AN EVALUATION OF THE READABILITY AND ACCEPTABILITY OF MATERNAL NUTRITION EDUCATION MATERIALS FOR EXPANDED FOOD AND NUTRITION EDUCATION PROGRAM CLIENTS

By

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ABSTRACT

AN EVALUATION OF THE READABILITY AND ACCEPTABILITY OF MATERNAL NUTRITION EDUCATION MATERIALS FOR EXPANDED FOOD AND NUTRITION EDUCATION PROGRAM CLIENTS

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Written materials are often used in nutrition education in an attempt to increase a client's knowledge. However, often the readability of these materials and the reading level of the population are not assessed and compared. In this study, the subjects were English speaking female Expanded Food and Nutrition Education Program (EFNEP) clients between 18 and 40 years of age. Michigan EFNEP materials (flipchart and handouts) for pregnancy, titled "Eating Right...for Two" (1992) were assessed for reading grade equivalency and other characteristics of readability using a scorecard developed by the investigator. In the preliminary phase of this research, the reading level of a sample of the Michigan EFNEP population was assessed using the Slosson Oral Reading Test (SORT). The readability of the printed materials and client reading level were compared

to determine the need for changes in readability of the materials.

A new flipchart was developed (Client-Adapted Language flipchart) using EFNEP-eligible women's remarks and written at the median reading grade level of the EFNEP women who were involved in the reading level assessment. Several surveys were used to assess client knowledge change and acceptability of materials.

The results of the SORT indicated that the median reading level of a sample of clients was 8.3 grade level equivalency. Survey results indicated that a greater percentage of clients agreed that "Eating Right...for Two" was easier to read and less insulting compared to the Client-Adapted Language flipchart. However, clients who used the Client-Adapted Language flipchart had a significantly greater increase in nutrition knowledge compared to the women who used "Eating Right...for Two." The method of allowing the target audience to produce the wording for their own reading materials might result in more understandable material.

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INTRODUCTION

A. Statement of the Problem

Several studies have indicated that low-income, low-literate individuals are the people least likely to understand the message in written health materials (Freimuth, 1979; Doak and Doak, 1980; Doak et al., 1985; Meade et al., 1989). In a 1985 study, Doak et al. found less than 10% of health-related educational pamphlets were written below a seventh grade reading level. The low-literate adult who reads below the seventh grade level is left with little comprehensible written material on health and nutrition.

Participants in this study will be a sample of the low-income women ages 18-40 who participate in the Expanded Foods and Nutrition Education Program (EFNEP) in Michigan. The reading level of the average EFNEP participant has never been reported and there is no documentation of measurement of the reading grade level equivalent of Michigan's printed EFNEP materials. Preliminary tests by the investigator of written materials ("Eating Right is Basic" and "Eating Right... for Two" flipchart and handouts) have shown a wide variation in readability within the different sections from

grade seven to grade thirteen using a SMOG readability test. By measuring the reading level of a sample from this population and the readability of the written text, it can be determined whether the existing materials for this population are written at the appropriate grade level equivalency. The target population, women in Michigan between the ages of 18 and 40 who participate in EFNEP, will benefit by having access to readable literature to increase their knowledge of nutrition in pregnancy.

B. Research Questions

1. What is the average reading level of a sample of women between the ages of 18 and 40 enrolled in Michigan EFNEP?

2. What is the readability of EFNEP's "Eating Right...for Two" flipchart and handouts?

3. What is the prevalence of characteristics that affect readability (but are not measured by formulas) in "Eating Right...for Two": number of abbreviations, percent white space, font type (Roman serif, Helvetica, etc.), type size (12 pt., 14 pt., etc), type of letters (capital vs. lower case), use of voice (passive vs. active), emphasis on action (positive vs. negative) use of symbols, number of headers used and leading size.

4. Which written materials produce the greatest increase in knowledge of nutrition during pregnancy:

    a) Michigan EFNEP's "Eating Right...for Two?"

    b) Michigan EFNEP's "Eating Right...for Two" rewritten by nutrition-trained researchers using clients' original language and written at the median reading grade level of female EFNEP clients in Kalamazoo County?

5. Which of the two sets of written materials are perceived to be the most informative, acceptable and interesting among female EFNEP clients?

C. Research Objectives

1. To determine the average reading level of women between the ages of 18 and 40 enrolled in the Michigan EFNEP program by using the SORT test.

2. To determine the readability of Michigan EFNEP materials "Eating Right...for Two" flipchart and handouts by using readability formulas.

3. To assess Michigan EFNEP maternal nutrition materials for characteristics that affect readability: number of abbreviations, percent white space, font type (Roman serif, Helvetica, etc.), type size (12 pt., 14 pt., etc.), letter type (capital vs. lower case), use of voice (passive vs. active), emphasis on action (positive vs. negative), use of symbols, number of headers used and leading size.

4. To determine which written materials produce the largest increase in knowledge about nutrition during pregnancy among a sample of female EFNEP clients:

    a) Michigan EFNEP's "Eating Right...for Two"

    b) Michigan EFNEP's "Eating Right...for Two" rewritten by researchers using clients' original language and written at the median reading grade level of EFNEP clients in Kalamazoo County.

5. To determine, by means of two surveys, which written materials are perceived by the EFNEP women as the most informative, acceptable and the most interesting: a or b above.

REVIEW OF LITERATURE

This review of literature is a report of an investigation of research in three major areas. The first portion of this review focuses on literacy and the impact of literacy on nutrition education in low-literate populations. The second section reviews aspects of nutrition education programs with a focus on the Expanded Foods and Nutrition Education Program (EFNEP). Finally, the third portion of this review will address research findings in the area of nutrition during pregnancy.

Literacy

Illiteracy[1] is a complex cultural and social problem that often isolates groups at risk: the poor, those who live in the inner city, recent immigrants, racial or ethnic minorities and high school drop-outs or push-outs (Nitzke, 1989). For many people lacking in literacy skills, illiteracy is just one of many social problems complicating their lives. Others include: illness, large families,

[1] The definition of literacy as used in this dissertation is having the ability to read, write and comprehend text written at the fifth grade level.

immobility, inadequate housing, joblessness, low self-esteem, high degree of welfare dependency and a general sense of powerlessness (Harman and Hunter, 1979; Nitzke, 1989). This portion of the review of literature will look at several aspects of literacy and the relationship between literacy and health and nutrition education materials including: formulas used to measure the readability of text, considerations and concerns of using readability formulas, factors not measured by formulas that might affect the reader's ability to comprehend text, the problems of unreadable health education materials and guidelines for producing readable text.

Harman (1987) suggests that three types of data need to be looked at when describing the literacy levels of a group of people: the results of national surveys on literacy and functional literacy[2], the results of readability studies done on similar groups of people and the average grade level completed in school. The most widely used data on American literacy was collected by the U.S. Census Bureau (1986) and suggest that 13% of Americans above the age of 20 are illiterate (Harman, 1987).

One investigation of the prevalence of illiteracy in the U.S., known as the Adult Performance Level (APL) Study,

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[2] The definition of functional literacy as used in this dissertation is having the abilities of basic reading and writing needed to obtain and use information to solve problems of everyday life.

was a joint project of the University of Texas and the U.S. Office of Education (Kazemek, 1985). This four year study of 10,000 people showed that over 3,000 of these adults could not follow instructions, could not comprehend graphs or bar charts and would need to read at the tenth grade level to understand the directions on a bottle of aspirin (Doak et al., 1985). Nearly 33% of the test population lacked the ability to fill out job applications, address envelopes or use a telephone directory and were, therefore, labeled functionally illiterate (Harman, 1987).

According to Doak and Doak (1980), in the future education will play an increasing role in health maintenance. If we are to improve health for the population as a whole, we must pay particular attention to individuals with low literacy skills. Mohammed (1964) reported that the well-informed adult generally participates in self-care more effectively than the poorly-informed individual. Written materials are often used to attempt to increase a client's knowledge, but the effectiveness of the materials depends upon the suitability of the reading level for that particular individual (Mohammed, 1964). Readability formulas can serve as tools to assess the reading level required for comprehension of written materials, so information can be more effectively communicated to the client.

In the past, reading competency has been assessed by

equating it with the last grade of school completed (Doak and Doak, 1980). However, a study by the National Tuberculosis Association in 1956 showed little correlation between education levels claimed by adults and actual reading ability (Mohammed, 1964). The results of this study indicate that even if printed material were rated by grade level, the problem of matching the reader to the appropriate material would remain.

Readability formulas for assessing text reading difficulty

Readability is often measured by one of over 40 different formulas for assessing the degree of difficulty of reading material. Some of the more widely used formulas are outlined below.

Lorge test Lorge (1939, 1948) was the first investigator to base a readability formula on the McCall-Crabbs Standard Test Lessons in Reading (McCall and Crabbs, 1925). Originally, these passages were not designed to be used with readability formulas, but were convenient for this use because they were already graded for difficulty by the authors on the basis of comprehensibility of the questions at the end of each passage. Lorge designed his formula for children in grades three to twelve and used the criterion of 50% correct answers to the questions following a passage of the McCall-Crabbs test. After counting independent

variables in each passage, Lorge used multiple regression to correlate the variables with grade level (R=.77) and derive a formula. Lorge's sequence of steps for formula development became very popular and similar steps were used by Flesch (1948), Dale and Chall (1948) and SMOG (1969).

The procedure for using the Lorge test contains the following steps (Lorge, 1948):

a) Choose a random sampling of paragraphs from the text to be tested (3 to 5 for an article, 25 to 30 for a book).
b) Count out the first 100 words in each sample.
c) Calculate the average sentence length in words for the 100-word samples.
d) Count the number of prepositional phrases per 100-word sample.
e) Count the number of words in each sample that are outside the Dale list of 769 words (Dale, 1931).
f) Calculate the final score.

Grade Level = .06 x (average sentence length in words) + .10 x (number of prepositional phrases per 100 words) + .10 x (number of words outside the Dale list of 769 words per 100 words) + 1.99

Flesch test Grade level measurement that estimates the reading difficulty of written material was used by Flesch in his 1943 formula which he revised in 1948. He established the Flesch formula based on the measurement of two components of comprehensibility: reading ease and human interest of the passage. By measuring human interest factors, Flesch was testing the conversational quality of the passage (Flesch, 1948). Other researchers had been critical of the human interest factor in his 1943 formula,

claiming that this portion of the equation diluted the value of the result (Klare, 1988). Therefore, in 1948 Flesch separated his formula into two different equations, one for measuring reading ease and another for determining human interest. Based on the McCall-Crabbs Standard Test Lessons in Reading, the reading-ease formula predicts the average grade level of a child who could answer correctly 3/4 of the test questions asked about a given passage.

According to Flesch (1948) the procedure could be completed in six minutes:

a) Choose a random sampling of paragraphs from the text to be tested (3 to 5 for an article, 25 to 30 for a book).
b) Count out the first 100 words in each sample.
c) Count the syllables in each 100 word sample.
d) Calculate the average sentence length in words for the 100-word samples. It might be necessary to count 95 or 105 words to make complete sentences near 100 words.
e) Figure the number of personal words per 100 word sample. Include: all pronouns referring to people, all words with masculine or feminine gender, and the words people or folks.
f) Figure the number of personal sentences per 100 sentences in all of the samples. Include: spoken statements, questions, commands, requests, exclamations and grammatically incomplete sentences whose full meaning is hidden in the text.
g) Calculate the final score.

Reading ease = 206.835 - .846 x (word length) - 1.015 x (sentence length)

Human interest = 3.635 x (no. of personal words) + .314 x (no. of personal sentences)

Table 1: Flesch Reading Ease Scores

Reading Ease Score	Grade Level
90-100	5
80-90	6
70-80	7
60-70	8 and 9
50-60	10 to 12
30-50	13 to 16
0-30	college grad

A low score of zero is interpreted as virtually unreadable text for the average reader or as text with no human interest, whereas, a top score of 100 indicates that a passage is easy-to-read (at the fifth grade level) or the text is full of human interest (See Table 1).

According to Flesch (1948), the point value of 100 corresponds to the prediction that a person who has completed the fourth grade would be able to answer 3/4 of the test questions. This person is barely literate according to the U.S. Census Bureau (Harman, 1987), therefore, even text with a score of 100 might be a struggle for the poor readers. The Flesch formula is valid for use in assessing news reports, adult education materials, government publications (Pichert and Elam, 1985), psychology textbooks and advertisements (Flesch, 1948). The Flesch test has recently been used in computer software programs for readability measurement, such as Grammatik III

(Reference Software, Inc., 1989) or Rightwriter (Que Software, Inc., 1992). According to Klare (1974), the Flesch formula has become the most widely used formula in the history of readability measurement.

Dale-Chall test Dale and Chall developed a formula for use with general audiences after they reviewed the relation of the various elements of reading difficulty: word length, sentence length, percent of personal words or personal sentences, the number of syllables, number of affixes, number of prepositional phrases and the proportion of difficult words mentioned in word lists (Spache, 1953). They found that the best predictors of reading difficulty are the number of difficult words and the average sentence length.

These researchers developed a word list of 3,000 words known by 80% of American fourth graders. According to Dale and Chall, the reason for the development and use of the larger word list was to increase the discrimination of the formula at higher grade levels (above grade eight), so the formula could be used with high school as well as children's texts. Like Lorge before them, Dale and Chall used 50% correct on questions from the McCall-Crabbs Standard Test Lessons in Reading as the criterion on which to base their formula (Dale and Chall, 1948). The procedure consists of the following steps (Dale and Chall, 1948):

a) Choose a random sampling of paragraphs from the text to be tested (3 to 5 for an article, 25 to 30 for a book).
b) Count out the first 100 words in each sample.
c) Calculate the average sentence length in words for the 100-word samples.
d) Count the number of hard words (all words not on the Dale list of 3,000 words) in each sample.
e) Calculate the final score using the equation below.

Reading Grade Score = .1579 x (number of words outside the Dale list of 3,000 words) + .0496 x (average sentence length) + 3.6365

The interpretation of the reading grade score can be found in Table 2. The multiple-correlation coefficient of the two formula variables (sentence length and number of difficult words) with the criterion is .70. Dale and Chall (1948) report that if they add the Flesch human interest factor, the correlation coefficient rises only to .7025, a negligible increase.

Table 2: Dale-Chall Reading Grade Scores

Formula Score	Grade Level
4.9 and below	4 and above
5.0-5.9	5 to 6
6.0-6.9	7 to 8
7.0-7.9	to 10
8.0-8.9	11 to 12
9.0-9.9	13 to 15
10.0 and above	16 and above

Gunning-Fog In 1950, Robert Gunning developed a readability formula using sentence length and difficulty of vocabulary as factors of readability (Gunning, 1968). The procedure for using the formula includes the following steps:

a) Take 3 samples of approximately 100 words each. Count to the end of the last complete sentence and note the exact number of words in each passage.

Laubauch and Koschnick (1977) suggest avoiding sampling of titles, headings, vertical lists and dialogue unless it is typical of the content of the text.

b) Divide the number of words by the number of sentences and round to the nearest tenth. This is the average sentence length.
c) Count the total number of hard words in each sample. A hard word is defined as any word of 3 or more syllables excluding proper names, numerals, initials, acronyms, abbreviations or two syllable words with the endings: s, es, ed, er, est, ly.
d) Calculate the percentage of hard words.

$$\text{Fog index} = (\text{percent hard words} + \text{average sentence length}) \times 0.4$$

According to Laubauch and Koschnick (1977), this formula was developed for use with adult materials. Today it can be found in several computer software programs designed to measure readability such as Rightwriter (Que Software, Inc., 1992) or Grammatik III (Reference Software, Inc., 1989).

Spache test Like Dale and Chall, Spache chose average sentence length as a predictor of reading difficulty (Spache, 1953). He used also the Dale list of 769 words, judging all words outside the list as hard words. Spache (1953) developed an equation using multiple regression techniques which determined the combination of these two factors needed to estimate reading grade level. The procedure for this test is as follows (Spache, 1953):

a) Choose a random sampling of paragraphs from the text to be tested (3 to 5 for an article, 25 to 30 for a book).
b) Count out the first 100 words in each sample.
c) Calculate the average sentence length in words for the 100-word samples.
d) Count the number of hard words (words outside the Dale list of 769 words) per 100-word sample.
e) Calculate the final score using the equation below.

Grade level of text= .141 x (average sentence length per 100 words) + .086 x (words outside the Dale list of 769 words) + .839

An answer of 2.3 would designate a text equal in difficulty to a level of second grade, third month. When using this formula there is no need for a table to interpret the results.

Spache (1953) reports that the multiple-correlation coefficient obtained by combining sentence length and percent of hard words to predict grade level of texts is .818, one of the highest correlations found between a readability formula and the criterion. According to Klare

(1974), the Spache formula is valid for use with children's materials for grades one to three, but has not been validated for use with higher reading level materials.

Fry graph With the publication of the Fry graph in 1968, readability formulas became available to greater numbers of people (Vaughan, 1976). The Fry graph (Appendix A) permits a direct estimate of reading grade level using two variables: number of syllables per 100 words and sentence length, but avoids time consuming formula calculations (Klare, 1988). According to a University of Arizona Study, the Fry scores consistently agree with those of the Dale-Chall formula (Vaughan, 1976), but the Fry formula has the advantage of being more simplistic (Fry, 1968). Both tests are based on prediction criteria of 50-70% comprehension at the grade level scored (Vaughan, 1976) and Fry reports accuracy within a grade level (Fry, 1968). The procedure for using this formula is as follows (Fry, 1968):

a) Select three 100 word passages from the beginning, middle and end of the text, skipping all proper nouns.
b) Count the total number of sentences in each 100 word passage to the nearest tenth of a sentence. Average these three numbers.
c) Count the total number of syllables in each 100 word sample. Average the total number of syllables for the three samples.
d) Plot on the Fry graph (See Appendix A) the average number of sentences per 100 words and the average number of syllables per 100 words. The graph will identify the grade level of reading difficulty.

Due to its simplicity and accuracy below the sixth grade level, the Fry formula is used by the Adult Performance Level Project and Literacy Volunteers of America, Inc. to evaluate written text (Laubach and Koschnick, 1977).

SMOG According to McLaughlin (1969), the SMOG readability test is simpler and easier to use than the Fry graph. Freimuth (1979) listed the advantages of this procedure as being useful for a general audience, applicable without a computer, only a two variable equation and no word list is required. The procedure for using this formula is written below (McLaughlin, 1969):

a) Count ten consecutive sentences near the beginning of the text, ten near the middle and ten near the end. Use these three samples for reading assessment.
b) Count every word (in the 30 sentences) of three or more syllables.
c) Estimate to the nearest whole number, the square root of the number of polysyllabic words counted.
d) Add three to the approximate square root. This gives you the SMOG grade, which is the reading grade that a person must have reached to understand the text.

SMOG grade = 3 + the square root of the number of polysyllabic words

The author of this test reports that this formula will predict the reading grade level of a text correctly within one and one-half grades in 68% of the cases. It takes only nine minutes to derive a SMOG grade based on a sample of 600 words, whereas, it takes the same time to find a Dale-Chall

prediction using a sample of only 100 words or a Flesch score based on two 100-word samples (McLaughlin, 1969).

Freimuth (1979) reports that the SMOG formula was tested on 64 university students using eight 1000-word passages from a variety of periodicals. After reading the passages, each student was tested for unaided recall to measure comprehension. After the scores were controlled for speed-reading, a perfect negative correlation was found between polysyllabic word counts and the measures of reading efficiency.

Published in 1969 by McLaughlin, the easy-to-use SMOG formula produced scores that did not agree with the results of the Fry graph or the Dale-Chall test. A University of Arizona study (Vaughan, 1976) found that SMOG grades tended to be two grades higher than the results of either the Fry graph or the Dale-Chall test. However, results of a Spearman rank correlation clearly show that the three formulas are highly correlated. Vaughan (1976) reported that there are differences in what the tests predict. The Dale-Chall and Fry tests are based on prediction criteria of 50-70% comprehension at the grade level scored, whereas, the SMOG formula is based on a predictive criterion of 90-100% comprehension at the grade level scored.

Table 3: Characteristics of Readability Formulas

Formula	Year	Variables Measured[1]	Criterion[2]	Required word list
Lorge	1939	sl, pp, dw	50% correct	yes
Flesch Reading-ease	1948	wl, sl	75% correct	no
Dale-Chall	1948	dw, sl	50-70% correct	yes
Gunning-Fog	1950	dw, sl	not reported	no
Spache	1953	dw, sl	not reported	yes
Fry graph	1968	sy,sl	50-70% correct	no
SMOG	1969	psy	90-100% correct	no

1. The variables measured are abbreviated as follows: sl=sentence length, wl=word length, pp=number of prepositional phrases, dw=number of difficult words, pw=number of personal words, ps=number of personal sentences, sy=number of syllables and psy=number of polysyllabic words.

2. The criterion used for all formulas in the table is a percentage of correct answers on the McCall-Crabbs Standard Test Lessons in Reading.

Therefore, if a text is given a Fry score of fifth grade at a 50-70% comprehension level and a SMOG grade of 7 at a 90-100% comprehension level, both reading grades might be correct. SMOG grades might disagree with the Fry graph and the Dale-Chall test but they are not inaccurate (Vaughan, 1976).

Cloze Procedure This test is not a formula, but the results are known to conform to the results of the Flesch test and the Dale-Chall test for estimating readability (Taylor, 1953). The procedure requires deleting every fifth word in a passage and asking respondents to fill in the deleted words. The percentage of exact replacements is considered to be the readability score (Farkas et al., 1987). Taylor (1953) reported that to be successful at filling in the blanks, the reader must know the meanings of different combinations of letters and not just recognize words. This procedure is commonly used and takes into account factors that other formulas ignore, such as previous knowledge or confusing sentence structure (Taylor, 1953). Taylor cautions it is necessary to strike out enough words when using this test so that the blanks will represent proportionately all kinds of words to the extent that they occur.

The Cloze test is superior to the use of multiple choice exams because multiple choice questions that are related to the passage being measured, are highly subjective and the number of questions possible for a 150-word passage is less than the 30 blanks allowed by the Cloze procedure (Sticht, 1975). Sticht reports also that because the Cloze test has consistently shown high correlations with multiple choice exams, it is a valid measure of reading comprehensibility. Pichert and Elam (1985) recommend the

use of the Cloze Procedure for measuring the readability of health related materials.

Considerations and Concerns of Using Readability Formulas

Various researchers have offered the following suggestions for consideration when using readability formulas (Klare, 1974; Freimuth, 1979; Klare, 1988; Zakaluk and Samuels, 1988):

* Remember that different formulas give different grade level scores based on different percentage levels of comprehension for the same piece of text. Know what the formula is measuring.

* Use a formula only as a screening device.

* Choose a formula with two variables, one greatly decreases predictiveness and three are very time consuming to measure.

* Formulas are poor predictors at high grade (college) levels.

* Be aware of other variables that might affect comprehension (motivation, previous knowledge, etc.) that a formula does not measure. For example, variables such as previous knowledge can be tested by administering exams, whereas, motivation might have to be estimated by using a Likert scale or might have its effects limited by use of a randomized population.

* Formulas do not indicate how to write for maximum comprehension.

Although readability formulas are as popular as ever (Fry, 1988), Pichert and Elam (1985) caution that the use of readability formulas should be controlled by three criteria:

a) The formulas should be supplemented by other means of judging the quality of the printed material.

b) The readers for whom the text was intended should be similar to those on whom the formula was validated.

c) The text to be assessed should have been written without reading ability formulas in mind.

Pichert and Elam (1985) added that educators cannot assume that a patient can understand a text just because its readability score matches the reader's grade level. Prior knowledge and motivation of the reader can affect comprehension of the material.

Many formulas (Flesch, Fry, SMOG, Dale-Chall, Lorge) are based on the McCall-Crabbs test lessons. These tests were poorly standardized on a small group of New York City school children (Stevens, 1980; Zakaluk and Samuels, 1988) and were designed only as practical exercises in reading (Pichert and Elam, 1985), not as a criterion for formulas. Grade scores of the passages and questions were determined by matching scores with student performance on the Thorndike-McCall Reading Scales Performance Test. Despite the shortcomings of the test lessons, until a more valid criterion is proposed, the McCall-Crabbs Test Lessons in Reading are the best criterion available (McLaughlin, 1968).

Irwin and Davis (1980) list other shortcomings of reading formulas, admitting at the same time that no other good replacements are available. Formulas do not examine: the relationship between the reader's background and the

difficulty of the text, the new ways in which concepts are introduced, and the motivation or the organization of the material.

In addition to the general problems that accompany formula use, many formulas have specific drawbacks. The Dale-Chall formula uses a list of 3,000 words that are familiar to fourth graders, but are words unfamiliar to fourth graders necessarily the same words that are unfamiliar to adults (Pichert and Elam, 1985)? Many of the formulas have not been validated on groups of low-literate adults and might not allow for differences in socio-economic status. The Fry test has been validated on tenth grade students and novels they had read in English class, whereas, the SMOG test was validated on University students using adult periodicals (Pichert and Elam, 1985). However, the Flesch formula is one of the equations that has been validated using adult education materials among other written works.

Although readability formulas are not perfect predictors of reading difficulty of text, they do have several advantages over other comprehension tests. Written comprehension tests can be very time consuming and require a willing population, whereas, readability formulas can be applied straight to a text, are quick, easy-to-use, widely recognized, highly reliable and valid for use with a specific population or particular materials. According to

Klare (1974), formulas have their maximum predictive validity when used for the purpose for which they were designed. The applicability of the formula lies with the user who must understand how the formula was developed, what it measures and to what degree of accuracy the grade level is predicted to correctly understand the results.

