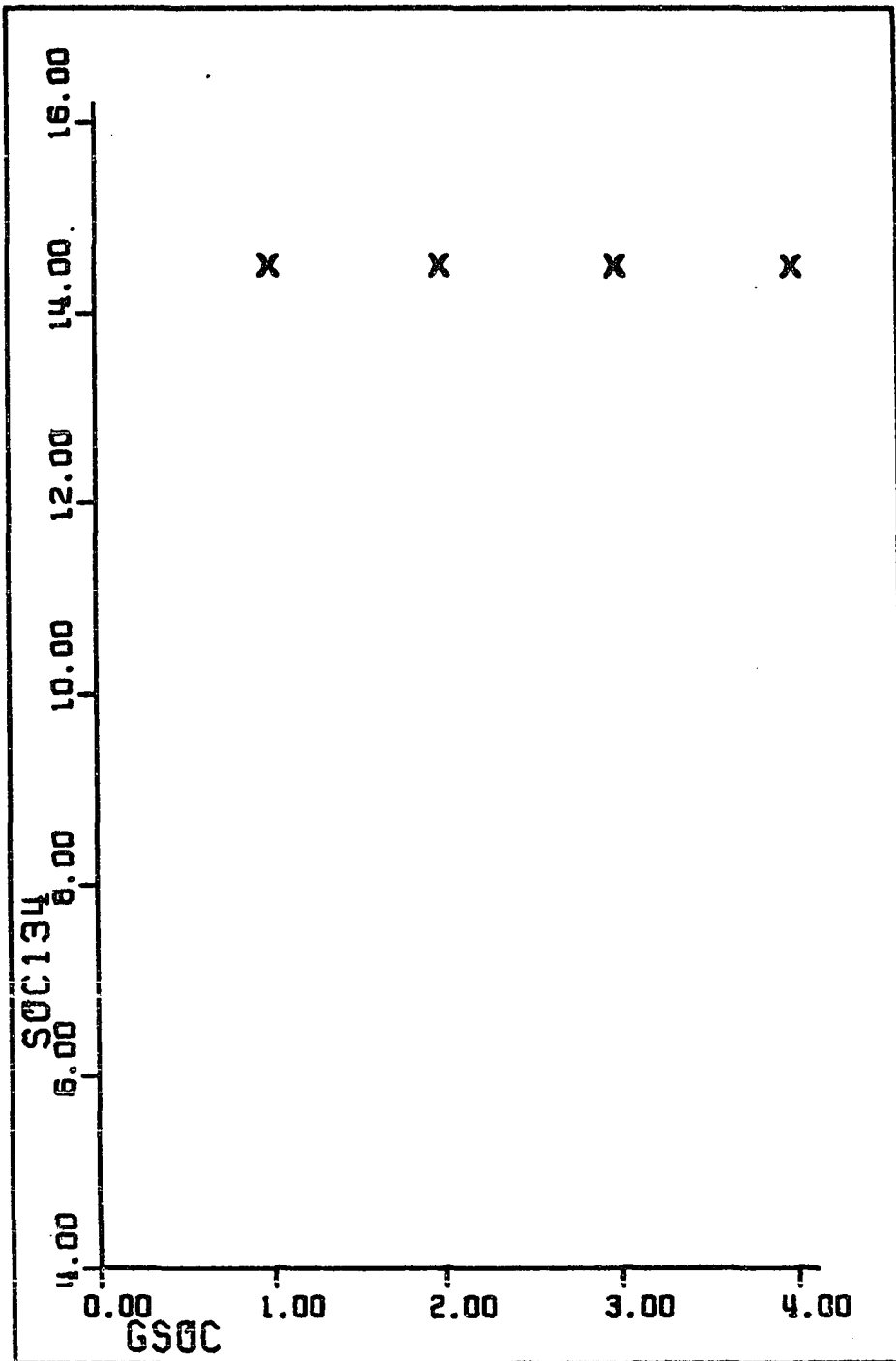


Figure C.6. Textbook readability with grade achieved--Sociology 134
 (0.00 = 2; 1.00 = 6; 2.00 = 11; 3.00 = 11; 4.00 = 3)