Measuring the reading levels achieved by the individual

The Slosson Oral Reading Test (SORT) This test attempts to measure reading achievement and was designed to be administered individually (Slosson, 1963). It is based on the ability to verbalize written words at increasing levels of difficulty. An individual is given a list of twenty words at a known grade level to read (Appendix B). He/she pronounces the words on the list to the best of his/her ability and then advances to the next grade-level list until he/she finishes the high school level list. An error is made if a word is mispronounced, omitted or takes more than five seconds to pronounce. The raw score is the total amount of words pronounced correctly, whereas, the reading level is half of the raw score divided by ten. For example, if an individual pronounced 42 words correctly and, therefore, had a raw score of 42, then his/her reading level would be 2.1 or second grade first month.

This test was validated using the Standardized Oral

Reading Paragraphs (Gray, 1960) and a correlation coefficient of .96 was obtained. Slosson claims that this test can be given to an individual and scored in less than three minutes.

Factors affecting readabilty that are not measured by formulas

The purpose of readability formulas is to give an indication of the reading grade level of a text in order to match the text with the ability of the student (Lorge, 1939). Used alone, however, the formulas are not sufficient for assessing readability (Farkas et al., 1987). Emphasis should not be placed on sentence and syllable length without considering the impact of variables such as: background knowledge, motivation and other meanings which might be derived from the material (Pichert and Elam, 1985).

Background knowledge Research by Recht and Leslie (1988) showed that previous knowledge can greatly increase the amount of information recalled from a passage and can even compensate for poor reading ability. In an investigation of the effect of prior knowledge on recall of information, 64 seventh and eighth graders were tested for their knowledge of baseball and ability to read a passage about a series of plays in an inning. The students were

divided into four groups: good readers with good knowledge of baseball, good readers with poor knowledge of baseball, poor readers with good knowledge of baseball and poor readers with poor knowledge of baseball. Good readers were defined as students who scored above the 70th percentile and poor readers scored below the 30th percentile on the Scientific Research Association Achievement Comprehension Test (SRA Achievement Series, 1971).

Students were asked individually to read a fifth grade level passage about an inning of baseball, then complete the following three tasks. First of all, they were to move figures around a board to demonstrate the action about which they had just read. After the reenactment, students were asked to summarize the text in their own words and thirdly, they were to rank 22 sentences according to their importance to the main ideas of the passage. Students were given points for each piece of information recalled correctly. The researchers found greater recall scores of high knowledge readers compared to low knowledge readers ($p<0.01$). The reading ability of the students had no significant effect on recall in this study.

In a similar study, (Taylor, 1979) evaluated the recall of two groups of third and fifth grade children after reading two passages. One passage was about a topic familiar to all students, whereas, the second passage was about an unfamiliar subject. The group of poor readers

consisted of third and fifth graders reading at the third grade level and the good readers were the children from either grade who were reading at the fifth grade level. Regardless of reading level, all groups recalled more details from the familiar passage than from the unfamiliar one with good readers recalling more information than poor readers from both passages. Taylor concluded that poor readers' comprehension suffers the most when background knowledge is low.

Zakaluk and Samuels (1988) reviewed various research articles that investigated the role of background knowledge in reading retention. They found some similar results among the studies:

a) Subjects familiar with a topic recalled more ideas from the text than students unfamiliar with the topic.

b) Well written text signals to the reader what background knowledge must be used to process the information.

c) Readers are able to construct meaning from background knowledge which allows them to make inferences and fill in missing ideas when a lapse in recall of the text occurs.

Motivation Motivation to read a piece of text can increase reading comprehension. When a reader's interest is high, the text might become more comprehensible to the reader. For example, a fifth grade reader and avid football fan might willingly read and comprehend details in a seventh grade level book about the Detroit Lions, but not understand

a word of his fifth grade level science text. As motivation to read increases, readability formulas tend to overestimate the difficulty of the text and when interest is low there might be underestimation (Pichert and Elam, 1985). Fry (1964) adds that a highly motivated student might have the interest to work through some very difficult material, whereas, Nitzke (1986) warns that even simple, readable language cannot make up for a boring topic. After examining 36 experimental studies of the effect of different variables upon reading comprehension, Klare (1976) concluded that motivation can sometimes override the effect of readability on comprehension. Therefore, raising motivation and keeping it high are extremely important factors in teaching.

Klare (1976) found also that gain attributed to improved readability was greater for a topic lower in interest value than for one higher in interest value. This finding is due to the observation that interest increases readability without changing the reading difficulty of the text. Klare concluded that it is more worthwhile to improve the readability of low-preference material compared to high-preference material.

Underlining The technique of underlining words or phrases is often used to aid in the recall of information for low-literate reader (Doak et al., 1985), but has been shown to have only a limited effect on retention. Johnson

(1988) conducted a study to investigate the usefulness of underlining. Two groups of below average college freshman (those first year students who scored below the 16th percentile on the Nelson-Denny Reading Test) were asked to read a passage written at the seventh grade level. One group was asked to underline one sentence per paragraph that they thought contained the main idea of the passage, whereas, the other group was asked to simply read the passage. After both groups took a multiple choice exam, it was discovered that underlining did not improve overall retention, but recall of the specific underlined sentences was increased in the experimental group compared to the control group. Therefore, underlining might be used with a particularly important word or phrase to increase retention of the isolated message.

In other studies investigating underlining, Idstein and Jenkins (1972) found no significant differences in the recall of information when pieces of text were underlined or when the same passages were read repeatedly by a group of college students. Furthermore, there were no significant differences in retention when the reader actively underlined the topic sentences from the text or when the experimenter underlined the main ideas (Rickards and August, 1975). These researchers found no differences in recall of either the main or secondary points in the text.

Pictures Another factor affecting comprehension of a text is the use of pictures. Illustrations and diagrams have been shown repeatedly to have a positive effect on the retention of information . In one study (Tajika et al., 1988), drawings or photographs pertaining to a passage (called pictorial organizers) were shown to a group of fifth graders before they read the passage. A second group of similar students only read the passage. Recall of information was tested immediately after reading and one week after reading the text. The results showed that students given the drawing or photographs retained significantly more information both immediately and after one week compared to their classmates not shown the pictures.

Mayer (1989) reviewed several studies where diagrams were used to highlight the major objects and actions of a piece of text. He found the following similarities among study results: Students who used diagrams recalled more conceptual information and scored lower on verbatim retention than students not exposed to diagrams. Students exposed to diagrams were more likely to answer problem solving questions correctly. Diagrams were most useful if placed before or within a lesson, but not after the relevant piece of text. Finally, diagrams are most useful to students of low aptitude or with low prior knowledge.

Irwin and Davis (1980) developed a checklist (Appendix

C) of 36 items as an alternative or supplement to using readability formulas. The list estimates the readability of the text with each item being rated on a scale of one to five. The items are divided into two main categories: understandability and learnability. Learnability is further divided into organization, motivation and reinforcement. The researchers report that these factors are important in retention. However, in this report there were no statements about validity or reliability of the checklist and all scores were subjective.

The problem of unreadable health-related materials

Several studies have indicated that low-income, low-literate individuals in need of health and nutritional instruction are the people least likely to understand the message in written health-care material. At the Public Health Services Hospital in Norfolk, Va., the Cloze procedure was used to test comprehension of patients. This test showed that approximately 50% could not read at a fifth grade level (Doak and Doak, 1980). Written materials covering subjects such as diabetes, family planning, infant care, prescriptions and clinical procedures were found to have few instructions below an eighth grade reading level. Amazingly, the surgical consent form at the same institution, had a required reading ability of 16th grade (college senior level).

In a similar study, Doak et al. (1985) examined a sample of 291 sets of health instructions for reading difficulty level. These researchers found fewer than 10% of the materials with a seventh grade or lower difficulty level, leaving them to conclude that virtually none of the instructions would be understood by individuals with low-literacy skills.

In another study, Samora et al. (1961) tested 125 low-income, hospital patients for the correct definitions of 50 common health-related words. Less than 79% of this population had a high school education. The researchers found that younger patients could identify more words than could individuals over 65 years of age. Four words (vomit, relieve, appointment, constipated) were recognized by 90% of the test population, whereas, four other words (tendon, terminal, malignant, nerve) could be defined by only 25% of the patients despite the syllabic similarities between the two groups of words.

Lanese and Thrush (1963) have used the Dale-Chall formula to estimate the readability of materials written for diabetic patients. The researchers investigated the effectiveness of diabetic materials in the form of pamphlets, booklets or reprints distributed by clinics, hospitals and health agents. These researchers sampled the literature of 21 teaching hospitals across the country and computed the median grade level and found it to be slightly

above the ninth grade in reading difficulty. Yet half of the diabetic population in 1962 had not completed nine years of education. They concluded that the reading levels of the material were beyond the reading levels of the patients, therefore, comprehension and recall would decrease and motivation for acquiring additional information would be reduced.

Problems with the readability of health-related materials are as much a concern today as in the past. Recently, Meade et al. (1989) estimated the reading difficulty of 49 materials on smoking education using a computer software program developed by the University of Minnesota. The program is able to compute grade levels of reading text by using the following formulas: Dale-Chall, SMOG, Gunning-Fog, Fry and Flesch. The researchers compared the readability of materials (median=10th grade) to the reading levels of smoking patients at a primary care clinic (median WRAT score=6th grade). These researchers concluded that a serious disparity existed between the reading level of the population and the skill level required to comprehend smoking materials.

In another study, Freimuth (1979) used the SMOG test to measure reading grade level of health-related articles of popular magazines and pamphlets written for patients. The researchers found that the articles ranged in difficulty from a ninth to a fifteenth grade (third year college)

reading level and the pamphlets ranged from an eleventh to a fourteenth grade (second year college) reading level. Freimuth concluded that patients who do not have at least two years of high school might have difficulty in understanding the written health material, adding that the technical nature of the subject of health might increase the number of polysyllabic words and inevitably increase the SMOG score.

Teacher-produced materials According to Klare (1974), readability formulas do not indicate how to write readably. Therefore, teachers often take guesses, rely on past experience or listen to feedback to estimate how to write appropriate material for a particular audience. Rules have been developed by researchers to guide educators when writing for ease of readability, but caution must be taken so structure is not emphasized at the risk of content. When preparing materials for low-literate individuals sentences should be kept as short as possible. However, more importantly, the vocabulary load should be kept to a minimum because it is the greater obstacle to readability (Lanese and Thrush, 1963). The writer can control this factor by using a vocabulary list of familiar words such as the Dale list or Thorndike-Lorge List (Thorndike and Lorge, 1944).

Doak et al. (1985) recommend the use of visuals for three reasons. Simple illustrations can decrease the amount

of necessary reading in the text, emphasize the important instructions and provide motivation. These researchers report that both simple line drawings and photographs might be useful to the low-literate reader. However, photographs were found to be more effective when the reader has control over his viewing time, whereas, simple line drawings are a greater asset when time is controlled by the teacher, television or filmstrip.

Researchers have outlined several strategies for designing written materials for the adult with low-literacy skills (Sticht, 1975; Klare, 1976; Laubach and Koschnick, 1977; US DHHS, 1982; Doak et al., 1985; Fry, 1988; Nitzke, 1989).

To improve the readability of the text:

* Use simple language. Avoid jargon, technical vocabulary, polysyllabic words, abbreviations and long explanations.
* Use circles or underline for emphasis as opposed to using italics or bold print (Doak et al., 1985). However, overuse of circles and lines decreases the attention value (Laubach and Koschnick, 1977).
* Emphasize the desired action.
* Use the active voice (Klare, 1976).
* Use words instead of symbols, such as "add" instead of "+" (Doak et al., 1985).
* Summarize the major points (US DHHS, 1982).
* When appropriate use headers to give readers clues to the message.

* Write instructions in the sequence they are to be performed.

* Present the minimum information essential for the adult's needs (Sticht, 1975).

* Keep sentence length as short as possible (Klare, 1976; US DHHS, 1982).

* Avoid using words beginning with pre-, dis- or multi- (Fry, 1988).

* Choose a large type size. Doak et al. (1985) recommend 12-14 point.

* Use the same type style throughout the text. A Roman style with serifs is recommended to help the letters blend together into words.

* Use lower case letters instead of capitals because the shapes of lower case letters are easier to recognize (Laubach and Koschnick, 1977).

* Use personal pronouns rather than impersonal.

* Terms presumed to be new should be defined when used for the first time (Fry, 1988).

* Keep the subject as near the verb as possible (Nitzke, 1989).

To improve the illustrations:

* Use simple line drawings or photographs (Doak et al., 1985).

* Show drawings or photographs from the reader's point of view (Sticht, 1975).

* Make drawings lifelike; avoid cartoon figures.

* When drawing organs of the body, draw as much of the body as possible for easy identification of the organ (Doak et al., 1985).

* Place visuals near the corresponding text. Avoid the use of arrows to portray the message (Sticht, 1975; US DHHS, 1982).

* Illustrate only the correct behavior.

* To draw attention to major points, use circles, arrows, or a little color.

* Too many colors are distracting. Keep the variety to two or three colors per page. Nitzke (1986) recommends using bright colors.

* Step by step instructions using pictures should be on one page or on opposing pages (Sticht, 1975).

To simplify page format and organization:

* Use black print on a white background rather than white on black. The latter combination reduces reading speed by 10% (Doak et al., 1985).

* Organize information into categories to improve recall (Doak et al., 1985).

* Use titles and subtitles to clearly define the organization of the text, but keep headers simple (US DHHS, 1982).

* Use plenty of white space to decrease eye distractions (Nitzke, 1989).

Before using any text or illustrations with clients, the materials should be pretested with a sample population. According to the U.S. Department of Health and Human Services (1982), the purpose of pretesting is to find out if the message attracts attention, is understood, is personally relevant to the audience, is believable or is offensive. Doak et al. (1985) add that pretesting addresses two factors: comprehension and interest. They caution, however, that self-administered pretests carry little validity when used with a low-literate audience.

Learner-produced materials A major cause of failure to achieve the desired goals of nutrition education is the poor comprehension of instruction (Doak and Doak, 1980). However, strategies can be used to eliminate the gaps between instruction and comprehension. One of these strategies is the Language Experience Approach (LEA).

During the 1960's, LEA was designed to teach reading to children and adults by using the student's language, words, sentences and stories as the basis for content (Pickering, 1989). According to Heller (1988), standard LEA includes introduction of a story topic by the teacher or student that relates to the previous experience of the student. The learner contributes information about the topic as the teacher transcribes the text on the chalkboard. Then the teacher reads the new passage to the student, repeats the passage and reads the passage with the student until the student is able to read his/her creation on his/her own. Kennedy and Roeder (1975) suggest that students' statements might be tape recorded for later transcription. The recording method allows students to talk spontaneously at a normal rate without waiting for the transcriber to write down each word.

The advantages of this technique are that it produces text from the reader's own experience, combining the oral and written language of the student (Stahl and Miller, 1989) and it improves the learners' self-concept and motivation

(Aderman et al., 1987). Harman and Edelsky (1989) report that language approaches are not as smothering to poor readers because the culture and language of all people are welcomed into the classroom. The teacher learns to share the control over the material with the students (Shannon, 1989), empowering the student to take control over the learning process. Kazemek (1984) reports that adult education is more ethical when people are able to express themselves. The educator must ask people about their interests, knowledge and beliefs, not simply make assumptions about what needs to be taught.

Since the 1960's, LEA has been used to teach a wide variety of topics. Children have learned to analyze television commercials by restating the main ideas and advertising claims in their own words (Allen et al., 1988). Doak et al. (1985) support the use of this approach to teach hospitalized patients of low literacy levels. These researchers claim that three factors interact to support comprehension: logic, language and experience. The patients must find that the language used to explain the health professional's instructions is close to their own vernacular so there are fewer barriers to learning.

Nitzke (1987) used an adaptation of the LEA to revise a nutrition pamphlet, and at the same time, increased the clarity and personal relevance of the writing. The target audience consisted of low-income, low-literate, white,

central-city mothers of children under twelve years of age. During the needs assessment phase of the project, the mothers expressed concerns over the cost of food and the adequacy of their children's diets. Nitzke addressed the latter issue using two pamphlets on the subject of healthy snacks.

One pamphlet was produced by mothers using the adaptation of the LEA. These women participated in a two hour nutrition education program where they were presented with snack information through a series of lectures, discussions and demonstrations. After each series there was an LEA experience where participants restated what they had learned. Statements were transcribed, organized and edited by the educators. A second pamphlet was produced by nutrition educators using a standard method. The pamphlets had the same snack information and layout, but different words and both pamphlets were measured at a fifth grade readability level by several readability tests.

The results showed that the pamphlet written by the target audience was more difficult to read, but its message was at least as well understood and more personally relevant to readers than the pamphlet written by nutrition educators. Nitzke suggests that readers are less likely to reject information expressed in peer language.

Twenty-six women outside the original test group were asked to evaluate the pamphlet. The pamphlet written by the

target audience was rated as more neighborly, helpful, sensible and informative than the nutrition-educator version. Furthermore, the target audience pamphlet was rated as appropriate for a racially mixed group of mothers, even though the producers were all white.

Nutrition Education in Pregnancy

It is often difficult for pregnant women to provide adequate nutrition to the fetus while maintaining an appropriate weight, especially if the woman is at risk for nutritional problems (Trouba et al., 1991). Risk factors include: age (less than 2 years post-menarche or over 35 years), high parity, poor obstetric history, faddist food habits, substance abuse, therapeutic diets, high or low maternal weight before pregnancy, anemia, glucosuria and inadequate or excess weight gain during pregnancy (Trouba et al., 1991). Nutrition education programs attempt to address these risk factors before and during pregnancy to improve dietary intake, health practices and weight gain to influence the outcome of pregnancy. This portion of the review of literature will describe nutrition education programs with a focus on the Expanded Foods and Nutrition Education Program (EFNEP).

Kafatos et al. (1989) investigated whether prenatal nutrition counseling in rural Greece was associated with improvements in diet and weight gain by analyzing dietary habits, nutrient intake, hemoglobin (Hb) levels, and serum vitamin concentrations in both intervention and control groups. The intervention consisted of home visits by nurses every two weeks to 300 village women. Instruction was given on the basics of nutrition during pregnancy and techniques

for improving the diet. Women were encouraged to prepare and preserve locally grown foods. Dietary habits were assessed by using a 24 hour recall and a food weighing inventory at the beginning of the study and every four weeks until delivery.

The results showed that in the intervention group, kilocalories increased significantly throughout pregnancy ($p<0.0001$), protein, fat and carbohydrate intake increased significantly ($p<0.001$) and mean weight gain increased at 32 and 37 weeks ($p<0.05$) when compared to the control group. The researchers concluded that nutrition education intervention can have a positive effect on maternal gestational weight gain.

Researchers have found that nutrition education programs that focus on an increase in knowledge do not necessarily have a positive change on attitudes or behaviors (Kaplowitz and Olson, 1983). Kaplowitz and Olson provided pamphlets on breast-feeding to literate, low-income, pregnant women and assessed knowledge on the subject before and after reading the material. Knowledge of breast-feeding significantly increased , but no change was found in positive attitude or behavior towards the practice. These researchers suggest that to be successful, future programs should address individual attitudes and experiences.

Brush et el. (1986) support the view that educators must not only teach nutrition knowledge, but tie the

knowledge to the experiences of the learner. These researchers improved post-test scores of adults by encouraging learners to relate new knowledge to their own experiences. The Language Experience Approach is one technique which can be used to tie knowledge to experiences by allowing the learner to express his/her own views in his/her own language.

The Expanded Food and Nutrition Education Program

Established in 1968, the Expanded Food and Nutrition Education Program (EFNEP) is a national program funded by the U.S.D.A. and state legislatures. Within each state, EFNEP is administered through the Cooperative Extension Service of the state land grant university and is implemented at the county level by paraprofessional nutrition instructors under the direction of the County Extension Home Economist. Each state is responsible for designating geographic areas in which the program will operate. Coordinators of the program provide training and develop or obtain educational resources for the instructors. County Extension Home Economists provide training to paraprofessionals who teach low-income homemakers within the county.

Michigan EFNEP is administered from Michigan State University and serves 15 counties statewide. The goal of EFNEP is to help families, especially those families with

young children, living at or near the poverty level to acquire the necessary skills and knowledge to achieve a nutritionally balanced diet (Michigan Expanded Food and Nutrition Education Program, 1990). During 1990, the program reached 4,730 homemakers with 9,155 children in 15 Michigan counties. A total of 91% of these homemakers had annual incomes below $13,000 and 47% were from minority groups (Michigan Expanded Food and Nutrition Education Program, 1990).

Adult participants in EFNEP are taught lessons in basic nutrition, food purchasing, food storage, sanitation and management of available resources. Families are informed how to apply for food stamps and how to obtain donated food. Homemakers are taught in small groups or individually by paraprofessionals who have been trained by the County Extension Home Economists and State Extension Specialists. The curriculum consists of "Eating Right is Basic" a series of handouts and flipcharts used with all adults, "Eating Right.....for Two" used with pregnant homemakers, "Feeding Your Infant" and "Feeding Your Baby Solid Food" used with mothers of young children. All of these materials were developed in Michigan in 1985 with the assistance of a national advisory committee and revised in 1992. They are currently used in 47 states, Guam, Canada and the Virgin Islands. Although the nutritional information in these materials was thoroughly evaluated for appropriate content,

no documentation exists as to the reading grade levels of the materials.

In addition to the Michigan EFNEP curriculum, other states have developed materials for use with pregnant clients. A group of educators at the Pennsylvania State University EFNEP program developed a special curriculum designed for use with pregnant teens. "Eating for a Better Start" addresses adolescent lifestyle characteristics which might adversely affect the outcome of pregnancy: skipping meals, alcohol and substance use or abuse, fad dieting and nutritionally poor food choices (Strycher et al., 1991). Only the Michigan materials, "Eating Right...for Two," will be used in this research.

Nutrition in Pregnancy

Adequate nutrition during pregnancy is essential for optimum health for the mother and the fetus. Poor nutrition during pregnancy has been associated with an increased risk of prematurity, infant mortality, pregnancy-induced hypertension (PIH) and anemia (Endres et al., 1981). This portion of the literature review focuses on the major nutrition-related areas which might affect pregnancy outcome: low birth weight and premature birth, maternal weight and weight gain, smoking, drug use, nutrient intake, cravings, aversions and pica.

Low birth weight and premature birth In the U.S. in the early 1900's, the infant mortality rate was 100 infant deaths in 1000 live births with two thirds of those deaths occurring in the post-neonatal period from 28 days to one year of life (McCormick, 1985). Many of those deaths were blamed on environmental factors, therefore, research focused on prevention of infectious diseases. Since 1950, infant mortality rates in the U.S. have declined to 10.1 deaths per 1,000 live births (National Center for Health Statistics, 1990). Due to the increased prevention of infectious diseases and improved nutrition most infant deaths now occur earlier, in the neonatal period from 0 to 28 days of life. The majority of deaths occur to low-birth weight (LBW)

babies who are at increased risk of infant mortality and morbidity compared to their normal weight counterparts (Abrams, 1991). There are two major categories of LBW infants, preterm (those babies born at a gestational period of $\leq$ 37 weeks) and small for gestational age (SGA, those babies born at a weight $\leq$ 2500g).

Researchers in the area of LBW have repeatedly found significant correlations between several factors and the risk of having a SGA or premature baby: low maternal weight gain (Mitchell and Lerner, 1989; Doyle et al., 1982; Mora et al., 1979), low maternal prepregnancy weight (Abrams 1991; O'Sullivan et al., 1965), high parity (Kleinman and Kessel, 1987), short intervals between pregnancy (Abrams et al., 1989), incompetent cervix (Abrams, 1991), smoking ten or more cigarettes per day (Haworth et al., 1980; Gormican et al., 1980; Meyer et al., 1976; Beal, 1971; Mulcahy et al., 1970), use of illicit drugs (Abrams et al., 1989), history of loss during pregnancy (McCormick, 1985; Meyer et al., 1976); unmarried status (Kleinman and Kessel, 1987); less than 12 years education (Kleinman and Kessel, 1987); low calorie ($\leq$1500 kcal/day) intake by the mother (Doyle et al., 1982; Lechtig et al., 1975), adolescent pregnancy (Brennan et al., 1983; McCormick, 1985), non-white race (Abrams et al., 1989; Kleinman and Kessel, 1987; Brennan et al., 1983; McCormick, 1985), and parity (Brown et al., 1986).

Many of these variables which influence the outcome of

pregnancy were established by analyzing research data using simple regression. At a Boston city hospital, O'Sullivan et al. (1965) asked 5,883 pregnant women about their ages, races, usual weights, numbers of previous pregnancies and the numbers of previous births in excess of nine pounds. These characteristics were compared to data of their present pregnancies. When the other factors were removed, racial characteristics, age, parity, and blood sugar had no significant effect, whereas, self-reported usual weight had a significant effect ($p<0.01$) on the birth weight of the infant. However, the income, race or education levels of these women were never reported or analyzed.

Only the studies by Haworth et al. (1980), Abrams et al. (1989), Abrams (1991) and Brown et al. (1986), specifically targeted a low-income population although a high prevalence of LBW babies are born to women in poor communities and this problem has become a major health concern (Lechtig et al., 1975). Brown et al. (1986) compared clinical data of low-income women with the birth weights of their infants. Multiple regression analyses showed that gestational length, weight gain during pregnancy, prepregnancy weight, cigarette smoking and parity are all individually correlated with infant birth weight. However, the influence of gestational length on birth weight decreased as prepregnancy weight increased only when the mother was $\leq$ 150% of her ideal body weight.

In two similar research projects, Abrams et al. (1989) and Abrams (1991) attempted to separate the risk factors of prematurity from the risk factors of SGA among low-income populations. Data of maternal characteristics and birth outcomes from 2228 women who participated in the University of California, San Diego Prenatal Nutrition Project between 1978 and 1988 were examined. Multivariate analyses of the data showed that significant risk factors for SGA births included: cigarette smoking, low rate of maternal weight gain, black or asian ethnicity, pregravid underweight (< 90% of the 1959 Metropolitan Life Standards), primiparity, and low maternal height. With the exception of black ethnicity and low maternal weight gain, the risk factors for premature birth were different: incompetent cervix, use of illicit drugs, exposure to trauma, surgery or anesthesia during pregnancy, maternal age less than 16 years and short interpregnancy intervals.

Lieberman et al. (1987) focused on the problem of race and premature birth. Primarily concerned with the fact that twice as many black babies die in the first year of life compared to white babies, these researchers collected data through medical records and personal interviews of 14,458 women at Boston Hospital for Women between 1977 and 1980. The results showed that 9.2% of black infants were born prematurely, whereas, only 4.9% of white infants were born at less than 37 weeks gestation. The black mothers were

often more anemic, underweight, younger, single, less educated and on welfare compared to white mothers. However, when socioeconomic status (SES) risk factors were taken into account, race was no longer a significant predictor of premature birth.

Maternal weight and weight gain The Institute of Medicine (1990) recommends that a woman should gain weight according to her prepregnancy Body Mass Index (BMI). Women with a low BMI ($\leq$19.8) should gain 28 to 40 lbs, with a normal BMI (19.8 to 26.0) should gain 25 to 35 lbs, and with a high BMI (>26.0) should gain 15 to 25 lbs during pregnancy. Less than half of the mass gained goes to the fetus, placenta and amniotic fluid, but the majority is added to reproductive tissues, fluid, blood and body fat stores (Worthington-Roberts and Williams, 1989). The adequacy of weight gain can only be determined when the length of gestation is known (Institute of Medicine, 1990). The length of gestation is often estimated by calculating the length of time since the last menstrual period, but this method is only as accurate as the memory of the mother.

Ideally, there is little weight gain in the first weeks of pregnancy, two to four lbs (0.9 to 1.8 kg) by the end of the first trimester and about one lb (0.45 kg) each week thereafter (Hytten and Leitch, 1971). According to Worthington-Roberts and Williams (1989), steady growth in

which most of the gain is in lean body tissue is desired. A sudden gain in weight might signal fluid retention, a sign of pregnancy-induced hypertension (PIH).[3] Low pregnancy weight gain can increase the risk of poor pregnancy outcome. The lowest incidence of PIH, LBW and perinatal death are associated with gaining 0.45 kg per week during the last 20 weeks of pregnancy (Hytten and Leitch, 1971). Those women at greatest risk for low weight gain (<6.8 kg or 15 lbs) are unmarried, black or Hispanic, cigarette smokers or women with low levels of education (Institute of Medicine, 1990). These women might need prenatal counseling to lower the risk of inadequate weight gain.

In a study by Mitchell and Lerner (1989), regression was used to determine if a relationship existed between prenatal weight gain and pregnancy outcome. The researchers obtained data on 1081 middle-class urban women who had volunteered for a previous study between 1976 and 1984. The women were matched for age, parity, occupation, height, race and smoking habits in an attempt to control for factors that have been correlated with negative pregnancy outcomes. A total of 362 pairs of normal weight and underweight women were formed. The results showed that no relationship existed between the initial weight of the mother and the

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[3] Pregnancy-induced hypertension is defined as a 20 to 30 mm Hg rise in systolic blood pressure or a 10 to 15 mm Hg rise in diastolic blood pressure measured on two separate occasions at least six hours apart. This condition is characterized also by edema and proteinuria.

birth weight of the infant. However, birth weight was shown to have increased significantly with maternal weight gain ($p<.0001$). For every kilogram of weight gained during pregnancy by an underweight mother, 12.85 g were gained by the infant and for each kilogram gained by a normal weight mother, the weight of the offspring increased by 8.59 g.

In a similar study of the relationship of maternal weight gain and infant birth weight, Brown et al. (1986) obtained data on low-income women collected by the Maternal and Infant Care (MIC) Project in Cleveland and Minneapolis. Data records from 1,342 women enrolled in the project between 1979 and 1982 were randomly selected. Underweight was defined as $\leq$ 95%, normal weight as 95% to 115%, over weight as 115% to 150 % and obesity as $\geq$ 150% of ideal body weight from the 1960 Metropolitan Life Insurance Tables. As in the studies of women at higher income levels, infant birth weight was found to be significantly correlated with prenatal weight gain ($r=.20$, $p< 0.001$).

In another study of the effect of maternal mass and weight gain on birth weight, Abrams et al. (1986) collected data through interviews and medical records of 2946 live births with deliveries after 37 weeks gestation at a University Hospital in San Francisco, California between 1980 and 1983. Through multiple regression, the researchers found that both pregravid body mass and weight gain during pregnancy significantly influenced infant birth weights, but

only for moderately overweight, normal weight and underweight women (those women with prepregnancy weights ($\leq$135% of ideal body weight). Body mass was estimated using Quetelet's index (kg/cm^2) and the researchers found that for every unit increase in maternal prepregnancy body mass, there was an increase of 15.9g in body weight of the infant ($p<0.00001$). Furthermore, for every kg increase in maternal weight there was a 25.9g, 28.3g or 17.8g increase in body weight of infants of underweight, normal weight and moderately overweight women, respectively ($p<0.00001$). No significant birth weight differences were found associated with an increase in body mass or weight among obese pregnant women.

Smoking Hundreds of studies have demonstrated that smoking during pregnancy increases the risk of low birth weight babies ($\leq$2500 grams) and perinatal mortality (Langford et al., 1983; Meyer et al., 1976). On the average, smokers' babies are 150 to 250g lighter than non-smokers' babies and this decrease in birth weight is independent of other factors that have been correlated with LBW such as maternal weight, age, race and socioeconomic status (Meyer et al., 1976). However, the results of recent studies conflict as to whether low birth weight is due to decreased dietary intake among smokers. Some researchers have reported decreased energy or nutrient intake among pregnant smokers

(Smithells et al., 1977; Rogozinski et al., 1983), whereas, other studies have shown an increase in energy intake among pregnant women who smoke when compared to pregnant non-smokers (Beal, 1971; Haworth et al., 1980).

In a study to determine whether the effect of maternal cigarette smoking on fetal low birth weight could be due to decreased dietary intake in smokers compared to non-smokers, Haworth et al. (1980) assessed the nutrient intake of 302 smoking and 234 non-smoking women. Dietary intake was assessed by calculating the average daily nutrient intake from a diet history and by analyzing 24-hour recalls of women in the last trimester of pregnancy.

The results of the study showed that smokers had significantly smaller infants than the non-smokers, although pregnancy weight gain did not significantly differ between the two groups. Furthermore, the analyses of the diet records and recalls indicated that the energy intake of smokers was not less than that of non-smokers. Leaving the researchers to conclude that fetal growth retardation due to smoking is not caused by a mother's decreased food intake.

Other researchers are looking beyond diet to explain the relationship between low birth weight infants and maternal smoking. Naeye (1980), Naeye (1981) and Meyer et al. (1976) report that cigarette smoking increases fetal and neonatal mortality by increasing the frequency of: abruptio placentae (the premature detachment of the placenta),

placenta previa (the implantation of the placenta in the lower part of the uterus so that it blocks the cervix opening) and major congenital malformations.

In one study Naeye (1980) analyzed data from the Collaborative Perinatal Project of the National Institute of Neurological and Communicative Disorders and Stroke which included information gathered on 53,518 pregnant women between 1959 and 1966. The investigation looked at the possibility that cessation of smoking might decrease the frequency of smoking-related disorders. The results showed that mothers who quit smoking after conception had a 23% lower frequency of abruptio placenta and a 33% lower frequency of placenta previa than women who continued to smoke. The greatest difference between groups was found when comparing smokers to non-smokers over thirty years of age.

Using data from the same study, Naeye (1981) reported that one disorder, placenta previa, was found to be directly related to the number of years the mother smoked regardless of how long before the pregnancy she had quit. The frequency of the three disorders did not decrease in infants of women smokers as weight gain increased, therefore, the researcher concluded that increasing food intake of pregnant women who smoke might not protect the fetus.

In a related study, Meyer et al. (1976) investigated the relation of the amount of smoking related to increased

fetal and infant mortality by analyzing data from the Ontario Perinatal Mortality Study. Regression analyses showed that placental complications increased consistently with smoking level. For smokers who consumed less than one pack per day, placenta previa rates increased by 25% and abruptio placenta rates increased by 23% over the control group. Furthermore, rates for smokers of greater than one pack per day increased 92% for placenta previa and 86% for abruptio placenta. Meyer et al. report that these complications carry high risks of perinatal mortality and account for 1/3 to 1/2 of the perinatal deaths attributed to maternal smoking. Due to the high health risks associated with smoking, the Institute of Medicine (1990) has recommended that public health programs for pregnant women target populations which tend to have a high prevalence of smokers such as groups of women with low levels of education. The Institute suggests that women who smoke be encouraged to quit, but if a woman continues to smoke during pregnancy, she might benefit from multivitamin/mineral supplementation.

Alcohol use According to the Institute of Medicine (1990), a review of scientific literature indicated that maternal use of alcohol did not affect the weight gain of the mother during pregnancy. However, maternal ethanol ingestion can interfere with transport across the placenta resulting in

fetal alcohol syndrome (FAS) (Worthington-Roberts and Williams, 1989). This syndrome was characterized by Jones et al. (1973) as abnormalities of the eyes, nose, heart and central nervous system, growth retardation, small head circumference and mental retardation. Moreover, excessive intake of alcohol by pregnant women has been reported to be associated with an increased risk of spontaneous abortion, abruptio placenta, LBW and prenatal mortality (Worthington-Roberts and Williams, 1989). The infants who do survive fetal exposure to alcohol often experience symptoms of withdrawal such as irritability and hyperactivity in their first few weeks of life (Worthington-Roberts and Williams, 1989).

The Council of Scientific Affairs (1983) reported that studies have consistently found a positive correlation between excessive maternal alcohol intake and the risk of fetal abnormalities, regardless of race or income level of the woman. The effects of moderate alcohol intake are not clear and, therefore, no safe level of alcohol consumption during pregnancy has been determined. The Institute of Medicine (1990) reports that mothers who consume alcohol during pregnancy might have a low intake of protein, essential fats, vitamins and minerals. Furthermore, they might have difficulty metabolizing calcium, amino acids and some vitamins and might have decreased nutrient utilization due to liver impairment. There is no convincing evidence

that nutritional supplementation can compete with the adverse effects of alcohol, therefore, the Institute of Medicine recommends that women limit or eliminate alcohol intake during pregnancy.

Caffeine intake The Institute of Medicine (1990) reports that there is not conclusive evidence to show that caffeine causes birth defects, but there is some evidence to suggest that the drug might be associated with decreased infant birth weight. At this time, the Institute of Medicine makes no official recommendation pertaining to caffeine intake during pregnancy.

Drug use Among the general pregnant American public, marijuana use is estimated at 10 to 27% and among inner city pregnant women cocaine use is about 18% (Institute of Medicine, 1990). According to Archer et al. (1983) cocaine use is associated with increased blood pressure and should not be confused with PIH. Cocaine-induced hypertension might lead to abruptio placenta.

A study by Chasnoff et al. (1985) compared pregnancy outcomes of 23 cocaine users with patients receiving methadone and patients free of drugs. First trimester miscarriages in the three groups were 38%, 16% and 0% respectively. Four cocaine users experienced onset of labor with abruptio placenta following an injection. The

Institute of Medicine (1990) recommends that highest priority be given to efforts to stop drug abuse because of the adverse effects on mother and fetus. Diet counseling and vitamin/mineral supplementation are recommended in addition to drug counseling due to the high incidence of nutritional deficiencies that accompany drug use.

Nutrient intakes of pregnant women According to Brennan et al. (1983), the groups most at risk for poor pregnancy outcome are the groups with an increased risk for poor nutrition: very young, low-income, non-white, high-parity, low-literate mothers living in the inner city. Beal (1971) reports that nutrition during pregnancy is most important for the woman who has been poorly nourished throughout her life and, therefore, has decreased reserves of nutrients to support the fetus. These women often continue to consume a less-than-optimum diet throughout pregnancy and, therefore, need extra attention from health care officials (Snowman, 1979). Beal (1971) recorded the nutritional histories of 149 white, middle-income, pregnant and non-pregnant American women between 1946 and 1966. These women were found to be well nourished before pregnancy, consuming an average of 1900 kcal, 65 g protein and 0.8 g calcium per day. The researchers found no consistent dietary patterns among women who gave birth before 37 weeks gestation compared to women who gave birth to full-term infants. Furthermore, the

change in kilocalories from one pregnancy to the next among multiparous women did not result in a comparable change in birth weight of the infant.

A study of an entirely different population, black and white, low-income pregnant women showed that the diet of these women differed considerably from the well-nourished population in Beal's study. Sixty-eight urban mothers in unskilled occupations and incomes of $5,000 (1970 income) or less annually were asked to respond to questions on personal dietary habits and to give a 24 hour food recall to a home-interviewer. The recall was given verbally to the interviewer to bypass any problems the subject might have had with literacy. The results showed that no typical dietary pattern existed among these low-income mothers, however, a few common practices were discovered. Vitamin and mineral supplement usage was high (96%), but half of the supplement users (53%) practiced some form of pica (the ingestion of non-food items). In this case, pica was not found to be significantly associated with altered dietary intakes, lowered hemoglobin or hematocrit levels, pregnancy complications or LBW, possibly due to the high prevalence of vitamin and mineral supplements. Intakes of energy, calcium and iron were found to be at low levels for both black and white women compared to the 1974 RDA's.

Similar results were found in the Ten State Nutrition Survey (TSNS) and in a study by Smithells et al. (1977).

Data collected in the TSNS showed that diets of pregnant women in the U.S. are below the RDA for energy, iron, calcium, vitamin A and protein (Brennan et al., 1983). In the study by Smithells et al. (1977), the researchers calculated the mean daily dietary intake of 195 British women ages 18 to 55 years in their first trimester of pregnancy. Volunteers were interviewed by a doctor and filled out a questionnaire on employment, family income and personal smoking habits. The women kept a five-to-seven day dietary record by weighing the food before eating it and noting any episodes of nausea or vomiting. When compared to the British RDAs for pregnant women, 80% of the women in the study had low intakes of energy and iron and 100% had low cholecalciferol intakes. In general, nutrient intakes tended to decrease with social class, severity of vomiting and age, but not with the number of cigarettes smoked. The researchers expressed specific concerns over the decrease in nutrient intake with social class, noting that due to the required literacy skills to keep accurate dietary records, women from the lowest social classes are often under represented in this type of research.

In 1983, Brennan et al. collected and weighed duplicate portions of food consumed in 24 hours by a group of black pregnant women of low SES. The 22 female volunteers ranged in age from 16 to 38 years. Through interviews it was revealed that half of the subjects consumed three meals

daily, whereas, the other 50% ate only two meals per day plus snacks. The consumption of fruits and vegetables was low with 14 out of 22 women eating less than three servings per day. Laboratory analyses on the duplicate portions and calculations of the data from these analyses were used to assess the actual nutrient intake of the women. The results were compared to the 1980 RDAs for pregnant women. The researchers reported that the average energy intake was low, but a wide range existed from 772 to 2,723 kcal per day. Less than half of these women met the RDA for magnesium, zinc or folacin. However, intakes of phosphorous, vitamin A, riboflavin and niacin met or exceeded the RDA.

In a third study, Doyle et al. (1982) assessed a seven day weighed dietary record of 76 low SES women in the third trimester of pregnancy. The researchers compared the data of those women who delivered SGA babies to the data of those women who delivered normal weight-for-age babies and they compare also the nutrient intake levels of all subjects to the British RDAs. All mothers were 17 to 29 years of age, non-smokers, primigravida or previously had SGA babies and were literate. Once again, due to the need for literate mothers to keep dietary records, the illiterate and low-literate individuals were not included in the study.

The results showed that mean energy intakes were lower for mothers who delivered LBW babies compared to mothers who gave birth to normal weight-for-date babies ($p<0.001$).

Secondly, the intake of almost all nutrients was lower for mothers of LBW infants, but only the levels of total fat and pyridoxine were significantly lower. When comparing the maternal intakes to the British RDAs, many of the results are similar to the results of studies by Brennan et al. (1983) and Smithells et al. (1977). Doyle et al. (1982) found low intakes of energy, iron, and calcium like the other researchers, but they found also low intakes of vitamin D and folic acid among mothers who delivered LBW babies compared to mothers who delivered normal weight babies.

Recommended Dietary Allowances (RDAs) are based on evidence from metabolic studies. Requirements are estimated to avoid deficiencies and maintain balance, then recommendations are adjusted upward to cover individual differences in the population due to variations in digestion, absorption and utilization (Worthington-Roberts and Williams, 1989).

Table 4: Recommended Dietary Allowances for Pregnant Women[1]

Nutrient	Allowance for Pregnancy	Nutrient	Allowance for Pregnancy
protein	60 g	folacin	400 ug
vitamin A	800 ug RE	vitamin B-12	2.2 ug
vitamin D	10 ug	calcium	1200 mg
vitamin E	10 mg TE	phosphorous	1200 mg
vitamin K	65 ug	magnesium	300 mg
vitamin C	70 mg	iron	30 mg
thiamin	1.5 mg	zinc	15 mg
riboflavin	1.6 mg	iodine	175 ug
niacin	17 mg NE	selenium	65 ug
vitamin B-6	2.2 mg		

1. The RDA's for pregnancy are adjusted upward when studies show an increased need for a nutrient during pregnancy compared to the needs of non-pregnant women.

Energy intake An increased requirement for energy during pregnancy occurs for several reasons: new tissues are being produced, there is an increase in maternal BMR and the workload of the mother has increased due to the increased weight (Blackburn and Calloway, 1976). Worthington-Roberts and Williams (1989) have reported that the estimated energy cost of pregnancy is 85,000 kcal or 300 kcal per day, although this increased need might be partially offset by decreased physical activity. Recent

studies on the effect of food restriction in pregnant rats fed half of their normal caloric intake resulted in significantly decreased body weight in the fetuses (Worthington-Roberts and Williams, 1989). Therefore, the fetus does not completely parasitize the mother in its need for energy and a lack of maternal energy could mean an increased mortality risk for the fetus. The Institute of Medicine (1990) reports that energy supplements would be beneficial for pregnant women whose average daily intake is $\leq$ 1900 kcal.

In humans, due to the laws of ethics, it is difficult to separate the effects of energy deficiency from those effects of protein deficiency. However, maternal protein-calorie malnutrition has been shown to decrease the ability of the mother to conceive, interfere with the normal growth of the placenta and fetus, and cause malformations, resorption or death in the fetus (Worthington-Roberts and Williams, 1989).

Protein intake Protein is required to build new cells in both the mother and the fetus, therefore, the requirement is increased during pregnancy. Schuster et al. (1981) found that among low-income, black and white, pregnant women the mean protein intake was 106% of the 1980 RDA. The Institute of Medicine (1990) recommends that protein requirements during pregnancy be met from the diet and no supplementation such as high protein powders are recommended.

Vitamins

Vitamin A intake No supplement of vitamin A is recommended during pregnancy, although the requirement is increased (Institute of Medicine, 1990). Pregnant women should be advised to avoid an excess ($\geq$ 25,000 IU per day) of this vitamin, because it can be easily transported across the placenta by simple diffusion and has been reported to cause fetal malformations (Worthington-Roberts and Williams, 1989).

According to Shah and Rajalakshmi (1984), relative vitamin A intake decreases with income level. These researchers compared the vitamin A status of newborns in relation to gestational age, birth weight and maternal vitamin A status among high and low income groups. Infants born to mothers from the high income group had significantly higher cord serum vitamin A levels than cord serum levels among babies from the low income group. Mothers of premature infants had lower levels of serum vitamin A compared to mothers of full-term infants, indicating a correlation between maternal vitamin A status and prematurity in poorly nourished individuals.

Vitamin D intake Like vitamin A, vitamin D easily diffuses across the placental membrane and, therefore, an excess intake can be toxic causing infantile hypercalcemia

(Worthington-Roberts and Williams, 1989). However, this vitamin positively affects calcium balance during pregnancy, therefore, those at risk (complete vegetarians, women with a low intake of vitamin D fortified milk and women with minimal sunlight exposure) should supplement their diets with 10 ug per day (Institute of Medicine, 1990).

Vitamin E intake The main role of vitamin E in the body is to prevent oxidation of unsaturated fatty acids in the cell membrane. Supplementation during pregnancy is not recommended as this vitamin is found in commonly eaten foods (Institute of Medicine, 1990). Deficiency of this vitamin is rare and has not been linked to any decrease in reproductivity or fertility (Worthington-Roberts and Williams, 1989).

Thiamin, riboflavin and niacin intake These three water-soluble B-vitamins are all part of reactions to produce energy and their requirement in the body is dependent upon caloric intake. During pregnancy, the need for these vitamins is increased due to the increase in dietary calories (Worthington-Roberts and Williams, 1989). Heller et al. (1974) found no significant correlation between riboflavin status in 651 women (assessed by means of an erythrocyte glutathione reductase activation test) and pregnancy outcome. The Institute of Medicine (1990) reports

that there is no basis for recommending supplementation of these three B vitamins for the general population of pregnant women.

Vitamin C intake Low plasma levels of vitamin C are associated with the premature rupture of membranes and pre-eclampsia. For the pregnant woman, extra daily intake of this vitamin is recommended, therefore, the RDA is raised to 70 mg per day. This level can easily be obtained with the American diet and no recommendation for supplementation has been made (Institute of Medicine, 1990). However, excessive maternal intake of vitamin C during pregnancy has been positively correlated with an increased requirement of this vitamin by the infant after birth, therefore, excessive supplementation should be avoided.

Folic acid intake The deficiency of folate in the diet is one of the most common vitamin deficiencies seen, especially among lower socio-economic groups (Subar et al., 1989), women and African Americans (Blocker et al., 1989). Deficiency, leading to abnormal cell division, might be caused by decreased dietary intake, alcohol consumption, smoking or use of specific drugs such as anticonvulsants (Bailey, 1990). During pregnancy, a woman's need for folate doubles due to the expanding red cell mass and continuous fetal growth. Therefore, the RDA for folate during

pregnancy is increased from 180 ug to 400 ug per day. A decrease in folate utilization or a failure to increase the level of folate intake might result in megaloblastic anemia. Most often occurring in the third trimester, this type of anemia causes the mother's heart, liver and spleen to become enlarged, threatening the health of the mother and the life of the fetus (Willis, 1984). Pregnant women consuming a low level of folate place themselves at risk for poor pregnancy outcomes, including: prematurity, LBW, abruptio placenta, spontaneous abortion, stillbirths (Blocker et al., 1989), and infant neural tube defects (Vergel et al., 1990; Bower and Stanley, 1989; Milunsky et al., 1989).

In an animal study involving folic acid levels in Cebus albifrons monkeys, Blocker et al. (1989) compared dietary folic acid intake during pregnancy with folate levels in the mother and child postpartum. Maternal, infant and non-pregnant hematologic indices, blood and liver folate concentrations and urinary formimino glutamine acid excretion levels all varied with dietary folate intake and pregnancy status. The results of the study suggest that since fetal tissues do not have preferential access to maternal folate stores when those stores are compromised, the fetus is highly dependent on the folate status of the mother.

In a human study, the mean daily folate intakes of 195 women in the first trimester of pregnancy were assessed by

weighed dietary records of five to seven days. Like many essential nutrients, Rogozinski et al. (1983) found that the lowest intakes of folate during pregnancy are associated with the lowest social classes, maternal age below 20 years and vomiting three or more days per week. The researchers found also that folate intake was greater in women who did not smoke compared to women who smoked ten or more cigarettes per day ($p<0.05$).

At a prenatal clinic in Florida, Bailey et al. (1980) determined folacin and iron status of 269 low income women. These researchers found that serum folacin levels were low in 45% (<6ng/ml) and deficient in 15% (<3ng/ml) of the subjects. At the same time, serum iron was normal in 96% of the subjects. These data suggest that folacin deficiency is more prevalent than iron deficiency in low income populations.

Due to the increased requirement of folic acid during pregnancy, supplementation is often prescribed, despite the ongoing controversy over this practice. One of the critics of folic acid supplementation is B.M. Hibbard of the University of Wales. Hibbard (1988) believes that folic acid supplementation for pregnant women is valuable only in selected individuals and that most women in Western society can get their necessary nutrients from a good mixed diet. He reports that folic acid intake is hindered by ignorance, inertia or a lifetime of bad habits, therefore, healthy

eating campaigns and not supplementation should be stressed during pregnancy.

Contrary to the view of Hibbard, Horn (1988) argues that most women are not able to meet the demands of expanding red cell mass and fetal growth in pregnancy through diet alone. Folate circulation in tissues is reduced and many pregnant women become anemic. She adds that supplements of 100 to 300 ug per day of folic acid are effective in maintaining the folate state of the healthy pregnant woman.

National committees differ in their support of folic acid supplementation during pregnancy. The Institute of Medicine (1990) sides with Hibbard, recommending no routine supplementation of folate. However, the Institute vaguely recommends a 300 ug per day supplement for cases where doubts exist about folate adequacy in the diet. The U.S. Centers for Disease Control recommend that all women of childbearing age increase their intake of folic acid to .4 mg daily, whereas, women with a history of neural tube defects increase their supplementation to ten times that amount to 4 mg folic acid per day.

Vitamin B-6 intake Schuster et al. (1981) report that a significant portion of low income pregnant women are in poor vitamin B-6 status. Maternal B-6 deficiency during pregnancy can result in infants born with lower Apgar scores

compared to the scores of infants born to mothers with adequate levels of this vitamin. Study participants consisted of 127 low income, black and white, adult and adolescent females. Vitamin B-6 intake data, collected by means of a 24-hour recall, showed that 57% of subjects consumed 53%, 77% of subjects consumed ≤67% and 88% of subjects consumed less than the 1980 RDA for vitamin B-6 for pregnant women. At the same time, the mean energy intake of the women was 84% of the RDA and the mean protein intake was 106% of the RDA. Apgar scores of infants at one minute after birth, but not birth weights, were significantly higher ($p<0.05$) for infants whose mothers' diets were B-6 adequate at their first prenatal clinic visit compared to scores of infants whose mothers had low vitamin B-6 diets. The Institute of Medicine (1990), however, has found no convincing evidence that vitamin B-6 supplementation is needed in pregnancy and makes no recommendation for supplementation at this time.