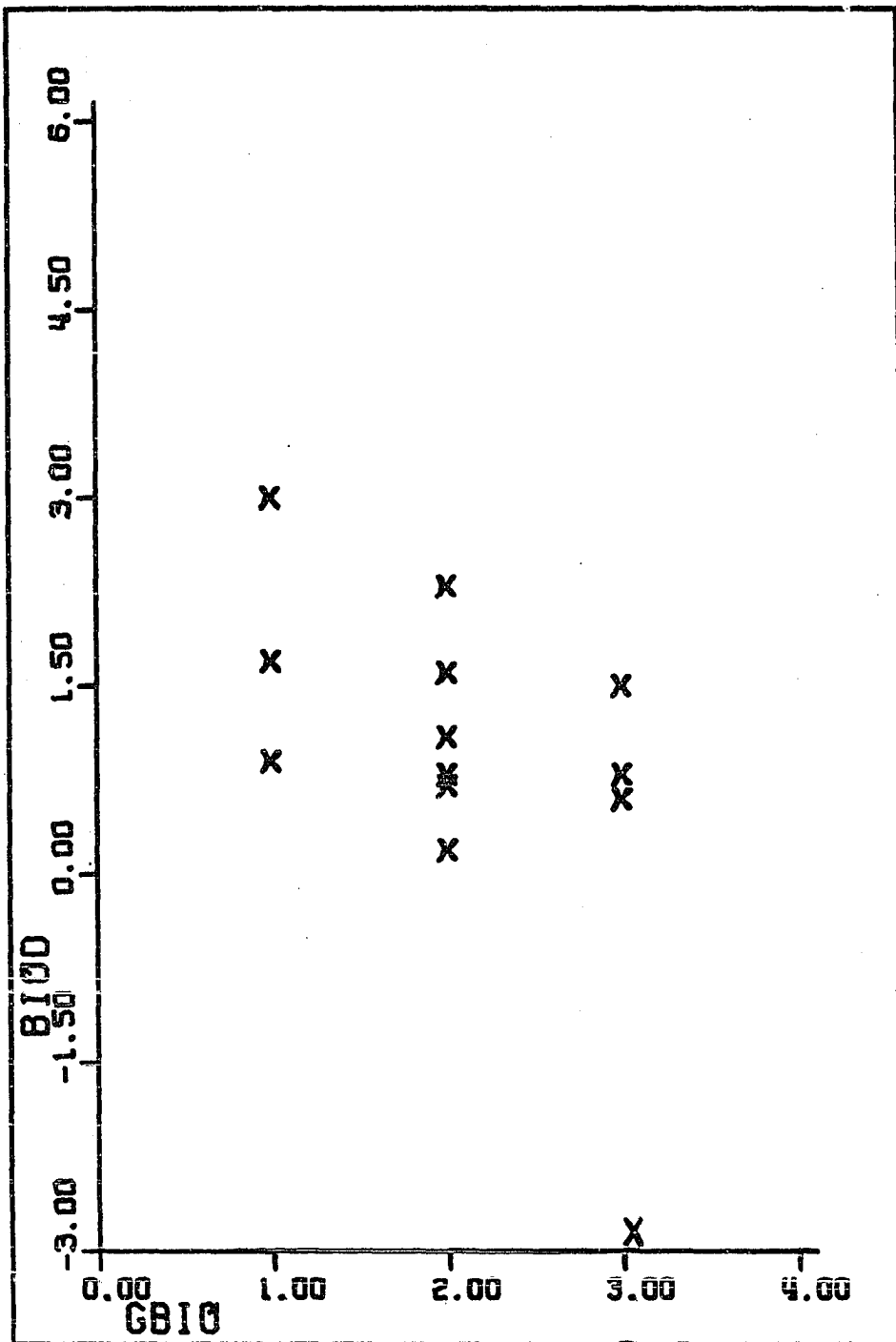


Figure C.7. Discrepancy with grade achieved--Biology 101