Vitamin B-12 intake A deficiency in vitamin B-12 produces the same anemia associated with a lack of folic acid: megaloblastic anemia. Besides anemia, severe deficiency can cause irreparable damage to the nervous system (Worthington-Roberts and Williams, 1989). Although, severe B-12 deficiency during pregnancy is rare, some researchers recommend a supplement (Willis, 1984). The

Institute of Medicine (1990) recommends a vitamin B-12 supplement of 2.0 ug/day for complete vegetarians.

Minerals

Iron intake A 30% increase in iron intake is required for the production of hemoglobin in the fetus and placenta and an increased maternal blood volume during pregnancy (Dawson and McGanity, 1987). Willis (1984) reports that the iron requirement during pregnancy cannot be met by the average American diet and although absorption during pregnancy increases, stores of the mineral consistently decrease (Dawson and McGanity, 1987). Furthermore, the Council of Foods and Nutrition of the American Medical Association has reported that many women enter pregnancy with inadequate iron stores (Ashe et al., 1979), and, therefore, the Council recommends supplementation of 30 to 60 mg per day. The Institute of Medicine (1990) recommends also 30 mg of ferrous iron per day for women in the second and third trimesters of pregnancy.

The diet of the mother might affect the absorption of iron in her body and, therefore, the availability of iron to her fetus. Absorption is decreased with the consumption of tannic acid found in tea, EDTA, calcium phosphate, phosvitin found in egg yolk, phytates and soy products, whereas, absorption is increased with the intake of ascorbic acid,

meat, poultry or fish (Raper et al., 1984).

A study by Dawson and McGanity (1987) investigated the usefulness of iron supplementation during pregnancy by determining whether supplementation of iron could maintain satisfactory hematologic values and maternal iron stores throughout pregnancy, delivery and up to three months post partum. Forty-two white and black women less than 16 weeks pregnant received multivitamin supplements either with 65 mg iron or without the iron. After 16 weeks of supplementation, those women without the iron supplement had significantly lower serum ferritin levels (0.05) and 43% of the non-iron group failed to maintain hemoglobin levels at 11.0 g/dl. These researchers concluded that use of iron supplementation is necessary to maintain iron stores and prevents the development of iron-deficiency anemia during pregnancy.

Calcium intake The fetus acquires most of its calcium in the last trimester of pregnancy when the majority of bone and teeth formation takes place. If calcium is not present or present at low levels, the mineral is removed from the mother's bones to be used for the fetus. Belizan et al. (1988) suggest that a lack of calcium intake during pregnancy might be also associated with an increased risk of PIH. The RDA for pregnant women is set at 1200 mg per day or 400 mg greater than for non-pregnant individuals.

To ascertain the effectiveness of supplements, Ashe et al. (1979) determined the retention of calcium and iron in women on supplemented and unsupplemented diets. Six 7-day metabolic studies were carried out on ten pregnant white women ages 19 to 29 years. The women ate self-selected diets in which they weighed, recorded and collected duplicate food samples for laboratory analysis. Medications were noted and all waste collected. The results showed no significant differences in calcium balance, but significantly greater retention in iron among supplemented compared to unsupplemented women. The researchers concluded that only iron supplementation can be substantiated. However, this study did not include young, low income or other high risk groups of pregnant women. The Institute of Medicine (1990) recommends calcium supplementation (600 mg) for women under age 25 whose daily dietary intake of calcium is less than 600 mg. Researchers have consistently found low calcium intakes among low-income pregnant women (Brennan et al., 1983; Snowman, 1979).

Zinc and Copper intake The recommended intake for zinc is set at 15 mg per day during pregnancy. Most women are only able to obtain 9 to 11 mg through their daily diets and it is possible that iron supplementation exacerbates the situation by decreasing absorption (Worthington-Roberts and Williams, 1989). Lack of zinc and copper in the prenatal

diet have been shown to have teratogenic effects on the fetuses of animals. In rats, severe copper deficiency increased the risk of fetal resorption and stillbirths (Taper et al., 1985).

In humans, Taper et al. (1985) evaluated zinc and copper utilization from the self-selected diets of 24 pregnant women in their second trimester of pregnancy. After conducting two 7-day metabolic studies in which all food, drink, fecal and urine samples were analyzed for the minerals, the researchers found that the RDA for zinc or the suggested intake for copper were not met unless supplements were used. According to Taper et al. intakes above 8 mg resulted in positive retention, but due to individual variation, the RDA of 15 mg zinc would not be excessive. Furthermore, adequate copper retention was not possible without supplementation. The Institute of Medicine (1990) does not recommend supplementation of these minerals for the general population, but supplements of 15 mg zinc and 2 mg copper are recommended for women who are taking therapeutic doses of iron (> 30 mg/day) for anemia.

Supplementation Several researchers have found low intakes of nutrients when assessing the diets of pregnant women. The most commonly found deficiencies include iron, calcium and folate, therefore, these nutrients are most often prescribed by doctors for supplementation of the

pregnant woman's diet. However, for the general population the Institute of Medicine (1990) recommends supplementation of iron only. The American Dietetics Association (ADA) takes the position that supplement usage might be indicated for women who are pregnant or breastfeeding, especially supplementation of iron and calcium (ADA, 1987). The Institute of Medicine (1990) recommends vitamin/mineral supplementation for women who might be at risk: women carrying multiple fetus, cigarette smokers, alcohol users and drug abusers. The supplement should contain the following:

30 mg iron	15 mg zinc	2 mg copper
250 mg calcium	2 mg vitamin B-6	300 ug folate
50 mg vitamin C	5 ug vitamin D	

In poor communities where food might be in short supply, supplementation might be better accomplished by adding extra food, with its much needed calories, to the diet as opposed to distributing vitamin/mineral supplements to pregnant women. Lechtig et al. (1975) studied the effects of food supplementation of pregnant women on the birth weight of the infant in four rural villages of Guatamala. Compared to the control group, the researchers found that the experimental group had an increased caloric intake (with or without increased protein intake) and experienced an increase in the birth weight of their babies (29 g birth weight per 10,000 supplemented calories). This increase was unchanged after controlling for initial

maternal diet, height, head circumference, parity, gestational age, duration of disease during pregnancy and socio-economic status.

In the U.S. low income women are eligible to participate in the Women, Infants and Children (WIC) program to obtain food coupons to improve their prenatal diets. A study by Endres et al. (1981) showed that pregnant participants in the WIC program increased their consumption of protein, calcium, iron, vitamin A, vitamin C, thiamin, riboflavin, niacin and folacin compared to low income, non-participating, pregnant women.

Cravings and aversions One way in which women meet the increased need for calories and nutrients during pregnancy is to change their dietary behavior. These changes might be affected by cultural beliefs, food availability, food costs and food preferences which in turn might influence cravings and aversions for certain foods.

Tierson et al. (1985) conducted a study of the influence of maternal dietary cravings and aversions during pregnancy on the frequency of consumption of specific dietary items. Cravings and aversions were defined as having extreme likes or dislikes for an item for at least 24 hours. The researchers interviewed 400 white, well-nourished women from Albany, New York at the 16th, 20th, 30th and 38th weeks of pregnancy and at eight weeks post

partum. During the interviews, the women were asked to report any episodes of cravings, aversions, nausea or vomiting since the previous interview.

The results showed that aversions tended to appear before cravings and last for a longer period of time. Cravings of at least one item were reported by 67% of the women and 85% of the subjects experienced one or more aversions. Commonly reported cravings included sweet foods: ice cream, chocolate, cookies, candy, fruits and Italian food. Aversions, on the other hand, included more bitter flavors: fish, meat, coffee and alcohol. Most reasons given for overindulging or avoiding a food item pertained to personal feelings of nausea, vomiting or food preference as opposed to advice from a physician or concern for the fetus.

Pica The most common pica practices (the ingestion of non-food substances) involve eating dirt, clay, starch and ice, but even large toxic compounds have been consumed during pregnancy. Worthington-Roberts and Williams (1989) report that pregnant women have been known to consume burnt matches, hair, gravel, charcoal, soot, cigarette ashes, mothballs, antacids, milk of magnesia, baking soda, coffee grounds and tire inner tubes.

Researchers and health care workers are concerned about pica for several reasons. First of all, non-food substances might replace nutritional foods, starch is particularly high

in calories and might lead to excessive weight gain, substances such as charcoal, air freshener and mothballs are toxic if consumed, the chemical ingredients in some substances might interfere with the absorption of some minerals (Willis, 1984) and parasitic infections might result from the ingestion of contaminated clay or soil (Worthington-Roberts and Williams, 1989). The reasons that pica occurs are unknown, however, researchers have suggested that it might be associated with iron deficiency (Willis, 1984).

In the study of aversions and cravings by Tierson et al. (1985), there were no reports of pica. The lack of occurrences of this type of craving might be due to the fact that the population for the study were white women from New York, whereas, pica is more prevalent among southern blacks (Willis, 1984). Snowman (1979) interviewed 68 low-income, black and white pregnant women from Syracuse, N.Y. concerning their pica practices. He found a 53% rate of pica practices among the expectant mothers: 30 consumed ice, 8-seeds, 6-laundry starch, 1-clay, 1-baby powder. However, this researcher found no association between pica and altered dietary intakes, low hemoglobin or hematocrit levels, complications during pregnancy or LBW. He adds that this particular population had a high (96%) rate of vitamin/mineral supplementation which might have masked any adverse effects of pica.

Horner et al. (1991) reviewed scientific literature from 1950 to 1990 on the prevalence of pica in the U.S. The researchers found that after a decline in the prevalence of pica between 1950 and 1970, the numbers have leveled off with no further decline in the past twenty years. Approximately 20% of the women in high risk groups practice some form of pica. Those women at greatest risk include black, southern, rural women from families with a history of practicing pica during pregnancy. The researchers found that the data suggesting that pica results in iron deficiency anemia are not definitive, but pica was consistently associated with an increase in maternal and perinatal mortality. Horner et al. suggest that counselors of pregnant women address the problem of pica in any nutritional assessment of clients.

III. Materials and Methods

A. Approval to Conduct This Study

Approval to conduct the preliminary research phase of this study was granted by the Michigan State University Committee on Research Involving Human Subjects (UCHRIS) in July, 1992 prior to the collection of any preliminary data (Appendix D). Approval from the UCHRIS for the data collection phase of this research was sought and granted in July of 1993 prior to the administration of all surveys (Appendix D).

B. Research Procedures

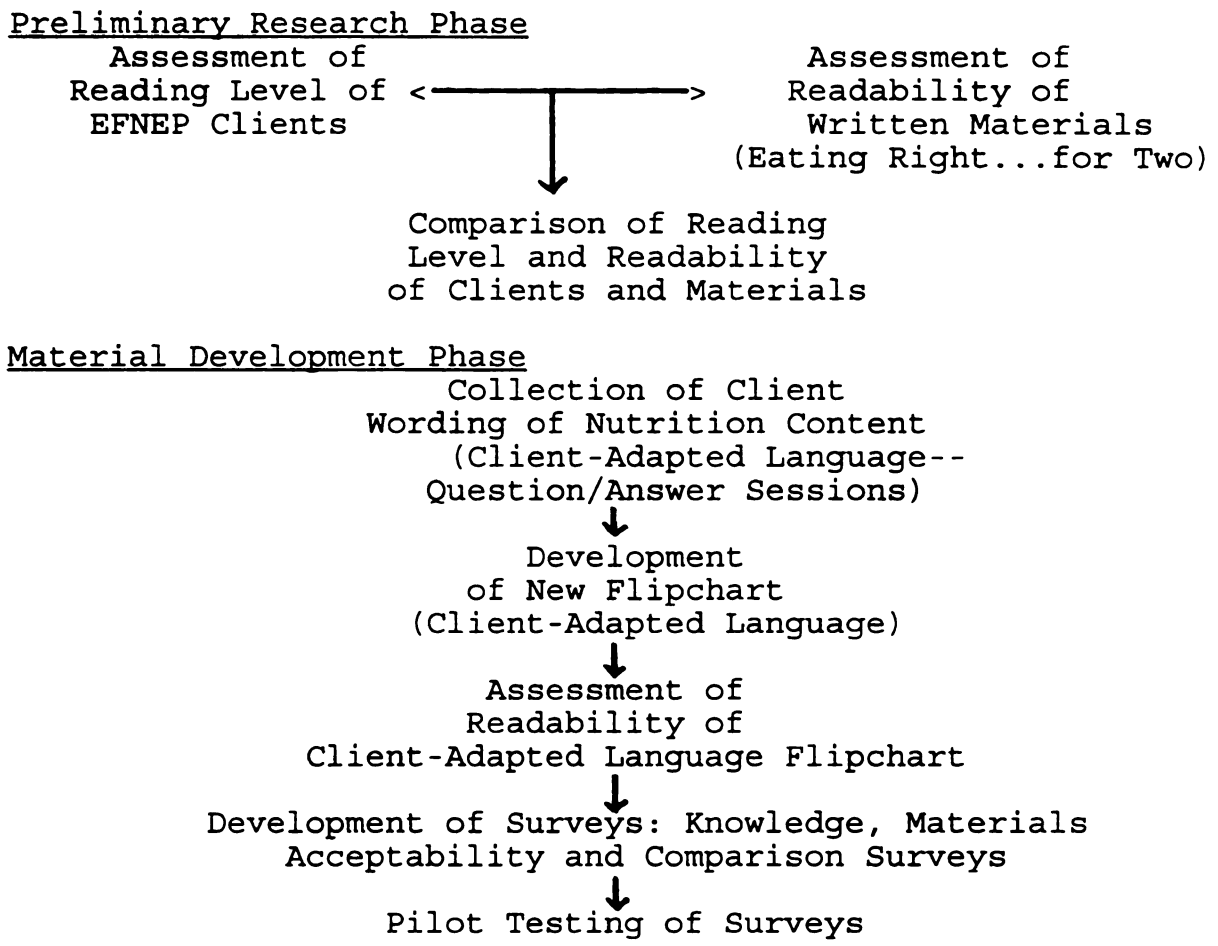
This research plan has been divided into three phases: the preliminary research phase, the material development phase and the data collection phase (Figure 1). Each phase is described separately.

Preliminary Research Phase

The reading grade level equivalents of females of child-bearing age (18-40 years) in a sample of the Michigan EFNEP population were determined by using the Slosson Oral Reading Test (SORT) (Slosson, 1963). The readability of Michigan EFNEP's written nutrition materials for pregnancy (Eating Right...for Two, flipchart and handouts) were determined by using the Flesch (Flesch, 1948), Fog (Gunning, 1950), SMOG (McLaughlin, 1969) and Fry (Fry, 1969) readability formulas. The median client SORT scores and the

reading grade level equivalency of the existing written materials were compared to determine differences.

Material Development Phase To obtain information needed to develop a new flipchart, an oral question-answer format was used with four separate groups of EFNEP clients (Appendix E). Sessions were facilitated by Ann Niewhenhuis, county Extension home economist in Kalamazoo County. Clients were asked to restate nutrition information contained in "Eating Right...for Two" using their own words. All sessions were tape-recorded and transcribed by the principal investigator (Karen Schmitz). A second researcher (Susan Miller) double-checked all transcriptions. The questions were written by the principal investigator and designed to cover material in the "Eating Right...for Two" flipchart. The written EFNEP flipchart for pregnant women, "Eating Right...for Two," was then rewritten using the clients' own language (after the statements were checked for accuracy by the principal investigator and Dr. Jenny Bond) to result in a new flipchart (Client-Adapted Language flipchart).



Data Collection Phase --Random assignment of clients to groups:

Group 1-----> Knowledge Pretest ——> Treatment: Eating Right...for Two Flipchart ——>Knowledge Posttest ——>Eating Right...for Two Handouts ——>Materials Acceptability Survey —— —> Treatment:Client-Adapted Language Flipchart ——> Comparison Survey

OR

Group 2-----> Knowledge Pretest ——> Treatment: Client-Adapted Language Flipchart ——>Knowledge Posttest ——>Eating Right...for Two Handouts ——> Materials Acceptability Survey ——> Treatment: Eating Right...for Two Flipchart ——> Comparison Survey

Figure 1. Research Procedures

The Client-Adapted Language flipchart was written as close as possible to the median reading grade level of EFNEP clients in Kalamazoo County as measured by the SORT. The mean SORT score could not be calculated because all scores below nine are given a number score, whereas, all scores of nine or above are grouped together into one classification called "high school". This new flipchart was assessed for readability in the same manner as the "Eating Right...for Two" flipchart.

During focus group discussions of "Eating Right...for Two" nutrition information, the subject of pica came up repeatedly. Many women admitted to practicing pica and expressed a need for more information on the subject. Information about pica offered by clients, but not contained in the "Eating Right...for Two" materials, was not used in the development of the Client-Adapted Language flipchart. However, a handout on pica was produced by the principal investigator using the clients' own language (Appendix P). The handout was reviewed by Dr. Carolyn Lackey of North Carolina State University, an expert on pica. After review, suggestions were incorporated into the handout and the final copy was given to the EFNEP (Michigan State University) to use. The new information on pica was not included in the Client-Adapted Language materials because it might have affected the acceptability or interest of the materials measured by the Material Acceptability and Materials

Comparison Surveys.

Three surveys were developed by the investigator: Knowledge Survey, Material Acceptability Survey and Materials Comparison Survey (Appendices G, J, L). All surveys were reviewed by experts in nutrition and pilot tested with EFNEP clients.

In addition, a readability scorecard was developed to assess characteristics of readability in written text that are not measured by readability formulas (Development of Readability Scorecard Section). The written EFNEP materials were assessed for ten specific selected factors that affect readability[4] (Appendix H): percent white space, leading size, number of abbreviations, type size (10 point, 12 point, 14 point, etc.), font type (Roman serif, Helvetica, etc.), letter type (capital vs. lower case), emphasis on action (positive vs. negative), use of voice (passive vs. active), use of symbols and number of headers used.

Data Collection Phase A knowledge survey was administered (pretest/posttest) to determine which of two flipcharts produced the greater increase in knowledge of nutrition during pregnancy among a sample of EFNEP women (n=331). Instructors were trained to use both flipcharts

[4]In this research project, readability will be defined as having two parts: 1) the reading grade level of a text, and 2) other characteristics that affect how easy or difficult a text is to read (Appendix H).

(Training of Data Collectors), but used only one flipchart with each client before the administration of the posttest. After taking the posttest, clients were given four EFNEP handouts: Iron, Folic Acid, Protein/Calcium and Discomforts during Pregnancy (Appendix O). The clients were instructed to read the handouts on their own before the next session. During the next lesson (a different day) clients were asked to complete the Materials Acceptability Survey to assess the usability/acceptability of the flipchart they used and the handouts they read. The clients were allowed to view the flipchart and handouts while completing this survey. Next, instructors used the other flipchart, "Eating Right...for Two" or Client-Adapted Language flipchart, with the same clients. Both flipcharts were available for review by the clients when completing the Materials Comparison Survey to compare the two flipcharts. The instructors read all questions and response choices on the Knowledge Survey, Materials Acceptability Survey and Materials Comparison Survey to minimize the effect of potential poor reading skills.

C. Sample Selection/Assignment

Women participating in EFNEP cannot be assumed to be representative of women in the general population who qualify for EFNEP, but do not participate, because participants have elected to join the program. Therefore,

the target population has been limited to women enrolled in EFNEP. The results of this study are generalizable to all Michigan women who participate in EFNEP. In the preliminary phase of the research, all women who were enrolled in EFNEP in Kalamazoo County in the month of August, 1992 and who spoke English as a first language were asked to participate in the SORT to measure reading levels.

In the data collection phase of the research in which the two flipcharts were compared and the handouts were assessed for acceptability, all women who were native English-speakers and who were newly enrolled in EFNEP beginning October 1st, 1993 in Kalamazoo, Ingham, Oakland, Kent or Genesee Counties were invited to participate. The investigator contacted the county Extension home economists in all counties to set up meetings with instructors to explain the project. The instructors asked their clients to participate. It was necessary to have only newly enrolled clients as subjects in this research to avoid the influence of knowledge gained from other EFNEP lessons. Recruitment ended when at least 331 subjects agreed to complete at least the pretest/posttest portion of the research. This number of clients (331) was determined to be needed for a sample that is representative of a Michigan EFNEP population which is an average of 1700 participants at any one time (Fitz-Gibbon and Morris, 1987). Although this sample selection does not involve random selection from all Michigan

counties, the self-selected participants were randomly assigned to experimental or control groups. Furthermore, the total sample size was large enough to generalize results to the total target population.

Instructors in Kalamazoo County indicated an interest in this evaluation project in the summer of 1992 when they were involved in the preliminary research phase. Meetings with the county Extension home economist and instructors in Ingham County and other counties were arranged in the fall of 1993 to train instructors to use both flipcharts. Instructors were told that one flipchart would be used to teach clients prior to the administration of the knowledge posttest and Materials Acceptability Survey, and the administration of the Materials Comparison Survey would occur after use of the other flipchart. Figure 2 indicates which flipchart was used first. Each client was assigned an envelope containing the surveys to be completed. The investigator rolled a die and assigned each envelope, and therefore, each client to a group. The "Eating Right...for Two" flipchart was to be used first with clients randomly assigned the numbers one, three or five by the roll of a die and the Client-Adapted Language flipchart was to be used first with clients assigned the die numbers two, four or six. All clients were assigned to one of the two groups by the roll of a die.

Client	Die No.	Flipchart/Groups
1	5	EFNEP flipchart
2	6	Client-Adapted flipchart
3	3	EFNEP flipchart
4	4	Client-Adapted flipchart
.	.	.
.	.	.
.	.	.

Figure 2. Example of Assignment of EFNEP Clients to Research Groups

This random assignment of clients to groups distributed the effects of individual differences between subjects to the two groups. Therefore, the change in knowledge scores between the pretest and posttest of the two groups could be compared because the groups were equivalent.

This design provides information about change in knowledge within and between groups, while controlling several threats to validity. The effects of history, maturation, attrition and regression were assumed to be distributed equally between the groups because random assignment of subjects to groups was used.

D. Research Sites

Reading level of a sample of the target population was tested by program instructors in Kalamazoo County under the direction of the county Extension home economist. The SORT was administered by the instructors during a regularly scheduled lesson (Training of Data Collectors). To compare

the two flipcharts and assess the usability of the handouts in the data collection phase, data were collected by instructors in the client's home or regular meeting place in five counties: Kalamazoo, Oakland, Kent, Ingham and Genesee (Data Collection, Materials Assessment).

E. Program Description

A description of the Expanded Food and Nutrition Education Program (EFNEP) is outlined in the "Review of Literature" section. The primary curriculum used by the program is "Eating Right is Basic" (Michigan State University Cooperative Extension Service, 1992). For pregnant women enrolled in the program, this curriculum is supplemented with materials about nutrient needs during pregnancy, "Eating Right...for Two" (Michigan State University Cooperative Extension Service, 1992). This supplemental lesson consists of a flipchart and six handouts (Appendix O). The flipchart covers general health and nutrition issues in pregnancy, whereas, the handouts cover specific topics: assessment of a sample diet for adequacy during pregnancy, iron, folic acid, calcium and protein information, discomforts during pregnancy, and a weight gain grid. The weight gain grid and the assessment of a sample diet were not analyzed for readability because of the lack of written text. In the usual EFNEP instruction, the

instructor reads the flipchart to the client as the client looks on, but the handouts are generally left with the client to read unassisted by the instructor. Both "Eating Right is Basic" and "Eating Right...for Two" were originally developed by the Michigan EFNEP in 1985 and revised in 1992. These materials are currently used in 47 states, Guam, Canada and the Virgin Islands.

F. Selection of the Reading Levels Test

The reading levels of the population were assessed by use of the SORT (Appendix B). This test was given individually to the women in their homes by their instructors to minimize embarrassment or anxiety associated with limited reading skills.

Readability of text has been measured manually using the SMOG and Fry tests, and by computer using the Flesch and Fog formulas (Review of Literature). These tests are widely used, so scores are meaningful to many professionals who might benefit by reviewing the data. The scores produced by these tests correlate well with SORT reading level scores. One limitation of the tests is that they are only useful if the reading levels of the population are known. However, in this research the reading levels of a sample of the target population were measured and, therefore, this limitation does not apply.

G. Instrument Development

In this evaluation, the following variables were assessed using instruments developed by the investigator: knowledge of nutrition in pregnancy [Pregnancy Survey I (pretest) and Pregnancy Survey II (posttest), Appendix G], characteristics of readability other than reading grade levels of the two sets of written materials (Readability Scorecard, Appendix H), usability/acceptability of the written materials (Material Acceptability Survey, Appendix J and Materials Comparison Survey, Appendix L).

1. Development of the Knowledge Survey (pretest/posttest)

A Knowledge Survey (Appendices F and G) was developed to measure knowledge change (pretest/posttest) for the EFNEP objectives developed by EFNEP program planners for the content area "pregnancy". This instrument was measured for readability and was found to be written at the median reading grade level of the sample of EFNEP clients, according to the results of the Flesch formula (Table 15). Therefore, it was not necessary to rewrite the survey at a lower reading level. The Knowledge Survey was administered individually to women in their homes, before and after the nutrition lessons were provided, by the teacher with whom they were working. A limitation of this instrument is the potential variation in administration and assistance (prompting) provided by instructors. Consistent training of

instructors helped to minimize this limitation.

The following steps were used to construct the instrument:

a. Competencies of the EFNEP curriculum "Eating Right...for Two" were obtained to use for the development of questions. The competencies are:

   i) To describe the importance of slow and steady weight gain during pregnancy.
   ii) To identify the changes in the number of servings needed daily from the milk group during pregnancy.
   iii) To determine if a meal plan includes the recommended number of servings from the food groups for a pregnant woman.
   iv) To identify iron, folic acid, calcium and protein as nutrients that are needed in additional amounts during pregnancy.

b. Two questions were developed for each competency.

c. The instrument underwent expert review to determine content validity by Dr. Jenny Bond, Dr. Anne Murphy, Dr. Wanda Chenoweth, Dr. Sandra Andrews, Dr. Sharon Hoerr, and Dr. Mary Noel because these women have expertise in one or more of the following areas: familiarity with EFNEP, knowledge of nutrition in pregnancy, data analysis, or survey development.

d. The survey was assessed for reading grade level equivalency using the Flesch, Fog, Fry and SMOG tests (Table 15).

e. The instrument was pilot-tested with 5 EFNEP clients in Ingham County and 7 EFNEP-eligible women in Kalamazoo County (Pilot Test).

f. An item analysis was conducted to assess difficulty, discrimination and reliability.

g. Based on the results of the expert review, the readability tests, the pilot tests and the item analysis, the instrument was revised (Appendix G).

2. Development of the Readability Scorecard

Characteristics of readability of written materials: number of abbreviations, font type (Roman serif, Helvetica, etc.), type size (12 pt., 14 pt., etc.), use of voice (passive vs. active), emphasis on action (positive vs. negative), percent white space (in margins and around headers), size of leading[5], type of letters (capital vs. lower case), use of symbols and number of headers used were selected for use in the scorecard by the principal investigator, after extensive review of the literature on characteristics of readability (Review of Literature) and after consulting other nutritionists with experience using readability: Dr. Jenny Bond, Char McKay of EFNEP and Dr. Anne Murphy.

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[5]Leading (pronounced with a short e) is the size of the space between lines of text.

Table 5: Characteristics of Readability: Definitions and Recommendations

Characteristic	Definition or Example	General Recommendation[1]
1) Use of voice	Number of sentences using passive voice per total number of sentences; expressed as percent; Example of passive: The ball was thrown by the boy. Example of active: The boy threw the ball.	Use active voice
2) Type size	Size of type: 8 point, 10 point, etc.	Use a type size $\geq$ 12 points
3) Font type	Roman serif or no serifs	Use Roman serif type
4) Abbreviations	Number of abbreviated words per total number of words; expressed as percent	Do not abbreviate words
5) Emphasis on action	Number of sentences emphasizing negative action per total number of sentences; expressed as percent; Example of negative emphasis: Do not eat candy for a snack. Example of positive emphasis: Eat fruit instead of candy for a snack.	Emphasize the positive, as opposed to the negative, action
6) Type of letters	Capital or lower case letters	Use lower case except for the first letter of the sentence

[1] Recommendations have been reported by experts in education and nutrition education: Sticht, 1975; Klare, 1976; Laubach and Koschnick, 1977; US DHHS, 1982; Doak et al., 1985; Fry, 1988; Nitzke, 1989.

Table 5 (continued)

7) Symbols	Number of symbols per total number of words; expressed as percent; Examples of symbols: / or \ or @ or +.	Avoid using symbols such as '+', write out 'plus' instead
8) Headers	Number of headers per total number of paragraphs; expressed as percent	Use of headers increases readability; no specific recommendation
9) White space: in margins and around headers	Any area of the text that does not contain written words (pictures are considered white space) and is not part of the leading.	Reader perceives white space as making a text easier to read; no specific recommendation
10) Leading	Size of the space between lines; This text is written with 2 point leading.	Use $\geq$ 2 point

Characteristics were chosen for the scorecard based on three criteria:

i) Research has shown that the characteristic affects readability or is perceived by the reader to affect readability (Review of Literature).

ii) Assessment of the characteristic is not subjective.

iii) The characteristic is not assessed by the Fog, Flesch, Fry or SMOG readability formulas.

Ten characteristics were defined, compared to research recommendations (Table 5) and assessed according to procedures outlined in Table 6. All assessments were checked by a second researcher (Susan Miller).

The assessment procedures for estimating percent white space were outlined after consultation with Dr. Darcy Greene of the College of Journalism, an expert in layout of text. Dr. Greene stated that there is no formula for determining white space, but in journalism two aspects of white space are considered when assessing the readability of text: white space in the margins and around the headers, and white space between lines of text (leading). Therefore, these two aspects of white space are assessed by the Readability Scorecard (Table 6).

Table 6: Characteristics or Readability: Assessment

Characteristic	Description of Assessment[1]
1) Use of voice	The number of times the passive voice (PV) was used, rather than active voice, were counted. Total number of sentences were counted. Use of voice = PV/total number of sentences.
2) Type size	The size of type of the main body of the text was compared to known type sizes printed in Laubach and Koschnick, 1977.
3) Font type	The font type of the main body of the text was compared to Roman serif type. The type was determined to be either Roman serif or not Roman serif.
4) Abbreviations	The number of abbreviations (AB) in the text were counted. Contractions of words were not counted as abbreviations. The total number of words were counted. Percent of AB = (total number of AB/total number of words) x 100
5) Emphasis on action	The number of times negative action (NA) was emphasized, as opposed to positive action, in a command or suggestion were counted. Any sentence telling the reader what not to do was counted. Percent NA = The total number of NA/total number of sentences.
6) Letter type	The main body of the text was examined. It was noted that the text was written in either capital letters or lower case letters (excluding the first letter of each sentence).
7) Symbols	The total number of symbols (NS) used in the main body of the text were counted. Some examples include "+", "%" and "&". Percent symbols =(NS/total number of words) x 100

[1] Total number of words, total number of sentences, total number of paragraphs and number of times passive voice is used can be determined using the computer program, Grammatik III.

Table 6 (continued)

8) Headers	The number of headers (H) used in the text were counted. The title was counted if it appeared on a written page of text being analyzed. The number of paragraphs (P) in the text were counted. Percent headers = (H/P) x 100 Note: Computer programs count a new paragraph any time there is a break in the leading. For accuracy, you might want to count paragraphs by hand.
9) White space: Margins and area around headers	Boxes were drawn around blocks of text and around headers. Boxes were drawn as close to the text as possible, but boxes were always in a rectangle shape. Any time there was a space greater than the leading of the main body of the text, a box was finished and new box was started. The area of the page was calculated (length x width). The area of the boxes were calculated and totaled. The percent white space = [1 - (total area of text/area of page)] x 100.
10) Leading	The leading of the main body of the text was compared to known leading sizes (Laubach and Koschnick, 1977).

Thirty-four handouts on nutrition written at different reading grade levels were assessed using the descriptions of characteristics in Table 6. The handouts were written text that discussed various nutrition-related issues and were distributed by different organizations (i.e. EFNEP, American Heart Association, March of Dimes). The results of the assessment of these texts were used to develop the scorecard. The texts ranged in reading grade level from 5 to 12. The mean and range (or other description) of measurements for the characteristics in the 34 texts are displayed in Table 7.

Table 7: Mean Scores and Range of Scores, or Descriptions of Characteristics of Readability Used for Development of the Readability Scorecard

Characteristic	Mean	Range	Description
1) Use of voice	9.2±9.0%	0 - 50%	
2) Type size	11 point	8 - 18 pt	
3) Font type	-------	--------	23 Roman serif 11 without serifs
4) Abbreviation	1.3±2.2%	0 - 8%	
5) Emphasis on action	1.8 ±3.6	0 - 12%	
6) Letter type	--------	--------	34 lower case 0 capital
7) Symbols	1.0±1.6%	0 - 7%	
8) Headers	56±32%	11 - 100%	
9) White space: margins	58±18%	30 - 89%	
10) Leading	1.3 points	1 - 2 pts	

For characteristics that could be measured, the mean and standard deviation of each characteristic were calculated. For characteristics that had set recommendations from research, could be measured and the measurements expressed as percentages (use of voice, emphasis on action, abbreviations and symbols), points on the scorecard were given as follows:

2 points =	The measurement met the recommendation.
1 point =	The measurement was between (or equal to) the mean and the recommendation.
0 points =	The measurement was above the mean.

For characteristics without specific recommendations from research, but which can be measured and expressed as percentages (headers, white space in margins and around headers), points on the scorecard were given as follows:

2 points =	The measurement was equal to the mean or above the mean.
1 point =	The measurement is within one standard deviation below the mean.
0 points =	The measurement is below one standard deviation below the mean.

For characteristics that had set recommendations from research and could be directly compared to a standard (type size, font type, letter type and leading), points on the scorecard were given as follows:

2 points =	The characteristic met the recommendation.

0 points = The characteristic did not meet the recommendation.

The scorecard was pilot tested for usability with five graduate and undergraduate students. Corrections were made when directions were found to be unclear. The final version of the Readability Scorecard is in Appendix H. The Readability Scorecard needs to undergo further testing for reliability and validity to design a meaningful scoring system. For the purpose of this research project, however, scores were assigned to one of three categories for interpretation:

<u>If the text scored</u>:

17-20 The text contains many characteristics that aid readability.

13-16 The text contains some characteristics of readability, but might need to be reviewed to further increase readability.

<12 The text contains few characteristics of readability. It should be reviewed and improved to increase readability.

3. Development of Materials Acceptability and Materials Comparison Surveys

The opinions of EFNEP clients on the different flipcharts and the "Eating Right...for Two" handouts were obtained using two surveys, the Materials Acceptability Survey (Appendix J) and the Materials Comparison Survey (Appendix L). The Materials Acceptability Survey was given to the client after the Knowledge posttest and applied only

to the acceptability/usability of the flipchart used in the knowledge assessment portion of the investigation and the "Eating Right...for Two" handouts. Then the Materials Comparison Survey was administered after use of the other flipchart. Questions regarding acceptability, interest, appropriateness of language used, and related characteristics of the materials were developed by the researcher and pilot-tested for usability with 5 EFNEP clients in Ingham County and 7 EFNEP-eligible women in Kalamazoo County (Data Collection).

H. Training of the Data Collectors

1. For Reading Level Assessment--During July, 1992 the investigator met with the instructors from EFNEP in Kalamazoo County. They were given a set of instructions (Appendix M) tape recorder, cassette tapes, ten lists of twenty words (Appendix B) and a letter asking for client consent to participate (Appendix N). Training consisted of:

a. practice using the tape recorders
b. reading through the instructions and
c. practicing the SORT on other instructors.

The instructors were asked to explain to their clients that the researcher was trying to improve the EFNEP materials, but to rewrite the materials she needed some idea

of the reading level of the clients. Clients were told that they would not be identified. After reading the letter asking for consent and obtaining consent from the client to participate, instructors would ask the clients to read the words from list one through list ten into the tape recorder. Clients were told to stop when they could not correctly pronounce five consecutive words. After testing the clients, tapes were turned in to the county Extension home economist and mailed to the principal investigator. All reading grade level scores were determined by the principal investigator using the tape recordings and directions on the SORT (Appendix B). All scores were verified by a second researcher, Susan Miller. When discrepancies in scoring occurred, the tapes in question were reviewed by the researchers and errors were corrected.

2. For Materials Assessment--Instructor training for teaching the two versions of materials began in the fall of 1993. Instructors were told that they would teach and test their own clients to avoid EFNEP client anxiety that might result from an outsider conducting these procedures. Training consisted of:

a. The principal investigator reading the directions for instructors' procedures (Appendix M).

b. The principal investigator and instructors reviewing the curriculum by reading through

the text of each curriculum.

c. The principal investigator demonstrating procedures for teaching the materials following the procedures outlined in Appendix M.

d. The instructors teaching the curriculum to each other.

e. The principal investigator and instructors reviewing the Knowledge Survey directions, questions, and answer choices by reading through the survey (Appendix G).

f. The principal investigator and instructors reviewing the Materials Acceptability and Comparison Surveys questions, answer choices and directions by reading through the surveys (Appendices J and L).

In the intervention, the messages on the flipchart were read to the client page by page with the client looking on. The "Eating Right...for Two" handouts were not read to clients, but were left with the clients to read on their own.

I. Data Collection

1. Reading Level Assessment--During August, 1992, EFNEP instructors tested their clients for reading level using SORT. Each female EFNEP client in Kalamazoo County between

the ages of 18 and 40 years who spoke English as her first language was asked to participate. Following informed consent, words were read by the client into a tape recorder according to the procedures (Training of Data Collectors). All data were recorded and mailed to the principal investigator for analysis.

2. Pilot testing of the Knowledge Survey--After the assessment of reading levels was completed, arrangements for the pilot test began. The county Extension home economists in Ingham County (Margaret Bucklin) and Kalamazoo County (Delores Hayden) were contacted about using a group of enrolled clients or EFNEP-eligible women to evaluate the wording of the surveys: Knowledge and Material Acceptability Surveys. The wording on the Materials Comparison Survey is similar to the wording on the Materials Acceptability Survey, so there was no need to pilot test the Materials Comparison Survey separately. One group of 5 women in Lansing and 7 women in Kalamazoo County were located and the women agreed to participate. The procedures were as follows:

a. The principal investigator distributed surveys and pencils, welcomed the participants and made introductions.

b. The procedures were explained to the participants by the principal investigator: "I've developed 3 surveys to be used with women like yourselves

after they have had a lesson in nutrition during pregnancy. Now I need to get your opinions on the wording of questions and answers in order to improve the surveys. Although you might or might not have used materials on nutrition in pregnancy, you will be asked to complete one survey and look at the question and answer choices on all 3 surveys. No names should be written on the surveys and any responses will not affect participation in EFNEP. I would appreciate any comments you can give me."

c. To begin the participants were asked to look at Pregnancy Survey I (Knowledge Survey). The principal investigator read the directions, each question and each answer choice. The client selected the answer that she thought was the most correct. The investigator told the clients that she realized that they might not have had the lesson that goes with the survey questions, but they should try to circle the correct answer.

d. The clients took the Knowledge Survey.

e. There was a break for food.

f. Each question in the Knowledge Survey was reviewed by the principal investigator and the clients. Clients were asked for general responses to survey items and then asked specific questions:

i) Are there enough categories for question 4? Did anyone find the question confusing?

ii) Is question 5 clear or is it confusing the way it is written?

iii) Any problems with the directions?

iv) Questions 1 through 8:

1) Is it clear that you need to total servings of milk + cheese + yogurt? Is the word "serving" confusing? When I say a serving of milk, do you think about a glass of milk? a slice of cheese?

2) By "daily meal plan" I mean all the food you eat in a day including snacks, breakfast, lunch and dinner. Is there a better way to say that?

3) Is there too much information in question 3? Any confusing words? Problems?

4) Do you think I should use the word uterus or would it be better to use womb? Should I use getting larger or growing?

5) What do you think the word "nutrients" means? Is it clear that I mean the nutrient that stays at the same level as before pregnancy?

6) Is the "s" in parentheses confusing? Is the response "a and b only" confusing? All of the above?

7) Any problems with #7? I want to know the best word or words that go in the blank.

8) Is question 8 too long? Too much information to follow?

g. Material Acceptability Survey: The principal investigator read the directions, each question and each response aloud. After reading each survey question, she asked the participants for comments:

1) Are the directions clear? Would you use the word "materials" or "flipchart" and handouts? What do you call this nutrition program?

2) Are the agree/disagree response choices acceptable or is there a better way to ask for your opinion?

3) What do you think of the word "insulting"? Should the question read: "talked down to?"

4) Any problems with #3? Should the question read: "neighborly" or "friendly"? "conversational"? "familiar words"?

5) Would you use "nutrition information" or "nutrition recommendations for pregnant women" or "nutrition needs?"
6) In your opinion, is "easy to read" different than "easy to understand?"
7) Is the word "useful" clear? Would you say "worthwhile reading" or "informative" or "helpful"?
8) What do you call your nutrition instructor?
9) Any problems with 10 or 11?
10) Do you understand the word "appearance"? Would you say "arrangement"? Would you use the term "blank space" or "white space"?
11) Would you say "print"? "type"? "letters"?
12) Are there other answer choices you would select for the question about the pictures?

h. Materials Comparison Survey: The principal investigator read the directions and the response choices aloud, then asked the clients for their opinions on the:

1) Directions

2) Response choices

i. Construct validity was assessed for the Knowledge Survey by calculating a discrimination index of items completed by the twelve pilot test participants (Table 14). Items with a low score (< .33) would have been revised or omitted, but no items scored below .33. Items were assessed for difficulty by calculating the percent of people who answered each question correctly (difficulty index, Table 14). Easy items (>80%) and difficult items (>17%) were reviewed by the principal investigator. Only one item scored below 20% (item #2 = 17%). Although the item was difficult, it was not removed or revised because it met a teaching objective for EFNEP and this research project. Other indicators of difficulty are the reading grade level of the questions and the reaction of the participants in the pilot test to the questions. Reliability of the knowledge test questions was assessed by using the KR-20 formula (Fitz-Gibbon and Morris, 1987).

3. Materials assessment--The following steps were used in obtaining data for the materials assessment.

a. During March and July of 1992 meetings with EFNEP

clients were held at a church in Kalamazoo to collect information for the development of the Client-Adapted Language flipchart (Research Procedures). Questions were asked by Ann Nieuwenhuis of EFNEP (county Extension home economist) because she had developed a comfortable relationship with the clients after leading them in a six week parenting class.

b. Instructor training for teaching the two versions of materials began in the fall of 1993. For details on instructor training, see Training of the Data Collectors.

c. Instructors pretested clients' nutrition knowledge according to directions on the Knowledge Survey. The Knowledge Survey, when given as a pretest, included demographics: ethnic background, age, education level and pregnancy status (Appendix G).

d. Instructors used one flipchart with the clients according to the results of the random assignment (Existing EFNEP or Client-Adapted Language materials).

e. Instructors administered the Knowledge posttest to clients according to the directions on the Knowledge Survey (Appendix G). "Eating Right...for Two" handouts were left with the clients to read on their own before the next

lesson.

f. On a different day, instructors administered the Materials Acceptability Survey to the clients (Appendix J).

g. Instructors used the other flipchart with the clients.

h. Instructors administered the Materials Comparison Survey to the clients (Appendix L).

IV. Results and Discussion

A. Preliminary Research Phase

1. Client Reading Level: During August and September of 1992, all clients enrolled in EFNEP in Kalamazoo County, Michigan (n=38) were measured for reading levels using the SORT (Appendix B). All clients were tested individually by their regular EFNEP instructors. Each test took less than 10 minutes and was tape-recorded. The tapes were given to the Kalamazoo county Extension home economist and mailed to the principal investigator who scored all the tests. Scores were double-checked by a second researcher, Susan Miller. The SORT scores are reported as grade levels below ninth grade. Anyone reading at the ninth grade level or above is grouped into a single category called high school. The results of the SORT are presented in Table 8. The median SORT score, the range of SORT scores, the percent of subjects reading at and below the high school level, and the mean SORT score of subjects reading below the high school level are reported (See Table 9).

Estimates of the percentage of illiterate American adults as defined by reading below the sixth grade level range from 10 to 13% (Harman, 1987). In this study, the results of the SORT showed only 7.8% of a sample of EFNEP clients read below the sixth grade level, despite the fact that poverty is a risk factor for illiteracy (Nitzke, 1989) and 91% of Michigan EFNEP homemakers have annual incomes

below $13,000 (Michigan Expanded Food and Nutrition Education Program, 1990). The Michigan EFNEP might not attract poor readers who have had bad experiences with previous learning situations.

Table 8: Preliminary Research Results: The SORT Data

Grade Level Score	Number of Clients/(%)
1.6	1 (2.6%)
4.3	1 (2.6%)
5.3	1 (2.6%)
6.2	2 (5.3%)
6.4	1 (2.6%)
7.2	1 (2.6%)
7.3	1 (2.6%)
7.6	1 (2.6%)
7.7	4 (10.5%)
7.9	2 (5.3%)
8.2	3 (7.9%)
8.3	3 (7.9%)
8.5	2 (5.3%)
8.7	2 (5.3%)
8.8	1 (2.6%)
8.9	1 (2.6%)
≥9	11 (28.9%)
Total	38

Table 9: Preliminary Research Results: Summary of SORT Data

Median Score	8.3
Range of Scores	1.6 to > 9 (high school)
Number of subjects with scores below the ninth grade reading level	n = 27, (71%)
Number of subjects with scores above the ninth grade reading level	n = 11, (29%)
Mean score of subjects reading below the ninth grade reading level	7.4 $\pm$ 1.6 s.d.

2. Correlation Coefficients Correlation coefficients were determined for SORT scores of the clients' reading below the high school level (dependent variable) and the independent variables:

a) clients' education level

b) clients' age

The SORT scores are restricted to those scores below the high school level because only individuals reading below the ninth grade level are given a number score. These data are displayed in scattergrams labeled Figure 3 and Figure 4.

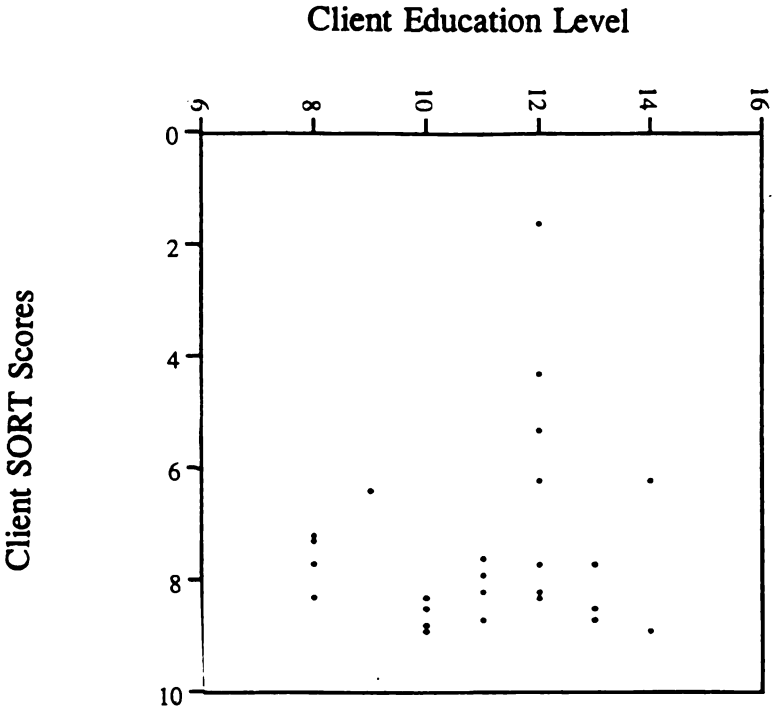


Figure 3: Client Education Level vs. Client SORT Scores

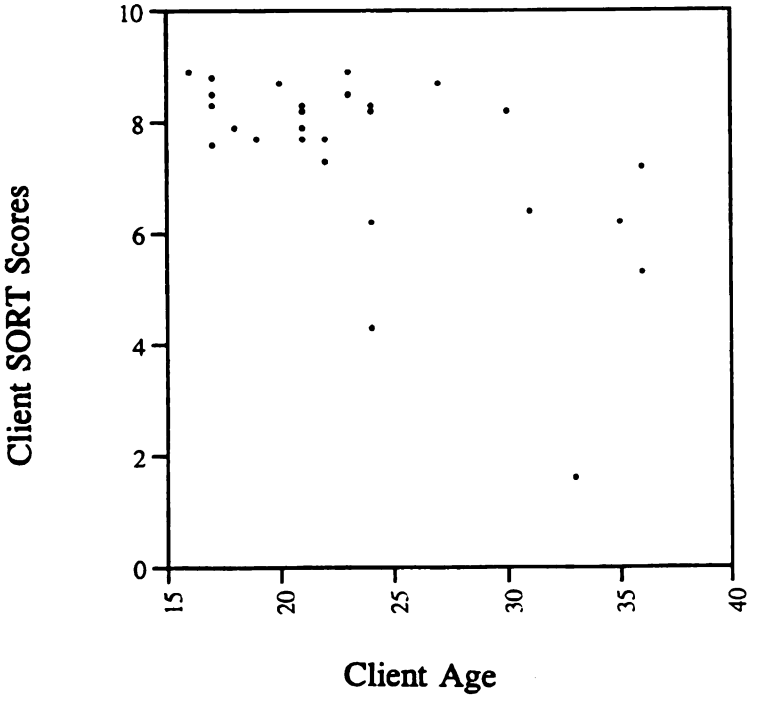


Figure 4: Client Age vs. Client SORT Scores

The correlation coefficient for the client education level and SORT score was -.1901 and not statistically significant at the $p<.05$ level. This result agrees with the results of a 1956 study by the National Tuberculosis Society which showed little correlation between self-reported education levels of adults and actual reading ability (Mohammed, 1964). In addition, Ruud et al. (1993) interviewed a group of 152 men and women between the ages of 16 and 60. Individuals reported their highest level of education completed ranged from 6th to 12th grade, but their measured reading levels ranged from 3rd to 8th grade.

The correlation between age and SORT score was -.5807, a number which is significant at the $p<.001$ level. This result shows a relationship between lower reading levels and increasing age. In 1961, Samora et al. tested 125 low-income hospital patients for comprehension of health-related words and found that patients of high school age could identify more words than older individuals. After finishing formal schooling, individuals from this population might not read on a regular basis, allowing their skills to decrease.

3. <u>The Readability of EFNEP's Written Materials</u> The results of using four formulas to measure the readability of Michigan EFNEP's written materials for nutrition during pregnancy are shown in Table 10. The Flesch and Fog scores

were determined by the principal investigator using the computer software program, Grammatik III (Grammatik III, 1989). The Fry and SMOG scores were determined by hand by two separate investigators. Results indicated that scores ranged from a Fog score of 12th grade on the "Iron" handout to a Fry score of 6th grade on the "Folic Acid" and "Calcium/Protein" handouts (Table 10).