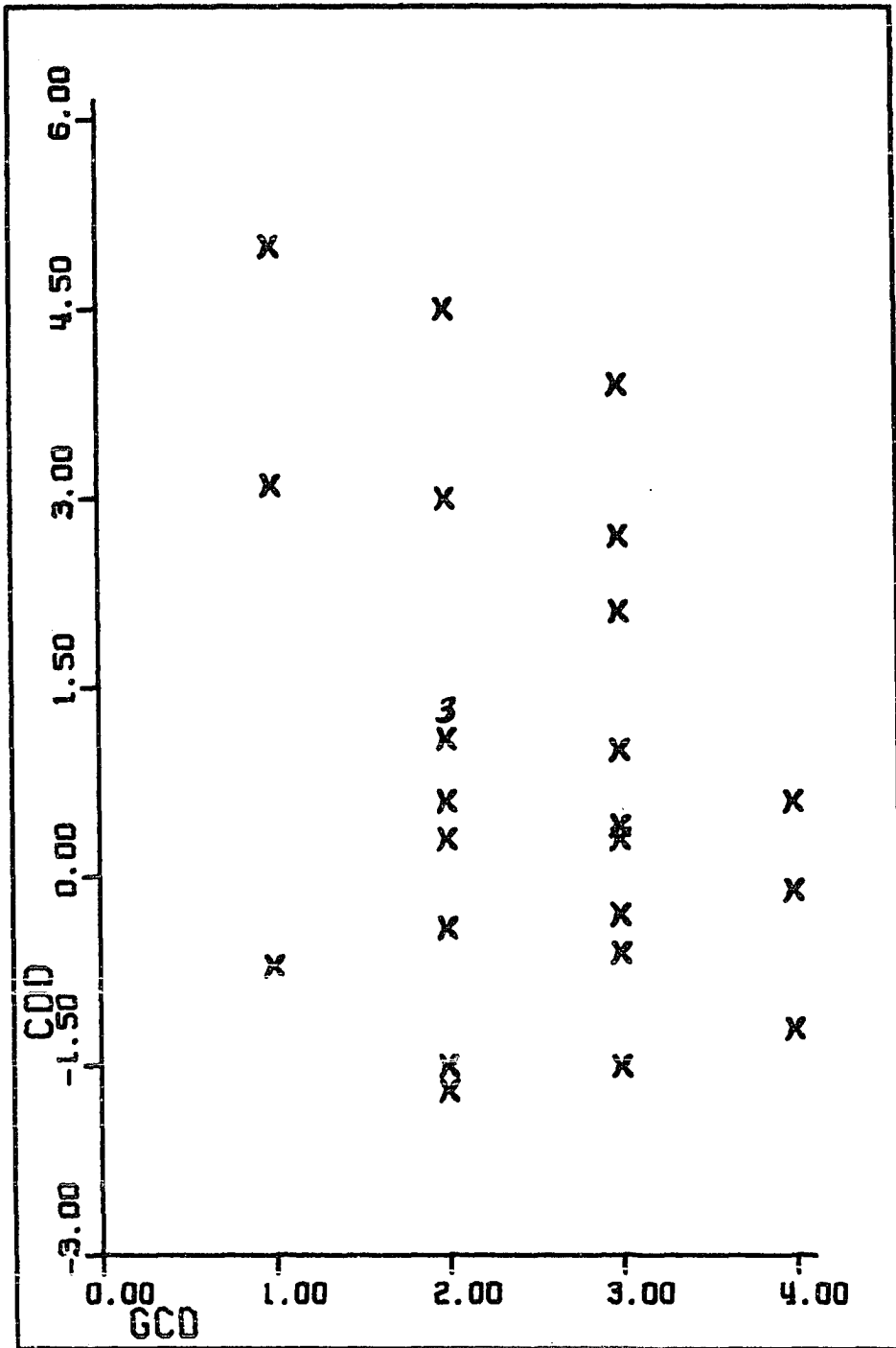


Figure C.8. Discrepancy with grade achieved--Child Development 129