Table 10: The Reading Grade Levels of EFNEP's Written Materials for Nutrition During Pregnancy

Material	Flesch	Fog	SMOG	Fry
Eating Right...for Two Flipchart	8	10	10	7
Discomforts During Pregnancy	7	8	8	7
Special Nutrient Needs: Folic Acid	8	8	8	6
Special Nutrient Needs: Iron	7	12	7	7
Special Nutrient Needs: Calcium/Protein	7	10	8	6

At the 50 to 75% comprehension level (Fry and Flesch scores), the reading grade level scores of EFNEP's written materials for nutrition during pregnancy tended to be very near the median reading grade level of the EFNEP clients. The SMOG scores (90% comprehension) were near the median SORT scores for the handouts, but were higher for the

flipchart. In many cases, the Fog scores were higher than the Fry and Flesch scores, but this is typical because the Fog, similar to the SMOG which also gives higher reading grade levels, considers any polysyllabic word as difficult instead of using a specific word list (Laubach and Koschnick, 1977).

The median SORT score of 8.3 for reading levels of EFNEP clients is higher than the Fry, Flesch and SMOG scores for the handouts. Using the SMOG readability formula as a predictor of reader comprehension, based on the results of the SORT over half of the EFNEP clients sampled could be expected to comprehend 90% of the material written in the handouts. However, an EFNEP client with a SORT score of 8.3 or above could probably comprehend only 75% (Flesch score of 8) of the written material in the flipchart. At the 90% comprehension level, a reader would need a SORT score at the high school level when reading the flipchart. Only twenty-nine percent of the EFNEP clients sampled read at this level.

B. Material Development Phase

1. Client-Adapted Language Flipchart During March and July of 1992, four focus groups of 8 to 12 women each were used to collect restated nutrition information contained in EFNEP's "Eating Right...for Two" flipchart and handouts. All four groups consisted of EFNEP-eligible pregnant women

from Kalamazoo County who had just completed a parenting class, including nutrition lessons. The women were asked a set of questions (Appendix E) and encouraged to discuss answers. Originally, the questions were based on material in EFNEP's "Eating Right...for Two" flipchart and handouts, but questions were added to cover the subject of "pica" when the discussions turned in that direction. Pica was common among the women in the focus groups, but few women expressed any concern that their practices might be harmful. Therefore, a handout was developed by the investigator on the subject of pica (Appendix P). The handout was reviewed by Dr. Carolyn Lackey of North Carolina State University, an expert on pica. It was edited and given to the Michigan State University EFNEP office.

The sessions were tape-recorded by the principal investigator. These recordings of the answers to questions on EFNEP's materials for nutrition during pregnancy were edited for incorrect statements by the principal investigator and Dr. Jenny Bond, and used by the principal investigator to write the Client-Adapted Language flipchart. The EFNEP flipchart and the Client-Adapted Language flipchart have the same layout, number of pages and pictures, only the words have been changed (Table 11).

In Table 11 and in the discussion of the wording, the original "Eating Right...for Two" flipchart is referred to as "Version X" and the Client-Adapted Language flipchart is

referred to as "Version Y". In some cases when there were no suitable substitute words offered by the participants, the original wording was maintained. Exact quotes from the participants used in version "Y" are in brackets [] instead of quotation marks, so they will not be confused with quotation marks already present in the "Eating Right...for Two" text.

Table 11: Wording of the Two Flipcharts

Page[1]	Version	Wording
2M	X	Now that you are pregnant you may hear that you are "eating for two." That's right--you are eating for you and your baby.
	Y	Now that you are pregnant [you're eating for two. That's the way you should look at it.] That's right--[the baby is feeding off] the food you eat.
4M	X	Even if you feel that you are overweight, it is important that you gain weight during your pregnancy.
	Y	[Even if you feel "fat", you need to gain weight for the baby's sake] when you are pregnant.
6M	X	Adequate weight gain during pregnancy increases the chance of having a healthy baby.
	Y	[You need to gain weight during pregnancy. If you do, you have a better chance of having a healthy, normal weight baby.]
8M	X	How much weight should you gain during pregnancy? Everyone is different so there are no rules. Generally, though, women who gain 22-30 pounds have a better chance of having a healthy baby.
	Y	How much weight should you gain during pregnancy? [It depends on the person, so talk to your doctor. The doctor will tell you what you should weigh and what you should gain. Most women should gain 22 to 30 pounds throughout the whole pregnancy.]

[1]The pages of both flipcharts were numbered from 2M to 40M because the original "Eating Right...for Two" was numbered in that fashion.

Table 11 (continued)

10M	X	You probably will not gain more than 2-4 pounds during the first three months of your pregnancy.
	Y	In the first three months of pregnancy [you won't gain much weight. It will probably not be more than 2 to 4 pounds because you have a long way to go!]
12M	X	After three months, a good pattern to follow is to gain about 1 pound per week until your baby is born. You won't hit 1 pound "right on the nose" every week. However, the important thing is a slow and steady weight gain.
	Y	After three months, [you should gain gradually through the next six months.] This gradual weight gain is called slow and steady weight gain. [Sometimes you might gain a pound a week. Sometimes you might gain a pound and a half.]
14M	X	The baby grows as you gain weight. The baby begins about the size of a grain of sand and grows to be about 7 pounds or more before it is born. In addition, the mother's uterus, or womb, grows to make room for the growing baby. Breasts also get bigger in preparation for breast-feeding. The amount of blood increases in the body to help get food and oxygen to the baby.
	Y	When you gain weight in pregnancy, [the weight can go all over. Your bottom, hips, thighs, face and even your feet can get bigger. Your breasts get bigger because of the milk. The uterus gets bigger to make room for the baby. The baby is growing.] Blood is increasing to help get food and oxygen to the baby.

Table 11 (continued)

16M	X	During pregnancy a lot of changes take place inside your body. Weight gain is important for these changes to occur. These changes help to support the growth and development of the baby.
	Y	[Pregnancy affects every part of your body. Weight gain is important for both the baby and the mom.] These changes help to support the baby who is growing and developing.
18M	X	Dieting during pregnancy is harmful. There is plenty of time to diet after the baby is born.
	Y	[Don't go on a diet during pregnancy. It's not a good idea because you can rob the baby of certain nutrients. When you diet you tend not to eat what your supposed to. Just eat the proper foods and watch your weight.] You want to gain the amount of weight that your doctor recommends.
20M	X	What you eat during pregnancy is important not only because it provides nutrients for the baby, but also because it helps you look and feel good. Eating a variety of nutritious foods makes pregnancy and delivery easier.
	Y	What you eat during pregnancy is important. [The baby gets nutrition from your body and you need nutrients for your own body. Eat 3 meals a day. You need your strength so you won't feel all weak and stuff.]
22M	X	How can you be sure you're getting enough of the right nutrients? By planning your meals to include a variety of foods.

Table 11 (continued)

	Y	How can you be sure you're getting enough of the right nutrients? By [eating foods from different food groups, like vegetables, fruits, meat, bread and cereal.] Make [snacks that can be nutritious, too. Take finger foods like grapes, muffins or juice boxes with you when you go places.]
24M	X	How do nutrients get from the food you eat to the baby? The nutrients in foods that you eat go directly to the baby through the placenta. Therefore, it is important to eat a variety of nutritious foods daily so that the baby's and your nutritional needs are met.
	Y	How do nutrients get from the food you eat to the baby? The nutrients go [through the little thing in the womb called the placenta. Food goes through the placenta to the baby. Eat healthy so both baby and mom can get the nutrients they need.]
26M	X	During pregnancy, you and your baby need extra nutrients. This means that, in addition to your regular nutrient needs, you need to eat extra amounts of foods high in protein, calcium, iron and folic acid.
	Y	During pregnancy, you and your baby need extra nutrients. [You need to eat more foods with iron, folic acid, protein and calcium.]
28M	X	Your baby needs calcium for healthy bones and teeth. To get all the calcium needed, increase milk and cheese servings to 3 or more per day during pregnancy.
	Y	During pregnancy, you need more [calcium for baby's bones and teeth. Eat] at least 3 servings or [more cheese, yogurt, ice cream, milk, cottage cheese and tofu] everyday.

Table 11 (continued)

30M	X	Two servings of meat or dried beans provide needed protein. Protein is necessary for every part of the baby's growing body, especially brain development.
	Y	[You need 2 servings] daily [of meat, eggs, beans, or peanut butter for protein.] Protein is necessary for every part of the baby's growing body, especially brain development.
32M	X	In addition to calcium and protein, the need for two other nutrients increases greatly during pregnancy. One of these nutrients is iron. Iron is needed to form blood, which carries oxygen. Because both the mother's body and the baby's body need oxygen, blood volume increases during pregnancy. As blood volume increases, the need for iron also increases.
	Y	[You need iron to build more blood] during pregnancy, [so you don't get anemic (low blood). Blood carries oxygen to the mother and baby.] To get more iron you need to eat more [foods like liver, broccoli, meat and fish.]
34M	X	The other nutrient that should be increased during pregnancy is folic acid. Folic acid is a B vitamin that is needed for healthy blood. Pregnant women need twice as much folic acid as non-pregnant women.
	Y	The other nutrient that you should increase during pregnancy is folic acid. Pregnant women need twice as much folic acid as non-pregnant women. [To get more folic acid you need to eat more stuff like orange juice, oranges, spinach and grapefruit.]

Table 11 (continued)

36M	X	Vitamin and mineral supplements prescribed by your doctor during pregnancy are added "insurance." They don't take the place of eating a variety of foods; they only add to it.
	Y	Vitamin and mineral supplements [help you make up for whatever you don't get otherwise.] They don't take the place of eating a variety of foods; they only add to it. [Some women who are pregnant don't take vitamin and mineral supplements because they say they are too big or they can't get them. But its a good idea to get vitamin and mineral supplements from your doctor in case you're not getting the vitamin and minerals you need.]
38M	X	There are some things that can harm your growing baby. While you are pregnant, it is best to avoid: * Smoking * Drinking alcoholic beverages * Drinking or eating foods with caffeine, like coffee, tea, cola, and chocolate, and * taking non-prescription medicines
	Y	Many women [are surprised just how many things they have to watch out for when they're pregnant, * like cough medicine], or other medicines, [that you've taken all your life.] * [Smoking harms the baby. When a woman smokes, the baby smokes with her. Ask people not to smoke in your house.] * Also, [drinking and taking drugs may harm the baby.] * Even drinking or eating foods with caffeine, like coffee, tea, cola, and chocolate
40M	X	Now you know how to eat for two. You know how to choose foods for a healthier baby and a healthier you!

Table 11 (continued)

	Y	[Be smart! You're eating for two now, so eat healthy.]

2. The Readability of the Client-Adapted Language Flipchart

Four formulas (Fog, Fry, SMOG and Flesch) were used to assess the readability of the Client-Adapted Language flipchart. The results are compared to the readability of EFNEP's "Eating Right...for Two" flipchart (Table 12). The Client-Adapted Language flipchart is easier to read according to all four formulas. An individual reading at a sixth grade level could comprehend 50% of the material in the Client-Adapted Language flipchart according to the Fry formula, and an eighth grade level reader could comprehend 90% of the material according to the SMOG readability formula. An eighth grade reading level was the median reading grade level of EFNEP clients according to results of the SORT, therefore, the Client-Adapted Language materials should be easy-to read for most women in EFNEP.

Table 12: The Reading Grade Level Equivalents of the Client-Adapted Language Flipcharts

Material	Flesch	Fog	SMOG	Fry
Client-Adapted Language Flipchart	7	8	8	6
"Eating Right...for Two" Flipchart	8	10	10	7

3. The Readability Scorecard Used with the Flipcharts and Handouts

Educators cannot assume that a client can read text just because her reading levels match the readability of the written material (Pichert and Elam, 1985). Many other factors affect comprehension, including the factors assessed by the "Readability Scorecard (Appendix H)." The "Readability Scorecard" was used with both flipcharts (Client-Adapted Language and "Eating Right...for Two") and the four handouts (Iron, Folic Acid, Protein/Calcium and Discomforts during Pregnancy) to estimate the number of characteristics present that might affect the readability of written text, but are not measured by reading grade formulas. The results of this assessment appear in Table 13. All assessments were double-checked by other researchers, Paula Montgomery and Ann Shanks.

Table 13: Using the Readability Scorecard: Assessment of Characteristics of Readability of Written Materials

Characteristic	Eating Right .. for Two	Client-Adapted Lang.	Iron	F. Acid	Pro /Ca	Disc Preg
Type size ≥ 12 pt=2 < 12 pt=0	2	2	2	2	2	2
Font Type Roman serif=2 All others=0	2	2	2	2	2	2
Abbreviations 0%=2 ≤ 2%=1 >2%=0	2	2	2	2	2	2
Use of Voice 0% passive=2 ≤10% passive=1 >10% passive=0	0	1	2	2	1	2
Emphasis on action 0% negative=2 ≤2% neg.=1	2	1	2	2	2	1
Letters Lower case=2 Capital=0	2	2	2	2	0	2
White Space ≥58%=2 40-57%=1 <40%=0	2	2	2	2	2	2
Leading ≥2 pt.=2 <2 pt.=0	2	2	2	0	2	0
Symbols 0% = 2 ≤ 1%=1	2	2	1	2	2	2
Headers ≥ 56%=2 24-55%=1 <24%=0	0	0	2	2	2	2

Interpreting the Score:

If the text scored:

17-20	The text contains many characteristics that aid readability.
13-16	The text contains some characteristics of readability, but might need to be reviewed to further increase readability.
<12	The text contains few characteristics of readability. It should be reviewed and improved to increase readability.

All handouts scored in the 17 to 20 range, but both flipcharts scored lower (16 points). The Readability Scorecard is intended to be a guide to help detect possible problems, so both flipcharts were analyzed to identify which characteristics of readability might need improvement and which are better left unchanged. For example, the EFNEP flipchart used passive voice 5 times when indicating that specific vitamins and minerals are needed by the body. These statements could be reworded in the active voice to increase readability. The Client-Adapted Language flipchart contained one sentence emphasizing negative rather than positive action. This sentence was included in the flipchart in an effort to use as many direct quotes from participants as possible. However, this sentence could be restated more positively to increase readability. Both flipcharts scored no points for "use of headers," but the flipchart contains two sentences per page, on average, and is used along with discussion rather than simply read. Use

of headers could interrupt the flow of the conversation. For these reasons, headers seem inappropriate in the flipchart.

4. Pilot Test Results: Wording of Surveys On July 28, 1993 five women who were currently enrolled in EFNEP in Ingham County met in Lansing, Michigan to pilot test the Knowledge and Material Acceptability Surveys. A second pilot test was done in September of 1993 with seven EFNEP-eligible women from Kalamazoo County. The women ranged in age from 22 to 33 years and were either pregnant or had children. All of the women had at least an eighth grade education. The procedures were followed according to the outline in the Materials and Methods section.

During the discussions, some of the women stated that they approved of the use of the word "instructor" as opposed to "teacher", although they usually called the instructor by name. They preferred the term "homemaker" to "client" or "EFNEP participant" when referring to themselves. The terms "flipchart" and "handouts" were easily understood because they were commonly used by EFNEP instructors and homemakers. The women made the following specific comments which led to changes in the final instruments (Appendices F, I and K = pilot instruments, Appendices G, J and L = final instruments).

a) Knowledge Survey:

Page 2, Question 4: What is your race?

____ African American/Black

____ Indian (American)/Alaskan Native

____ Asian/Pacific Islander

____ White

____ other what? _____

____ I do not wish to answer

Are you of Hispanic origin? ____ yes ____ no

The women stated that this question was too confusing as written. They preferred "Hispanic" to be listed as a race just like on the EFNEP surveys. Although Hispanic is not technically a race, it is thought of as a race by women in the program. Women of Hispanic origin will look for the word Hispanic and might not check the "white" or the "other" categories.

Page 3, Question 2: A daily meal plan for a pregnant woman should include 3 to 5 servings of _____ _____.

The women stated that this question should read "A daily meal plan including snacks" because several women did not think to include snacks when totaling their daily servings.

Page 4, Question 4: Weight gain in pregnancy is important because:

a) the baby is growing
b) the mother's breasts are getting larger
c) the mother's uterus is getting larger
d) a and b only
e) all of the above

The term "getting larger" was preferred to the term "growing" when referring to the breasts and uterus because the first term was perceived as simpler and straight to the point. There were no problems with the answer choices "a and b only" and "all of the above."

Page 4, Question 5: Which nutrients are <u>not</u> needed in extra amounts during pregnancy?

This question was confusing and had to be explained. The words "not needed in extra amounts" were interpreted as simply "not needed." They preferred: The need for calcium, protein and folic acid:

a) increases during pregnancy
b) decreases during pregnancy
c) does not change from non-pregnancy to pregnancy

Page 4, Question 6: The need for which nutrient(s) increases during pregnancy:

The "s" in parentheses was interpreted correctly as meaning that the answer might be plural or singular.

Page 5, Question 8: Betty is pregnant. Yesterday she ate the following:

fruits: 2 servings

milk and cheese: 3 servings

meat, poultry, fish, eggs and beans : 4 servings

breads and cereals: 4 servings

vegetables: 3 servings

Betty needs to eat more _____.

a) fruits

b) vegetables

c) meat, poultry, fish, eggs and beans

d) breads and cereals

e) milk

The women stated that there were no problems with the length or other aspects of this question.

b) Material Acceptability Survey:

The instructions on completing the survey by circling one answer choice for each question were interpreted correctly by the pilot test participants. The women

understood when to choose one answer and when more than one answer could be selected from the possible choices. They liked the scale of "strongly agree", "agree", "disagree" and "strongly disagree." They stated that they liked the choice of "I have no opinion" being available and the five answer choices were about the right number of choices to select from. The following comments were made about specific questions:

Page 1, Question 2: The way the flipchart is written is insulting to me.

The word "insulting" was thought to be a little strong for a flipchart, but better than "childish" or "talked down to." As long as the participants in the study would be allowed to disagree with the statement, the women thought that the term "insulting" would be better than any alternatives for this question.

Page 1, Question 3: The flipchart uses words similar to the words I use.

The women stated that they liked this question. The phrase "words that are similar to the words I use" was perceived as simple and better than "conversational" or "friendly."

Page 2, Questions 4 and 9: 4) The flipchart helped me learn about nutrition information and 9) The flipchart answered questions I had about nutrition information.

The women commented that they liked having two questions on nutrition information instead of one because, they said, they often learn about nutrition information before they even have enough knowledge to form a question.

Page 2, Question 5: The flipchart is easy-to-read.

Unlike the women in EFNEP in Kalamazoo County, these women in Ingham County stated that they never read the flipchart. Therefore, this question seemed to be irrelevant. (However, this question was left in the survey to allow for the differences between counties. There was an answer choice, "I did not read the flipchart").

Page 2, Question 8: I would be able to understand the flipchart without an instructor helping me.

This question was eliminated prior to pilot-testing because the EFNEP homemaker always has an instructor at the lesson to explain the flipchart.

Page 3, Question 10: The number of pages in the flipchart made it:

The phrase "number of pages" was preferred to the term "length."

Page 3, Question 11: The appearance of the flipchart (the pages with the writing) are:

The women repeated that they don't see the pages with the writing, so this question is irrelevant like question 5. (Again, this question will be left in the survey to allow for differences between counties. The women might answer that they did not see the pages of text).

Page 3, Question 12: The size of the print used in the flipchart is:

The term "print" was preferred to the term "type" or "letters."

Page 3, Question 13: The pictures in the flipchart are:

One woman suggested adding the choice "held my attention", but otherwise the women agreed that there were enough choices. The women added that too many choices would be confusing.

c) Materials Comparison Survey: The women agreed that the directions were clear and the answer choices were easy-to-understand. The wording on this survey is similar to the wording on the Material Acceptability Survey, so comments on the Material Acceptability Survey apply to the Materials Comparison Survey, also.

5. Pilot Test Results: Item Analyses

An item analysis of the eight items on the Knowledge Survey was conducted using the responses of the twelve participants in the pilot test. The mean knowledge score was 2.75 (34.4%).

a) Discrimination and Difficulty Indices for the Knowledge Survey

During pilot-testing, five EFNEP homemakers and the seven EFNEP-eligible women completed the knowledge survey, although none of them had had the lesson on nutrition during pregnancy, "Eating Right...for Two.". Table 14 contains the results of pilot-testing: the number of correct responses and the item difficulty and the discrimination of each question.

The difficulty of the items ranged from 17% to 50%, with a mean of 35%. Item #2 was difficult (17% answered correctly) for most women because it required knowledge of specific numbers of daily servings recommended for the food

groups. Although this item was difficult, it was not removed or revised because it met the objectives of EFNEP and of this research. No items scored above 80% (easy).

Table 14: Number of Correct Responses, Difficulty and Discrimination of Knowledge Survey Items

Question	No. Correct Responses (Out of 12)	Difficulty (%)	Discrimination
1	4	33	.67
2	3	25	.67
3	2	17	.67
4	6	50	.67
5	5	42	.33
6	5	42	1.00
7	4	33	.33
8	3	25	.33

The discrimination ranged from .33 to 1.00, with a mean of .42. The ability of the items to discriminate between people who performed well on the test and people who performed poorly on the test was acceptable for all survey items.

b) Assessing Reliability of the Survey Questions

The Kuder-Richardson (KR-20) formula was used to assess the reliability of the Knowledge Survey questions (Fitz-Gibbon and Morris, 1987). This formula measures the internal consistency of the survey items. The value of the score lies between zero and one, and the higher the value, the stronger the inter-correlation of test items.

$$KR20 = \frac{\text{Number of test items}}{\text{Number of items} - 1} \times \frac{\text{Population variance of an item}}{\text{Population variance of total}}$$

Analysis of the pilot test data, showed that the Knowledge Survey had a reliability score of .874, indicating a strong inter-correlation of test items and, therefore, a highly reliable survey.

6. Readability of Surveys Four formulas were used to measure the readability of the pilot forms of the Knowledge, Material Acceptability and Materials Comparison Surveys. Different formulas were used because the results indicate different levels of comprehension at the different grade level scores. The Flesch (75% comprehension) and Fog Scores were determined using the Grammatik III computer program (Reference Software, Inc., 1989), whereas, the Fry (50% comprehension) and SMOG (90% comprehension) scores were determined by hand by two separate investigators (Fry, 1968;

McLaughlin, 1969). The readability scores of the pilot instruments can be found in Table 15.

Table 15: The Readability of the Pilot Survey Instruments

Pilot Instrument	Flesch	Fog	SMOG	Fry
Knowledge Survey	6	6	7	5
Material Acceptability Survey	8	10	9	7
Materials Comparison Survey	7	7	8	7

The scores ranged from a Fry score of 5th grade (50% comprehension) on the pilot form of the Knowledge Survey to a Fog score of 10th grade on the pilot form of the Material Acceptability Survey. However, like SMOG scores (90% comprehension), Fog scores tend to be higher than Fry or Flesch scores. The Flesch formula (75% comprehension), which has been validated on adult education materials, indicated that the pilot form of the Knowledge Survey is written at the 6th grade level; the pilot form of the Material Acceptability Survey is written at the 8th grade level and the pilot form of the Materials Comparison Survey is written at the 7th grade level. The median reading grade level of the EFNEP population was determined to be 8.3 by the SORT. All 3 surveys are written below this level

according to the Flesch formula, so the readability was not changed in developing the final instrument. To control for different reading levels among clients, all questions and answer choices were read by the instructor.

C. Data Collection Phase

1. Pregnancy Survey I and II/Pretest-Posttest

Response frequencies, mean scores and range of scores were reported for responses to the Knowledge Survey, pretest and posttest. The differences in Knowledge Survey pretest and posttest change (posttest minus pretest) scores were compared between and within groups 1 and 2.

a. The frequency of responses on the pretest and posttest for each question and each response choice have been calculated and presented as percentages in Table 16.

Response frequencies for the correct answer choices increased for all questions from the pretest to the posttest, regardless of flipchart used. However, response frequencies of two incorrect answer choices from two separate questions increased from pretest to posttest.

Table 16: Response Frequencies on the Knowledge Survey (Pretest/Posttest)

Question	Response (%)[1]					
	a	b	c	d	e	No or >1 answer
1	1.3/ 0.4	7.9/ 4.6	*27.1/ 55.0	62.9/ 39.2	------	0.8/ 0.8
2	*28.3/ 43.3	13.8/ 5.4	19.2/ 13.8	15.8/ 17.1	15.8/ 14.2	7.1/ 6.3
3	16.7/ 5.8	24.2/ 7.9	11.3/ 6.3	*47.1/ 76.7	------	0.8/ 3.3
4	35.0/ 22.5	3.8/ 1.3	2.9/ 1.7	5.4/ 7.1	*52.1/ 67.1	0.8/ 0.4
5	*70.8/ 86.3	9.2/ 4.6	5.8/ 2.5	12.5/ 5.8	------	1.7/ 0.8
6	22.1/ 5.0	5.0/ 5.0	7.1/ 1.3	*58.3/ 85.0	6.3/ 2.9	1.3/ 0.8
7	19.6/ 18.3	*27.9/ 40.4	14.6/ 11.7	36.3/ 27.9	------	1.7/ 1.7
8	28.8/ 21.7	8.3/ 8.3	6.7/ 3.3	*23.3/ 39.2	27.5/ 21.3	5.4/ 6.3

1. The correct response is indicated by *. Posttest responses were obtained after only one reading of the flipchart.

For one of those questions, question 2, "A daily meal plan, including snacks, for a pregnant woman should include 3 to 5 servings of _____"

a) vegetables

b) fruits

c) breads and cereals

d) milk and cheese

e) meat, poultry, fish, eggs and beans

more women circled choice "d" than the correct answer "a." When the results of the pretest and posttest are divided by the flipchart used, for flipchart X (the original EFNEP flipchart) there was a 6.3% increase of the number of women who chose the incorrect answer "d" on the posttest compared to the pretest, whereas, for flipchart Y (the Client-Adapted Language flipchart), there was a 3.1% decrease in the number of women who selected choice "d." Clearly, the Client-Adapted Language flipchart was more effective in teaching the correct number of recommended servings from the food groups.

For the other question (question 4), "Weight gain in pregnancy is important because:"

a) the baby is growing

b) the mother's breasts are getting larger

c) the mother's uterus is getting larger

d) a and b only

e) all of the above

more women chose the incorrect answer choice "d" than the correct answer "e." Again there was a difference in which flipchart was used. Among those women who used the original EFNEP flipchart, 3.6% more women chose the incorrect answer "d" on the posttest compared to the pretest. Among the women who used the Client-Adapted Language flipchart there was no difference in response frequencies for the selection of choice "d" between the two tests. Although the results of the pilot test did not indicate that the answer choice "a and b only" might be confusing, the results of the actual study suggest that confusion might have been a problem.

When response frequencies for the correct answer choices were divided by the flipchart used, participants who used the Client-Adapted Language flipchart selected the correct answer choice on the posttest for all eight questions, more often than participants who used the original EFNEP materials (Table 17). Increases in frequencies of correct answer selection ranged from 5.2% for question four on the importance of weight gain in pregnancy to 28.2% for question eight where the client is given a sample daily diet and she needs to select which food group

needs to be increased in number of servings.

Table 17: Response Frequencies for Correct Posttest Answers

Question	Group 1: Eating Right...for Two (%) (n=112)	Group 2: Client-Adapted Language(%) (n=128)	Difference (Group 2 minus Group1) (%)
1	40.2	68.0	+27.8
2	32.1	53.1	+21.0
3	68.8	83.6	+14.8
4	64.3	69.5	+5.2
5	76.8	94.5	+17.7
6	76.8	92.2	+15.4
7	26.8	52.3	+25.5
8	24.1	52.3	+28.2
Mean	51.2	70.7	+19.5

b. The mean pretest, posttest and change scores (posttest minus pretest) for each group, along with the standard error, and range of scores were calculated and reported (Table 18). An unpaired t-test was used to determine if there is a significant difference between the means of posttest scores and change scores for group 1 vs. group 2 (Table 18).

Table 18: T-Test Results, Mean Scores and Range of Scores for the Knowledge Survey

Scores	Group 1: Eating Right for Two (n=112)	Group 2: Client-Adapted Language (n=128)
Pretest:		
mean	3.5 ± 0.1	3.4 ± 0.1
range	0 to 8	0 to 8
Posttest:		
mean	4.1 ± 0.2[1]	5.7 ± 0.2[1]
range	0 to 8	0 to 8
Change:		
mean	0.8 ± 0.2[2]	2.4 ± 0.2[2]
range	-4 to 6	-2 to 8

1. indicates significant difference ($p<.001$) mean posttest scores between groups
2. indicates significant difference ($p<.001$) mean change scores between groups

The mean pretest scores between Group 1 and Group 2 were not significantly different, but the mean posttest scores and mean change scores were significantly different ($p<.001$) between groups who used the two different flipcharts. Within both groups the difference between pretest and posttest scores were signifiicantly different ($p<.001$). These results indicate that the two groups

started with approximately the same amount of knowledge of the specific subject area tested. However, the group that used the Client-Adapted Language flipchart increased their knowledge of nutrition in pregnancy to a greater extent than the group that used the original EFNEP flipchart as indicated by the significant differences in posttest and change (posttest minus pretest) scores.

c. Demographic information for study participants is reported in Tables 19-24. Women from five Michigan counties (Oakland, Ingham, Kalamazoo, Kent and Genesee) participated in the data collection phase of this study. Participant numbers per county varied with the number of newly enrolled clients during the study period, the number of instructors in each county available for data collection, the motivation of the county Extension home economist to encourage participation of instructors and the feasibility to complete the testing within each county. The total number and percent of participants from each county appear in Table 19.

Table 19: Number of Participants per County

County[1]	Eating Right...for Two	Client-Adapted Language	Total
Oakland	32	10	42 (17.5%)
Ingham	16	18	34 (14.2%)
Kalamazoo	24	43	67 (27.9%)
Kent	31	35	66 (27.5%)
Genesee	9	22	31 (12.9%)
Total	112 (46.7%)	128 (53.3%)	240 (100%)

1. Instructors were given packets of surveys randomly assigned to either flipchart group, resulting in unequal numbers of participants per county assigned to each group.

Mean posttest and mean change scores were determined for different groups within each demographic variable (age, pregnancy status, number of babies, race/origin and highest education level achieved) and by flipchart used. The results are entered into Tables 20-24. Correlation coefficients were determined to detect if a relationship existed between mean posttest scores or mean change scores and each demographic characteristic.

Age

The original target population for this study was adult women of childbearing age (18-40 years) who participated in EFNEP. A few instructors, however, collected data from fifteen women under 18 years and two women over 40 years of

age. There was no significant correlation between age of participants and posttest or change scores, regardless of the flipchart used. Therefore, all data were included in the analyses. Mean posttest scores, mean change scores, and standard errors of the mean determined for all age groups are shown in Table 20. The mean age of study participants was 25.1 years and the median was 24.0 years of age.

Table 20: Mean Knowledge Survey Scores (Posttest and Change Scores) by Age of EFNEP Clients

Age (years) (n=group 1, group 2)	Subjects (%) (n=240)	Group 1: Eating Right.. for Two	Group 2: Client-Adapted Language
		Mean Posttest Scores(± s.e.)	Mean Posttest Scores(± s.e.)
<18 (n=14,1)	15 (6.3%)	3.2 ± 0.2	6.0
18-21 (n=33,29)	62 (25.8%)	4.1 ± 0.3	5.6 ± 0.4
22-25 (n=24,35)	59 (24.6%)	4.6 ± 0.3	6.2 ± 0.3
26-29 (n=14,18)	32 (13.3%)	3.6 ± 0.7	5.9 ± 0.4
30-33 (n=13,21)	34 (14.2%)	4.6 ± 0.6	4.9 ± 0.4
34-37 (n=5,11)	16 (6.7%)	4.5 ± 0.5	6.4 ± 0.5
38-42 (n=4,10)	14 (5.8%)	4.5 ± 1.0	4.9 ± 0.5
		Mean Change Scores(±s.e.)	Mean Change Scores(±s.e.)
<18 (n=14,1)	15 (6.3%)	-.15 ± 0.3	6.0
18-21 (n=33,29)	62 (25.8%)	1.2 ± 0.4	2.4 ± 0.4
22-25 (n=24,35)	59 (24.6%)	1.1 ± 0.4	2.6 ± 0.4
26-29 (n=14,18)	32 (13.3%)	0.3 ± 0.7	2.7 ± 0.5
30-33 (n=13,21)	34 (14.2%)	1.1 ± 0.4	1.3 ± 0.4
34-37 (n=5,11)	16 (6.7%)	0.4 ± 1.2	2.5 ± 0.4
38-42 (n=4,10)	14 (5.8%)	0.8 ± 0.5	2.1 ± 0.4

Pregnancy status

At the time of the study, 27.1% of the participants reported that they were pregnant and 72.1% that they were not pregnant (Table 21). Two participants (0.8%) were unsure of their pregnancy status. There was no significant correlation between pregnancy status and posttest scores or change scores, regardless of the flipchart used. Although Klare (1976) reported that motivation can sometimes override the effect of readability on comprehension, increased motivation to learn about nutrition in pregnancy for pregnant women compared to non-pregnant women did not appear to be a factor in this study.

Table 21: Mean Knowledge Survey Scores by Pregnancy Status of EFNEP Clients

Pregnancy Status[1] (n=group 1, group 2)	Subjects (%) (n=240)	Group 1: Eating Right.. for Two	Group 2: Client-Adapted Language
		Mean Posttest Scores (±s.e.)	Mean Posttest Scores (±s.e.)
Pregnant (n=38,27)	65 (27.3%)	4.1 ± 0.3	5.9 ± 0.3
Not Pregnant (n=74,99)	173 (72.1%)	4.1 ± 0.3	5.8 ± 0.2
		Mean Change Scores (±s.e.)	Mean Change Scores (±s.e.)
Pregnant (n=38,27)	65 (27.3%)	0.8 ± 0.3	2.4 ± 0.4
Not Pregnant (n=74,99)	173 (72.1%)	0.8 ± 0.2	2.4 ± 0.2

1. Pregnancy status indicates status at time of intervention, all women had previously been pregnant.

Number of babies

Most women in this study had given birth previously; only 12.1% of participants were about to be first-time mothers. Approximately one-third (30.4%) of the women had given birth once, 35.4% twice and 20.4% three or more times. Two individuals (0.8%) refused to report this information. See Table 22 for data on number of babies by flipchart used. There was no significant correlation between number of babies born to a mother and posttest or change score achieved. Like pregnancy status, increased motivation to

learn about nutrition in pregnancy by women who had less experience at giving birth did not appear to be a factor in this study. Research by Recht and Leslie (1988) showed that previous knowledge can greatly increase the amount of information recalled from a passage and can even compensate for poor reading ability. However, in this study previous knowledge of pregnancy among women experienced at giving birth did not appear to effect nutrition knowledge.

Table 22: Mean Knowledge Survey Scores by Number of Babies Born to the EFNEP Client

No. of Babies (n=group 1, group 2)	Subjects (%) (n=240)	Group 1: Eating Right.. for Two	Group 2: Client-Adapted Language
		Mean Posttest Scores (±s.e.)	Mean Posttest Scores (±s.e.)
none (n=17,12)	29 (12.1%)	3.8 ± 0.4	5.7 ± 0.3
one (n=35,38)	73 (30.4%)	4.3 ± 0.3	5.8 ± 0.3
two (n=32,53)	85 (35.4%)	3.9 ± 0.3	5.8 ± 0.2
three or more (n=26,23)	49 (20.4%)	4.0 ± 0.4	5.5 ± 0.4
		Mean Change Scores (±s.e.)	Mean Change Scores (±s.e.)
none (n=17,12)	29 (12.1%)	0.2 ± 0.3	3.0 ± 0.5
one (n=35,38)	73 (30.4%)	1.1 ± 0.3	2.3 ± 0.4
two (n=32,53)	85 (35.4%)	1.0 ± 0.4	2.3 ± 0.2
three or more (n=26,23)	49 (20.4%)	0.4 ± 0.4	2.5 ± 0.5

Race

Overall the majority of study participants classified themselves as either African American (26.7%), White, not Hispanic (68.3%), or Hispanic (7.9%). When responding to the question of race and ethnicity, three individuals (1.3%) classified themselves as Native American and two (0.8%) as Asian/Pacific Islander. All participants responded to this question (Table 23). This representation of different races/ethnicities is very close to the actual EFNEP representation. In 1991, Michigan EFNEP served 5430 clients: 51% white, 38% African American, 8% Hispanic, 2% Asian/Pacific and 1% Native American or Alaskan. In this study, there was no significant correlation between race and either posttest or change scores, regardless of flipchart used. This result implies that the flipchart material is not culturally or racially biased toward or against Caucasians, Hispanics or African Americans. However, the groups of Native Americans (n=3), and Asians/Pacific Islanders (n=2) were too small to make the same generalization. Change scores were higher for Hispanics using the Client-Adapted Language flipchart, partially due to the fact that two individuals achieved perfect scores on the posttest after poor pretest showings.

Harman and Edelsky (1989) report that using LEA is

advantageous to learning because it welcomes all cultures and languages into the classroom. However, in this study no one particular race or ethnic group increased their nutrition knowledge to a significantly greater extent than other groups using the Client-Adapted Language flipchart. The fact that only native English speakers were accepted as participants in this study probably had a great impact on these results.

Table 23: Mean Knowledge Survey Scores by Race or Origin of EFNEP Clients

Race/Origin (n=group 1, group 2)	Subjects (%) (n=240)	Group 1: Eating Right.. for Two	Group 2: Client-Adapted Language
		Mean Posttest Scores (±s.e.)	Mean Posttest Scores (±s.e.)
African American (n=23, 29)	52 (21.7%)	3.2 ± 0.4	5.4 ± 0.4
Native American (n=1, 2)	3 (1.3%)	4.0	3.0± 1.0
Asian/Pacific Islander (n=1, 1)	2 (0.8%)	7.0	3.0
White (not Hispanic, n=83, 81)	164 (68.3%)	4.3 ± 0.2	5.9 ± 0.2
Hispanic (n=4, 15)	19 (7.9%)	3.3 ± 0.5	5.9 ± 0.4
		Mean Change Scores (±s.e.)	Mean Change Scores (±s.e)
African American (n=23, 29)	52 (21.7%)	0.2 ± 0.4	2.3 ± 0.4
Native American (n=1, 2)	3 (1.3%)	-3.0	2.0 ± 2.0
Asian/Pacific Islander (n=1,1)	2 (0.8%)	2.0	2.0
White (not Hispanic, n=83,81)	164 (68.3%)	1.0 ± 0.2	2.3 ± 0.2
Hispanic (n=4,15)	19 (7.9%)	0.0 ± 0.9	3.0 ± 0.7

Highest level of education achieved

All women who participated in this study had completed at least the seventh grade level of formal schooling. Sixty-eight percent had graduated from high school, with eight of those women (3.3% of participants) graduating from college, also. See Table 24 for data on education by flipchart used. The mean highest level of education achieved was 11.8 grade and the median was nearly the same at 12 grades completed. Therefore, half of the study participants had graduated from high school and half had not. Two individuals (0.8%) refused to answer the question on education level. There was no significant correlation between highest level of education achieved and posttest or change scores. This lack of significance is probably due to the relatively high level of education among women in this study. Only 1.8% of participants had less than a tenth grade education.

Table 24: Mean Knowledge Survey Scores by Level of Education of EFNEP Clients

Highest Level of Education (n=group 1, group 2)	Subjects (%) (n=240)	Group 1: Eating Right.. for Two	Group 2: Client-Adapted Language
		Mean Posttest Scores (±s.e.)	Mean Posttest Scores (±s.e.)
Grades 7-9 (n=2,8)	10 (4.2%)	3.5 ± 0.5	5.0 ± 0.7
Grades 10-11 (n=35,29)	64 (26.7%)	3.1 ± 0.3	5.7 ± 0.4
High School Graduate/GED (n=51,52)	103 (42.9%)	4.4 ± 0.3	6.0 ± 0.2
Some College/ Professional School (n=20,33)	53 (22.1%)	5.1 ± 0.3	6.0 ± 0.4
College Graduate (n=3,5)	8 (3.3%)	5.7 ± 1.3	4.4 ± 0.7
		Mean Change Scores (±s.e.)	Mean Change Scores (±s.e.)
Grades 7-9 (n=2,8)	10 (4.2%)	0.0 ± 1.0	1.5 ± 0.8
Grades 10-11 (n=35,29)	64 (26.7%)	0.3 ± 0.4	3.1 ± 0.5
High School Graduate/GED (n=51,52)	103 (42.9%)	1.3 ± 0.3	2.5 ± 0.3
Some College/ Professional School (n=20,33)	53 (22.1%)	0.4 ± 0.3	1.7 ± 0.1
College Graduate (n=3,5)	8 (3.3%)	1.0 ± 1.0	2.0 ± 0.9

2) Material Acceptability Survey

Responses to the Materials Acceptability Survey questions (Appendix J) have been tallied and frequencies of responses have been entered into Table 25 (questions 1-8), Table 27 (questions 9-11), Table 28 (question 12) and Table 31 (questions 15-19). Significant differences cannot be reported because the data are frequency data.

When frequency scores were combined into one category for "agree" plus "strongly agree" and one category for "disagree" plus "strongly disagree," group 2 scores were subtracted from group 1 scores to show differences in agreement (Table 26, questions 1-8).

Table 25: Frequency of Responses (Material Acceptability Survey, Questions 1-8)

Question/ Group[1] Group 1 (n=67) Group 2 (n=61)	Response Choices: Strongly Agree (%)	Agree (%)	Dis-agree (%)	Strongly Dis-agree (%)	No Opinion (%)
Easy to Understand					
Group 1	38.8	46.3	1.5	3.0	10.5
Group 2	41.0	55.7	3.3	0.0	0.0
Insulting					
Group 1	3.0	11.9	46.3	22.4	16.4
Group 2	3.3	11.5	42.6	34.4	8.2
Uses Similar Words					
Group 1	14.9	59.7	16.4	3.0	6.0
Group 2	24.6	59.0	11.5	1.6	3.3
Informative					
Group 1	19.4	65.7	10.4	0.0	4.5
Group 2	36.1	60.7	3.3	0.0	0.0
Easy to Read					
Group 1	20.9	29.9	1.5	3.0	44.7[2]
Group 2	19.7	23.0	3.3	0.0	54.1
Interesting					
Group 1	11.9	50.7	28.4	1.5	7.5
Group 2	26.2	45.9	11.5	3.3	13.1
Useful					
Group 1	19.4	59.7	7.5	0.0	13.4
Group 2	32.8	59.0	3.3	1.6	3.5

Table 25 (continued)

Answered my Questions					
Group 1	11.9	44.8	10.4	0.0	32.9
Group 2	24.6	54.1	8.2	0.0	13.1

1. Group 1=Clients who used the EFNEP flipchart
   Group 2=Clients who used the Client-Adapted Language

2. Many participants declined to read the flipchart, but preferred to have the instructor read it to them.

Table 26: Differences in Frequency of Responses (Group 2 minus Group 1)

	Combined Response Choices	
Question	Strongly Agree + Agree	Strongly Disagree + Disagree
Easy-to-Understand	+11.6	-1.2
Insulting	-0.1	+8.3
Uses Similar Words	+9.0	-6.3
Informative	+11.7	-7.1
Easy-to-Read	-8.1	-1.2
Interesting	+9.5	-15.1
Useful	+12.7	-2.6
Answered My Questions	+22.0	-2.2

Therefore, a negative score in this table would indicate a higher percentage of women who used the "Eating Right...for Two" flipchart agreed or disagreed with the statement and a positive score would indicate a higher percentage of women who used the Client-Adapted Language flipchart agreed or disagreed with the statement.

Results of the Material Acceptability Survey showed that 11.6% more clients agreed that the Client-Adapted Language flipchart was easy to understand compared to the percentage of clients who thought that the original EFNEP flipchart was easy to understand. This "ease of understanding" might refer to how easy the flipchart is to understand when the words are read to the client because this result is opposite to the result of the question on how

easy the flipchart is to read. It is possible that the instructors' familiarity with the "Eating Right...for Two" flipchart might have played a role in how easy a flipchart was to understand. Although the instructors were asked to read the flipcharts, they might have paraphrased some of the text because they had previously taught the same lesson many times.

When responses to the statement, "The flipchart is easy to understand" were considered by the education level of participants, most clients from every educational level agreed or strongly agreed with the statement. As would be expected, more clients (4.8%) with a high school education or less disagreed with the statement than clients with some college or professional school (2.9%). Responses grouped by age showed more agreement among individuals over 25 years of age (97.9% agreed or strongly agreed) that the flipchart was easy to understand compared to participants 25 years of age or less (84.6% agreed or strongly agreed). When responses were further divided by education level or age and by flipchart used, there was little difference in client agreement of the understandability of the flipchart between "Eating Right...for Two" and the Client-Adapted Language flipchart at each education level or age group.

More clients (8.1%) agreed that the original flipchart was easy-to-read compared to the percentage of clients that thought the Client-Adapted Language flipchart was easy to

read. Although 50.8% of group 1 and 42.7% of group two thought that the flipcharts were easy to read, 44.7% of group one and 54.1% of group two never read the flipchart. The reasons for not reading the flipchart were not stated by the participants, however, instructors in some counties do not routinely let clients read the flipchart and might have discouraged clients from doing so during this project. The clients who chose to read the flipchart might have volunteered because they are better readers, therefore, the percentage of women who reported the flipchart was easy to read might be inflated compared to the opinion of Michigan EFNEP women in general.

When responses were divided by education level, similar numbers of individuals who had completed $\leq$ 12 years of school and individuals who had completed >12 years of school agreed with the statement, "The flipchart is easy to read." This result is not surprising because according to the results of the SORT in the preliminary phase of this research, education level achieved and reading levels are not correlated.

When responses were further divided by flipchart used, more women with less than a high school education (11.6%) agreed that "Eating Right...for Two" was easy to read compared with 3.9% of women who thought that the Client-adapted Language flipchart was easy to read. These numbers were reversed for women with a post-high school education.

Less highly educated women (5.5%) agreed that "Eating Right...for Two" was easy to read compared to the number that agreed that the Client-Adapted Language flipchart was easy to read (7.8%).

Whether or not a flipchart is easy-to-read might seem irrelevant because the flipchart is often read to the client. However, the process of using client language could be repeated to make handouts or other materials for clients to read. In this case, developers should be aware that using client language does not necessarily produce text that is easier for the client to read. Both readability formulas and the Readability Scorecard might be used to assess the readability of new written text.

Nitzke (1987) developed a nutrition pamphlet using a process similar to the one used to develop the Client-Adapted Language flipchart. She found that the newly developed pamphlet was actually more difficult to read than the original pamphlet, but the readers found the new pamphlet understandable and more personally relevant than the original pamphlet.

Less than 16% of the clients in this study thought that either flipchart was insulting; however, more clients (8.3% more) disagreed that the Client-Adapted Language flipchart was written in insulting language, despite the fact that several clients reported not liking the words "thing" and "stuff" (Appendix Q). Shepard et al. (1994) reported that

consumers prefer informal writing. When 28 adults (25% with college degrees) evaluated nutrition education materials, the least formal writing style was rated most preferred compared to more formal or scientific styles. The clients who commented that the words "thing" or "stuff" were insulting in the Client-Adapted Language flipchart were all young (≤ 26 years of age) and had less than a high school education. The older, more educated women tended to comment on the flipchart as a whole and not specific words.

More clients (9% more) agreed that the Client-Adapted Language flipchart used words similar to the words they used. However, both flipcharts scored high in this area with >74% of clients agreeing that either flipchart used words similar to their own, despite the fact that only the Client-Adapted Language flipchart used exact quotes from an EFNEP-eligible population. The original EFNEP flipchart language was pilot-tested with clients; therefore, scores would be expected to be high in this area. When responses to this question were divided into categories by age, education level or race there was little difference between groups.

When responses to this statement were further divided by age and by flipchart used, there was little difference between responses of younger compared to older women. However, more African American women agreed that the Client-Adapted Language flipchart used words similar to their own

(41.3%) compared to "Eating Right...for Two" (34.8%). Different results were seen among white women who agreed that "Eating Right...for Two" contained similar language to their own (47.0%) compared to the Client-Adapted Language flipchart (40.7%). The Client-Adapted Language flipchart was written using quotes from both African American and white women. Although the data shows differences in opinions among racial groups, many women (>30%) from each race chose either flipchart. It would be difficult to justify producing race or ethnic-specific materials for native english speakers based on this data.

Furthermore, the Client-Adapted Language flipchart was viewed by a higher percentage of clients as being informative (11.7% more agreement), interesting (9.5% more agreement), useful (12.7% more agreement) and answered more client questions on nutrition (22% more agreement). Over 15% more clients <u>disagreed</u> that EFNEP's "Eating Right...for Two" was interesting compared to the percentage of women who disagreed that the Client-Adapted Language flipchart was interesting. When responses to the question, "The flipchart helped me learn about nutrition information" were divided by pregnancy status, non-pregnant women found the flipchart they used more informative (95.4% vs. 85.3%), more interesting (76.3% vs. 69.7%) and more useful to pregnant women (95.1% vs. 85.3%). Pregnant women might be more discriminating than non-pregnant women in choosing or

evaluating educational materials.

When responses were divided by education level and flipchart used, a greater number of the less educated women (≤ 12th grade) agreed that "Eating Right...for Two" was informative (37.5%) and useful (36.6%) compared to women who used the Client-Adapted Language flipchart (28.9% agreed informative, 28.9% agreed useful). The opposite result was found among women with a post-high school education where more women agreed that the Client-Adapted Language flipchart was informative (52.7%) and useful (52.1%) compared to "Eating Right...for Two" (46.4% and 50.6%, respectively).

Both flipcharts had 20 pages of written text and 18 point type. Of the clients who responded to questions 9, 10 and 11 on the Material Acceptability Survey (Table 26), most respondents thought both flipcharts had the correct number of pages (68.2%, Group one and 73.8%, Group two), was "O.K." in appearance (65.1%, Group one and 66.7%, Group two), and had about the right size print (69.5%, Group one and 80.3%, Group two).

Table 27: Frequency of Responses (Material Acceptability Survey, Questions 9-11--Length, Appearance and Print Size)

	Response Choices			
Question/Group[1]	too long (%)	too short (%)	about right (%)	no opinion (%)
9) No. of Pages				
Group 1 (n=66)	18.2	4.5	68.2	9.1
Group 2 (n=61)	14.8	1.6	73.8	9.8
	too crowded	too much space	is O.K.	
10) Appearance				
Group 1 (n=63)	0.0	6.3	65.1	28.6
Group 2 (n=57)	1.8	3.5	66.7	28.0
	too large	too small	about right	
11) Print Size				
Group 1 (n=59)	6.8	0.0	69.5	23.7
Group 2 (n=61)	4.9	0.0	80.3	14.8

1. Group 1=Clients who used the EFNEP flipchart
   Group 2=Clients who used the Client-Adapted Language flipchart

Over 14% of the clients responded that 20 pages were too many, whereas, less than 5% thought that number of pages was too few. The type size (18 point) is a large size type, increasing the readability of the flipchart. Most clients thought this size was about right (>69%), less than 7% thought this size might be too large, and no one thought that the print was too small. Not surprisingly, all responses that the print size was too large were from women less than 30 years of age. Researchers have reported that

12 point or larger types are easier to read (Doak et al., 1985) and consumer groups evaluating nutrition education materials preferred large (12 to 16 point) types, also (Shepard et al., 1994).