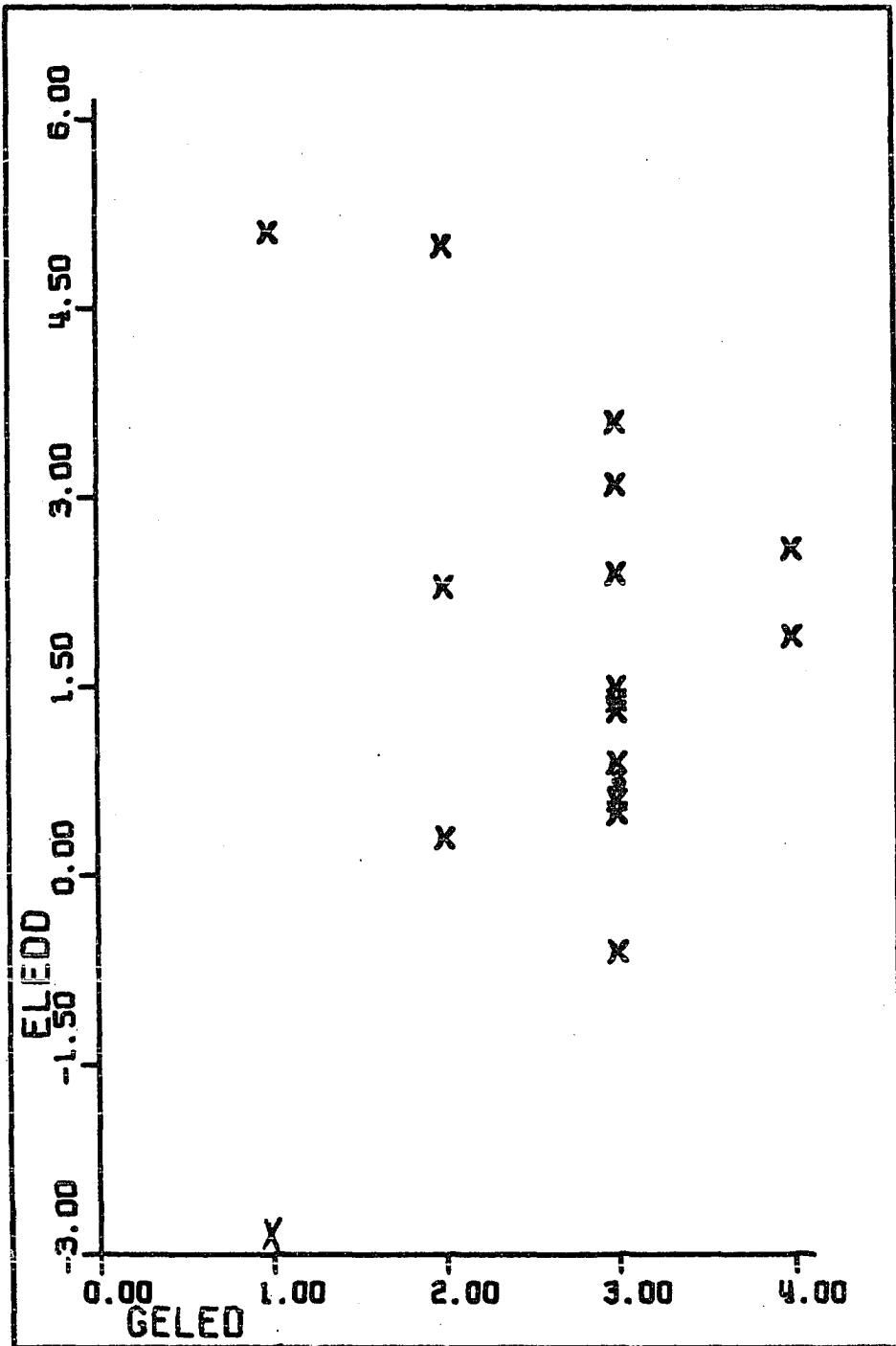


Figure C.9. Discrepancy with grade achieved--Elementary Education 204

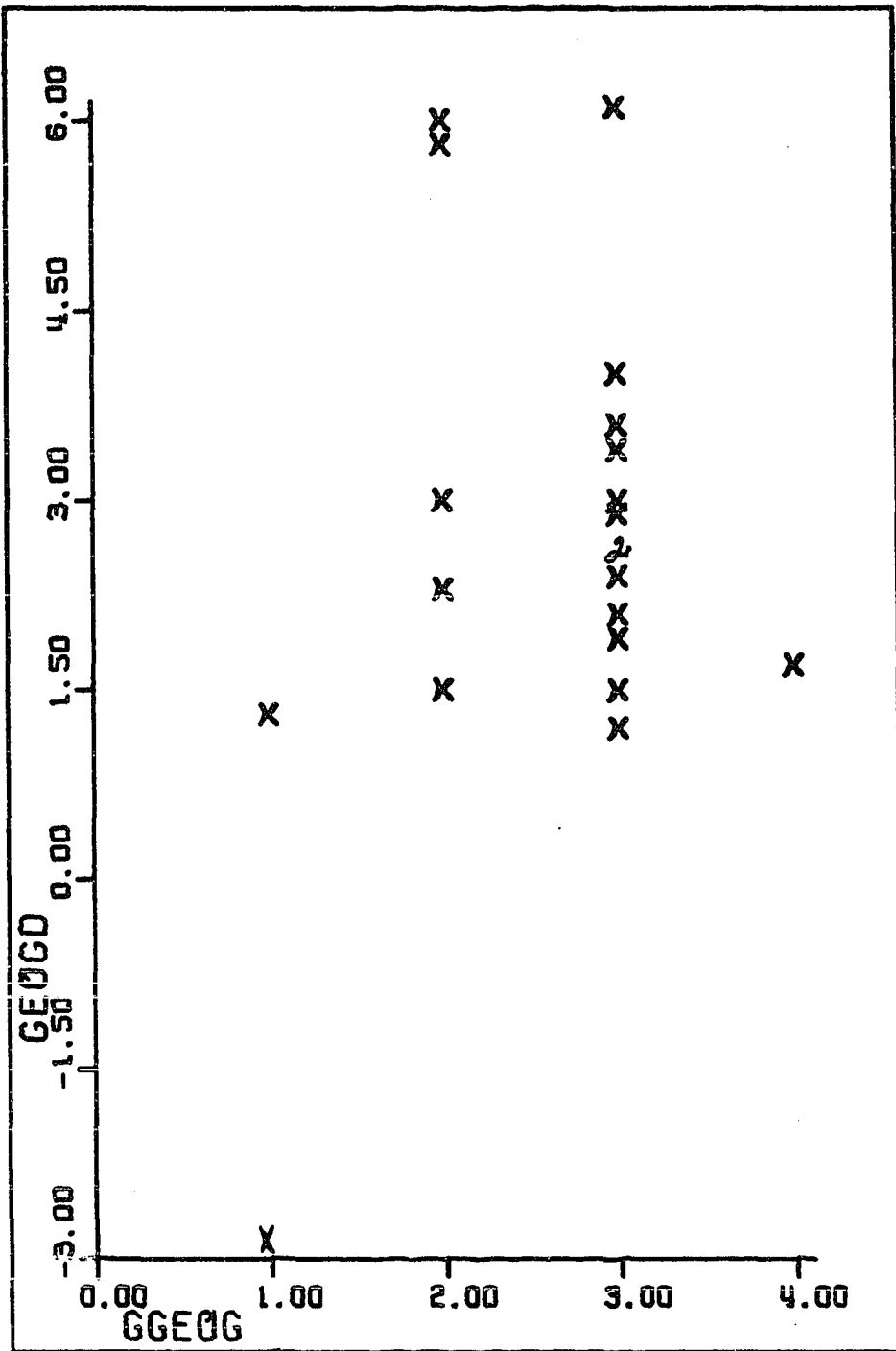


Figure C.10. Discrepancy with grade achieved--Geography 100

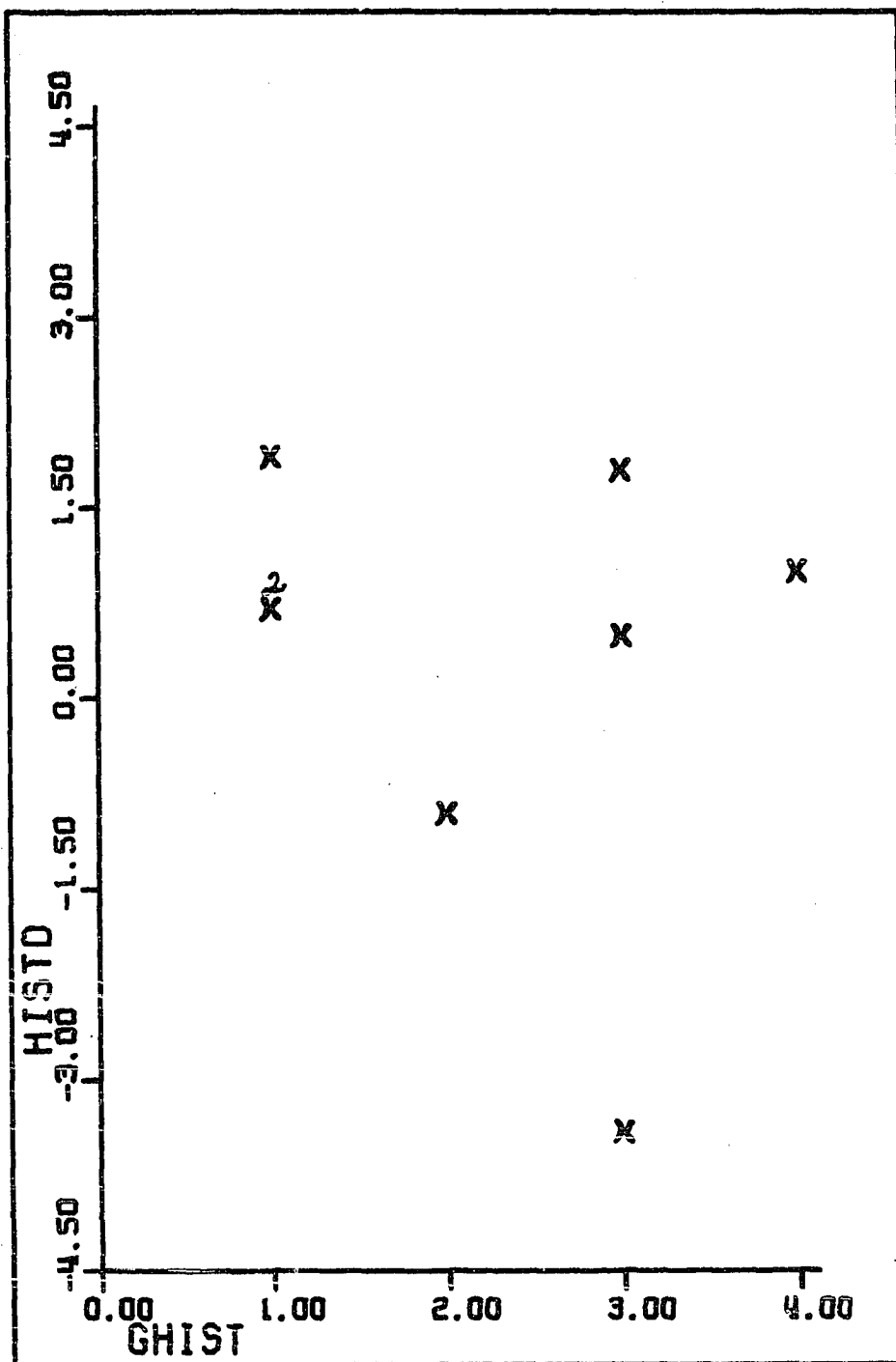


Figure C.11. Discrepancy with grade achieved--History 201

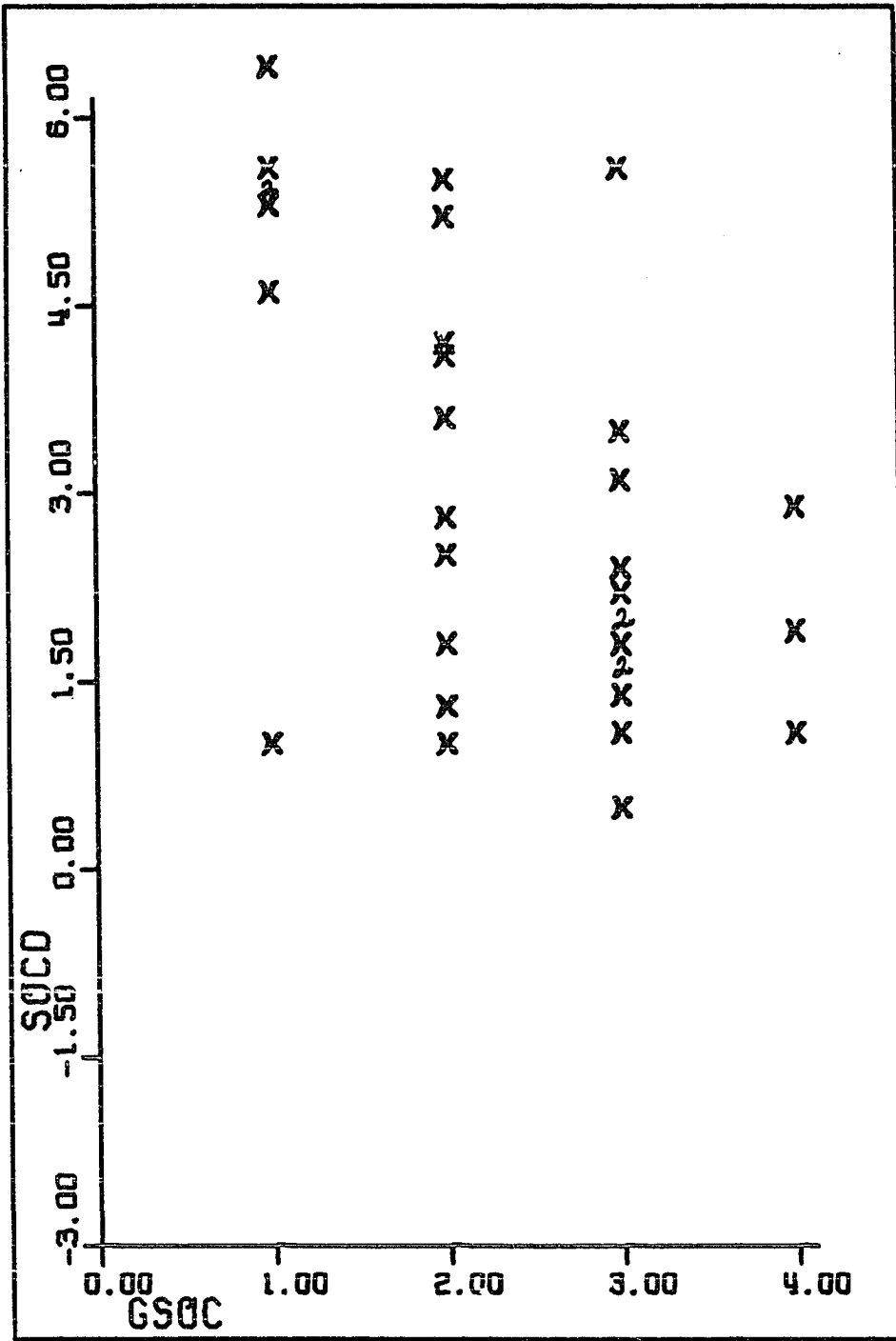


Figure C.12. Discrepancy with grade achieved--Sociology 134