The appearance of the flipchart did vary slightly between the two versions, with the Client-adapted Language flipchart having more words (708 words compared to 617 words in "Eating Right...for Two." However, only 1.8% of the women who used the Client-Adapted Language flipchart thought that it looked too crowded, whereas, 6.3% of the women who used the "Eating Right...for Two" version thought that the latter flipchart had too much blank space. The majority of women (>65%) thought the appearance of both flipcharts was O.K. Similar results were reported by Shepard et al. (1994) who found consumers prefer "a good deal of white space" because it helps you organize the material and too much text is intimidating. These researchers report that the ideal amount of white space for maximum readability is unknown.

Pictures

The next question addressed the pictures which were the same for both flipcharts. When asked to select an answer from several choices to the closed-ended question, "The pictures in the flipchart are _____," most of the responses were positive (Table 28). Many of the women thought the pictures helped them understand the nutrition

information (52.3% of respondents), were interesting (32.8% of respondents) and held their attention (25.0% of respondents). Fewer women thought the pictures could have been left out (11.7% of respondents) and even fewer viewed the pictures as insulting (5.5% of respondents). Although few women selected the negative responses to this close-ended question, some negative responses about the pictures that were written as comments to other questions (e.g. ugly, outdated, etc.) were not among the answer choices for this question. More women might have viewed the pictures negatively, but could not find the appropriate answer choice to express their feelings.

There were some interesting results when responses to the questions about the pictures were divided by education level. A greater percentage of women with less than a tenth grade education thought the pictures were interesting (44.4%) and understandable (66.7%) compared to women with a high school education (28.6% and 41.7%) or post high school education (25.7% and 51.4%). Also, more of the less educated women found the pictures insulting (11.1%) compared to women with a post high school education (0%). In this case, the less educated women seemed to be more opinionated, regardless of whether their opinions were positive or negative. According to Shepard et al. (1994), consumers prefer realistic drawings, paintings or color photographs in nutrition education materials. These researchers report

that common foods should be used in pictures compared to exotic or expensive foods, so consumers understand that good nutrition is affordable.

Table 28: Frequency of Responses (Material Acceptability Survey, Question 12--Pictures)

Characteristics of Pictures (Question 12)	Frequency of Responses (EFNEP Materials)[1] (%)
Interesting (n=42)	32.8
Helped Me Understand Information (n=67)	52.3
Insulting (n=7)	5.5
Could Have Been Left Out (n=15)	11.7
Held My Attention (n=32)	25.0

1. Pictures are the same on both flipcharts.

These results seem to contradict the result of the written comments about the pictures (Table 29). In the written comments, women responded with nearly twice as many negative comments as positive comments. Some of the negative responses referred to the pictures as outdated, insulting, unrealistic, old "crud", ugly, boring and in need of improvement (60% of responses, 20% of women). It appears that either question 12 did not address the problem or that the pictures were not perceived as negatively as the written comments would lead the reader to believe. The women who did not like the pictures might have been more motivated to

write out their comments than the women who were satisfied with the present pictures.

Written Responses: Material Acceptability Survey

The principal investigator reviewed the written responses to questions 2, 10, 12 and 13 in the Material Acceptability Survey and has summarized them in narrative form. Although over 14% of clients who used either flipchart agreed that the flipchart was insulting, very few clients (<8%) responded with written comments to the question, "Which part of the flipchart was insulting?" Some comments were very general, simply stating that the writing (one respondent who used "Eating Right...for Two") or pictures (two respondents who used either flipchart) were insulting. Of the clients who used the Client-adapted Language flipchart, three women (4.9%) commented that the words "thing" or "stuff" sounded unprofessional when used in a flipchart.

Sixteen of 128 women (12.5%) responded to question 10 "The appearance of the flipchart could be improved by _____ _____." Most responses (87.5%) addressed concerns over the quality of the pictures and not the writing. Fourteen women stated that the pictures needed to be improved, updated or made more realistic. One woman noted that a prescription bottle in one picture was dated

1985. Other comments included that the flipchart was O.K. as is (one response) or that the flipchart needed more color (one response).

Table 29: Written Responses About Flipchart Pictures[1]

Comment	Number of Responses (n=43)	Percent of Responses
Outdated/Old crud	8	6.3%
Simple	3	2.3%
Helpful/Useful	3	2.3%
Easy to look at	1	0.8%
O.K.	8	6.3%
Ugly	2	1.6%
Childish/Insulting	7	5.5%
Necessary	1	0.8%
Boring	1	0.8%
Not realistic	3	2.3%
Colorful	2	1.6%
Educational/Informative	1	0.8%
Self-explanatory	1	0.8%
Didn't catch attention	1	0.8%
Upside down	1	0.8%

1. The pictures are the same for both flipcharts.

Thirty three percent of 128 women responded to question 12, "The flipchart pictures are _____ _____." There were approximately twice as many negative as positive comments. Comments were grouped by subject and appear in Table 29. The most common negative responses to the pictures were that the pictures were outdated (18.6% of responses) or childish (16.3% of responses). However, 18.6% of responses did classify the pictures as O.K. as is. One woman wrote that the pictures were "the best that could be expected." Another woman wrote that the pictures were upside down. However, the pictures would have been right side up if she had used the flipchart as it was intended.

Illustrations and diagrams that successfully portray the message in the text have repeatedly been shown to have a positive affect on retention of information (Tajika et al., 1988). Mayer (1989) found that diagrams within a lesson helped students answer problem-solving questions and were most useful to students of low aptitude or with low prior knowledge. Doak et al. (1985) recommend simple illustrations to decrease reading time for poor readers, emphasize important points and provide motivation. Simple drawings were found to be effective when the instructor controls viewing time, but photographs were found to be more effective than drawings when the reader has the control over her viewing time (Doak et al., 1985). Therefore, the Michigan EFNEP participants might benefit from new

illustrations or diagrams in the "Eating Right...for Two" flipchart and photographs to accompany handouts left with the client to aid in understanding the specific objective being taught.

Table 30: Written Responses About Improving the Flipcharts

Comment	EFNEP Flipchart No. Responses (%)	Client-Adapted Language Flipchart No. Responses (%)
Make more interesting	2 (3.0%)	1 (1.6%)
Like as is	4 (6.0%)	6 (9.8%)
Don't use flipchart	1 (1.5%)	0 (0.0%)
Make easier	3 (4.5%)	0 (0.0%)
Make harder/more detailed	2 (3.0%)	2 (3.3%)
Change wording	1 (1.5%)	0 (0.0%)
Add more pictures	0 (0.0%)	1 (1.6%)
Comments didn't answer question	4 (6.0%)	1 (1.6%)
Improve/update pictures	10 (14.9%)	10 (16.4%)

Of the women who wrote comments on the Material Acceptability Survey, more women (37.5%) responded to question 13, "How could the flipchart be improved?" than to any other question. Of the women who used "Eating Right...for Two," 27 women (40.3%) wrote comments with ten of those (37% of comments) commenting that the pictures

should be updated, made more realistic or otherwise improved. Likewise, of the women who used the Client-Adapted Language flipchart, 21 women (34.4%) made written comments of which ten (47.6% of comments) responded that the pictures should be updated, made more realistic or otherwise improved. As expected, the response frequencies were similar with either flipchart because the pictures were exactly the same.

The comments from question 13, "How can the flipchart be improved?," were grouped into categories by subject and appear in Table 30. When participants were asked this question, the number of responses that pertained to the pictures exceeded the number of responses to question 12, which asked specifically about the pictures. After reading question 12, the women might have been thinking about the pictures when answering question 13 about how to improve the flipchart. In all (responses from question 12 and 13), there were 63 comments about the pictures with 46 (73.0%) of those comments being negative (i.e. old, outdated, boring, not realistic).

Over 14% of the responses indicated that the women liked the present flipchart as it is, but twice as many (28.5%) liked the Client-Adapted Language flipchart. Two users of either flipchart asked to make the flipchart more difficult, and three users of the "Eating Right...for Two" flipchart requested that it be made easier. One woman who

used "Eating Right...for Two" stated that no flipchart should be used. Other comments included making the "Eating Right for Two" flipchart more interesting (n=2, 7.4% of comments) or changing the wording (n=1, 3.7% of comments). Client-Adapted Language flipchart users thought the flipchart could be more interesting (n=1, 4.8% of comments) and that more pictures could be added (n=1, 4.8% of comments).

Materials Acceptability Survey: Handout Acceptability

Of the 128 participants provided with the handouts to read on their own time, about 62% reported that they had read at least one of the four: Iron (55.4%), Folic Acid (50.7%), Protein/Calcium (56.2%) and Discomforts During Pregnancy (48.4%). A majority of the women who read the handouts thought that they were easy to read (>89%) and easy to understand (>89%) (Table 30). However, it is quite possible that the better readers actually read the handouts and the poorer, less interested readers did not. The handouts have 7th or 8th grade reading levels according to the Flesch formula, making them easy to read for about half of the EFNEP population which has a median reading skill level of 8.3. In addition to an appropriate reading grade level, all four handouts scored in the highest range (17-20 points) on the Readability Scorecard (Table 13), suggesting that the handouts contain many characteristics of

readability.

Many of the clients thought that all four of the handouts were useful (>80%) and the handouts on iron, folic acid and protein/calcium were nutritionally informative (70.8 to 76.9%). The handout, Discomforts During Pregnancy, scored lower regarding nutrition information (43.5%), probably due to the fact that it focuses on problems during pregnancy that are not specifically nutrition-related. The Folic Acid handout was reported to be the most interesting (73.8%), and most useful (86.2%), followed by Discomforts During Pregnancy in which 64.5% of respondents classified it as interesting and 85.5% as useful.

Table 31: Frequency of Responses (Material Acceptability Survey, Questions 15-19--Handout Acceptability)

	"Eating Right...for Two" Handouts			
Question	Iron (n=71)	Folic Acid (n=65)	Protein/ Calcium (n=72)	Discomforts (n=62)
15. Easy to Understand	94.4%	89.2%	90.3%	95.2%
16. Easy to Read	91.5%	89.2%	90.3%	93.5%
17. Informative	74.6%	76.9%	70.8%	43.5%
18. Interesting	56.3%	73.8%	51.4%	64.5%
19. Useful	83.1%	86.2%	80.6%	85.5%

3) Materials Comparison Survey Data about material preferences have been grouped into three categories according to the three possible responses ("Flipchart X", "Flipchart Y" and "About the same"; Appendix I) to each survey question (questions 1-7). The frequency of responses for each item are presented in Table 32.

Table 32: Frequency of Responses (Comparison Survey)

Question	Flip X	Flip Y	About the same
1) Easier to Understand (n=136)	27.2%	30.9%	41.9%
2) Uses More Words That I Would Use (n=137)	35.0%	29.2%	35.8%
3) More Useful (n=137)	24.8%	19.0%	56.2%
4) Easier to Read(n=50)[1]	26.0%	36.0%	38.0%
5) More Interesting (n=138)	27.4%	18.5%	54.0%
6) More Helpful (n=137)	30.7%	31.4%	38.0%
7) Women in EFNEP Would Like Better (n=137)	36.5%	28.5%	35.0%

1. Participants were given the option to read the flipchart or have it read to them. Most participants chose not to read the flipchart.

When EFNEP clients were given the two flipcharts ("Eating Right...for Two" and Client-Adapted Language) to compare using the Materials Comparison Survey, many of the women responded that the two flipcharts were about the same

in the areas of usefulness (56.2%) and interest (54.0%). These results might indicate that both flipcharts are equally useful rather than equally not useful, because in the Material Acceptability Survey 79.1% of women who used "Eating Right...for Two" agreed that it was useful and 91.8% of women who used the Client-adapted Language flipchart agreed that this flipchart was useful. A majority of women agreed that the flipcharts were interesting, as well as useful. Nearly 63% of women who used "Eating Right...for Two" agreed that it was interesting and 72.1% of Client-Adapted Language flipchart users agreed that this flipchart was interesting, also.

The Client-Adapted Language flipchart was thought to be easier to understand by more women (30.9%) compared to "Eating Right...for Two" (27.2%), but again more women thought the two flipcharts were about the same in the area of understandability (41.9%). The Material Acceptability Survey showed that both flipcharts are easy to understand according to 85.1% of women who used "Eating Right...for Two" and 96.7% of women who used the Client-Adapted Language flipchart.

Fewer women thought that the Client-Adapted Language flipchart (29.2%) contained language similar to their own compared to "Eating Right...for Two" (35.0%). About a third of the participants (35.8%) thought that both flipcharts contained similar language, despite the fact that the

Client-Adapted Language flipchart contained direct quotes from an EFNEP-eligible population. However, the "Eating Right...for Two" flipchart was pilot-tested with EFNEP clients to improve language understandability. Comparing these results to the results of the Material Acceptability Survey, the Material Acceptability Survey showed high percentages of clients thought that either flipchart used language similar to their own (74.6% for "Eating Right...for Two" and 83.6% for Client-Adapted Language).

More women perceived the Client-Adapted Language flipchart as easier to read (36.0%) compared to "Eating Right...for Two" (26.0%), yet 38% of the clients thought there was little difference in readability between the two flipcharts. The flipcharts are written at different reading grade levels, with "Eating Right...for Two" being one grade higher (Flesch score = 8th grade, Fry score = 7th grade) according to the Flesch and Fry formulas. The majority of participants in the study (60.9%) did not read the flipchart, so this data might not be useful in evaluating readability of the flipcharts for the EFNEP population. It is possible that this large group of women might have contained poorer readers who might have been more sensitive to differences in the readability of the flipcharts. When given handouts to read about 62% of participants read at least one of four handouts. Although many women did read the handouts, Michigan EFNEP should be aware of the large

segment of their population that might not benefit from reading material left with the client.

The results of the Material Acceptability Survey showed 50.8% of women who read "Eating Right...for Two" agreed that it was easy to read and 42.7% of women who read the Client-Adapted Language flipchart agreed that this flipchart was easy to read. However, similar to the Materials Comparison Survey results, >60% of participants did not read either flipchart.

Nearly equal groups of women selected the Client-Adapted Language flipchart or "Eating Right...for Two" or "About the same" to answer the question on which flipchart would be more helpful to women in EFNEP. However, more women (36.5%) thought that EFNEP clients would like "Eating Right...for Two" better than the Client-Adapted Language flipchart (28.5%). Over one-third of the women (35.0%) thought that women in EFNEP would like either flipchart about the same.

In addition, data have been grouped into 6 categories according to the responses to the survey questions ("Flipchart X", "Flipchart Y" and "About the same" and to which set of materials the client used first (EFNEP or Client-Adapted Language materials, See Table 33).

Table 33: Responses to Comparison Survey Questions, Reported by the Order of Use of the Materials

Question/Group[1]	Flip X(%) (Eating Right...for Two)	Flip Y (%) (Client-Adapted Language)	About the same (%)
1) Easier to understand			
Group 1 (n=70)	25.7	32.9	41.4
Group 2 (n=66)	28.8	28.8	42.4
2) Uses more words that I would use			
Group 1 (n=71)	38.0	29.6	32.4
Group 2 (n=66)	31.8	28.8	39.4
3) More useful			
Group 1 (n=70)	24.3	15.7	60.0
Group 2 (n=67)	25.4	22.4	52.2
4) Easier to read			
Group 1 (n=26)	33.3	33.3	33.3
Group 2 (n=24)	17.4	39.1	43.5
5) More interesting			
Group 1 (n=71)	21.3	14.8	63.9
Group 2 (n=53)	33.3	22.2	44.4
6) More helpful			
Group 1 (n=71)	22.9	34.3	42.9
Group 2 (n=66)	38.8	28.4	32.8
7) Women in EFNEP would like better			
Group 1 (n=71)	31.0	33.8	35.2
Group 2 (n=66)	42.4	22.7	34.8

1. Group 1=Clients who used the EFNEP flipchart first
Group 2=Clients who used the Client-Adapted Language flipchart first

Which flipchart the client used first (either "Eating Right...for Two" or the Client-Adapted Language flipchart), did not make a difference as to which flipchart the client selected as easier to understand, using more similar words to her own, more useful, easier to read, more interesting, more helpful or better for women in EFNEP (Table 33). The average frequencies of clients who (numbers are not significantly different at $p<.05$ level):

used flipchart X first and chose X = 28.1 $\pm$ 0.3%
used flipchart Y first and chose Y = 27.5 $\pm$ 0.3%
used flipchart X first and chose Y = 27.8 $\pm$ 0.7%
used flipchart Y first and chose X = 31.1 $\pm$ 0.7%

Written comments from the Comparison Survey (question 8, "Do you see any other differences between Flipchart X and Flipchart Y?") have been summarized and reported. Of 138 people who completed the survey, 45 made written comments (32.6%). Fourteen people (31.1% of comments) simply stated that the wording was different. One woman reported that the two flipcharts were the same. Other comments are divided by flipchart and are listed in Table 34.

Table 34: Written Responses about Differences Between Flipcharts

Comment	Flipchart X(%) Eating Right... for Two	Flipchart Y(%) Client-Adapted Language
Easier to Understand	2.2	2.2
More for adults	6.7	0.0
Better for young mothers	0.0	15.5
Less professional	0.0	4.4
More information/ longer/addressed specific subjects	2.2	13.3
Feels better/more personable	2.2	4.4
Shorter/less information	6.7	0.0
Better grammar	2.2	0.0
Talked down to/childish	0.0	4.4

Most written comments on the Materials Comparison Survey addressed two subjects: the appropriate audience for the flipchart and which flipchart had more information. Three women (6.7% of comments) thought flipchart X ("Eating Right...for Two") was more appropriate for adults and 15.5% of the women who made written comments thought younger mothers or teenage mothers would prefer flipchart Y (Client-Adapted Language flipchart). The women who thought the flipchart was appropriate for younger, teenage women were all over 25. Possibly, they thought the Client-Adapted Language Flipchart was less professional or more childish

and, therefore, more suitable to younger or less educated women.

Many women (13.3% of comments) thought that the Client-Adapted Language Flipchart contained more information on subjects such as nutrition, weight gain and smoking. One woman thought "Eating Right...for Two" had more information on pregnancy in general, whereas, three women (6.7% of comments) thought that this flipchart had less information compared to the Client-Adapted Language Flipchart. In reality, both flipcharts were 20 pages in length, but "Eating Right...for Two" had fewer words (617) compared to 708 words in the Client-Adapted Language Flipchart. Overall, more comments were positive (68.4% of comments on "Eating Right...for Two" and 80.0% of comments on the Client-Adapted Language Flipchart) than negative (31.6% of comments on "Eating Right...for Two" and 20.0% of comments on the Client-Adapted Language Flipchart) for either flipchart.

In addition to summarizing written comments, mean overall scores (numbers between zero and 100 given by clients to rate the flipcharts) for both flipcharts have been calculated (question 9). Women gave each flipchart a score after using both flipcharts and comparing them. The only criteria given on which to base the scores were that "zero=terrible" and "100=wonderful". The mean score given to "Eating Right...for Two" was 67.1 $\pm$ 2.3 (S.E.M.) and the

Client-Adapted Language Flipchart was 70.1 ± 2.1 (S.E.M.). A paired T-test indicated that these two scores are not significantly different ($p<.05$). For both flipcharts the median score was 75 and the range of scores given was 9 to 100. Many women (31.3%) assigned both flipcharts identical overall scores. Frequency of scores given are listed in Table 35.

Table 35: Frequency of Overall Flipchart Scores

Range of Scores	Eating Right...for Two (n=112)	Client-Adapted Language (n=128)
0-25	13 (11.6%)	10 (7.8%)
26-50	38 (33.9%)	33 (25.8%)
51-75	17 (15.2%)	23 (18.0%)
76-100	44 (39.3%)	62 (48.4%)

Correlation coefficients were determined to compare Comparison Survey overall scores to Knowledge Survey posttest scores and Knowledge Survey change scores. The data are presented in scattergrams (Figures 5, 6, 7 and 8). Client scores for either flipchart X or flipchart Y are positively correlated ($p<.01$) to Knowledge Survey posttest scores, but not to Knowledge Survey change scores. The correlation coefficients are:

Flipchart X and posttest scores r=.2155
Flipchart X and change scores r=-.0588
Flipchart Y and posttest scores r=.2164
Flipchart Y and change scores r=.1789

The EFNEP clients who were more knowledgeable about nutrition during pregnancy (higher posttest scores) gave the flipcharts higher overall scores compared to clients who were less knowledgeable (lower posttest scores), regardless of the flipchart used. However, the clients who greatly increased their nutrition knowledge (higher change scores) did not necessarily rate the flipchart higher than the clients who increased their knowledge to a lesser extent (lower change scores).

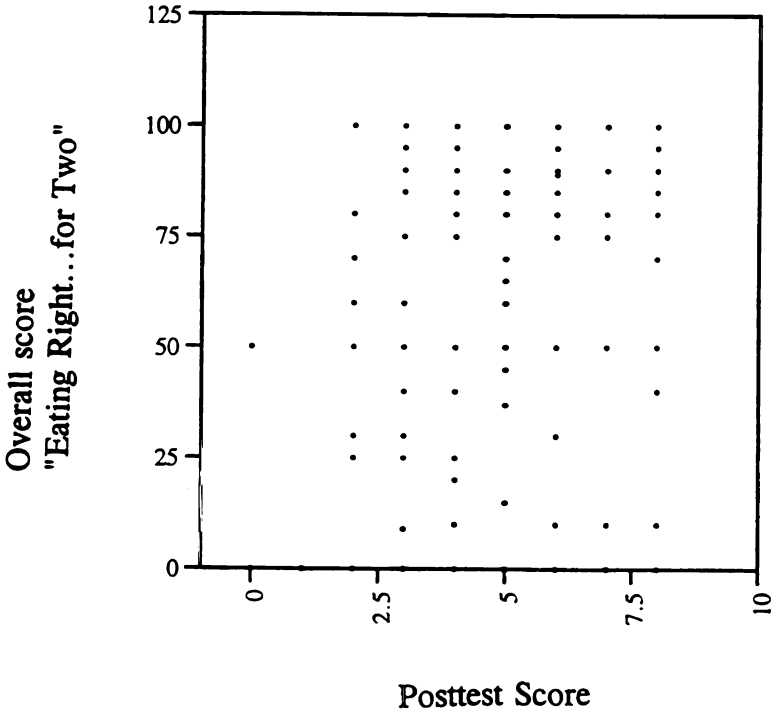


Figure 5. Comparison Survey Overall Scores for "Eating Right...for Two" vs. Knowledge Survey Posttest Scores

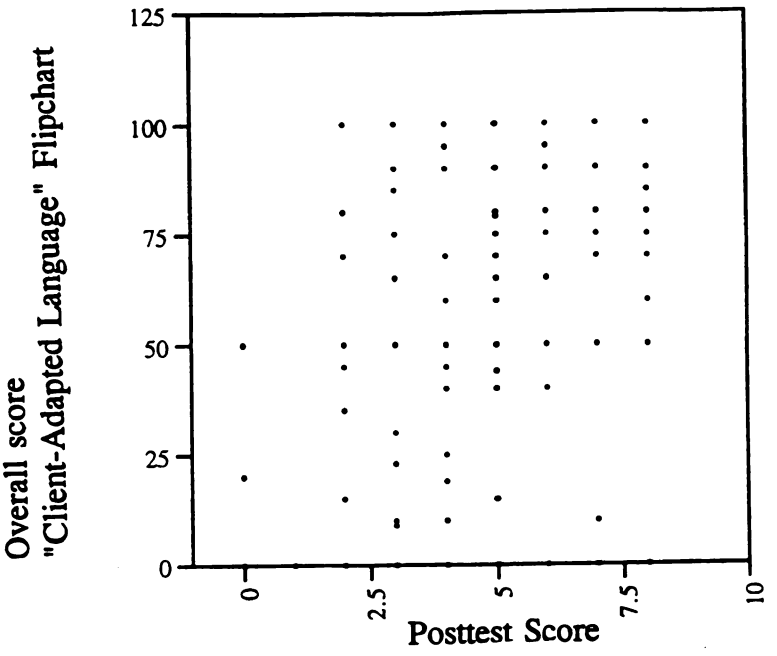


Figure 6. Comparison Survey Overall Scores for the Client-Adapted Language Flipchart vs. Knowledge Posttest Scores

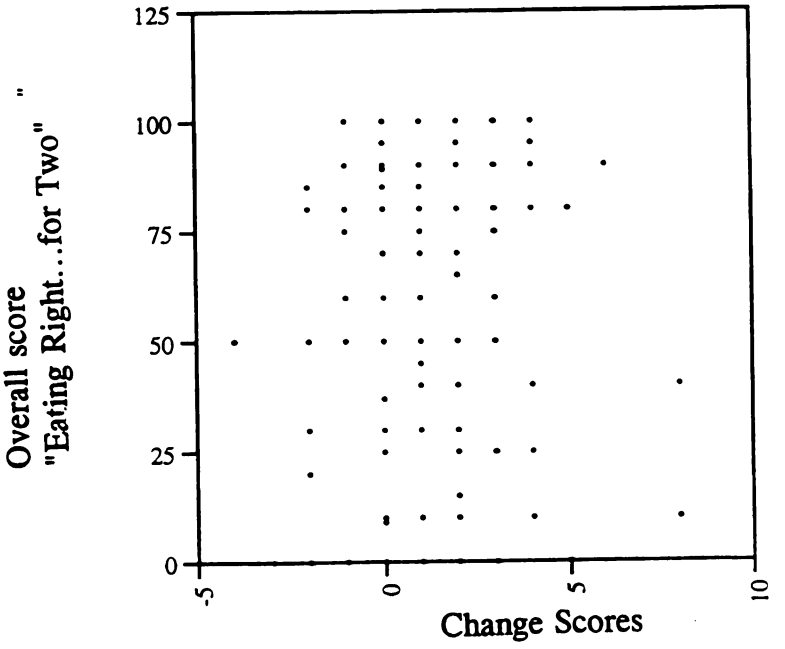


Figure 7. Comparison Survey Overall Scores for "Eating Right...for Two" vs. Knowledge Survey Change Scores

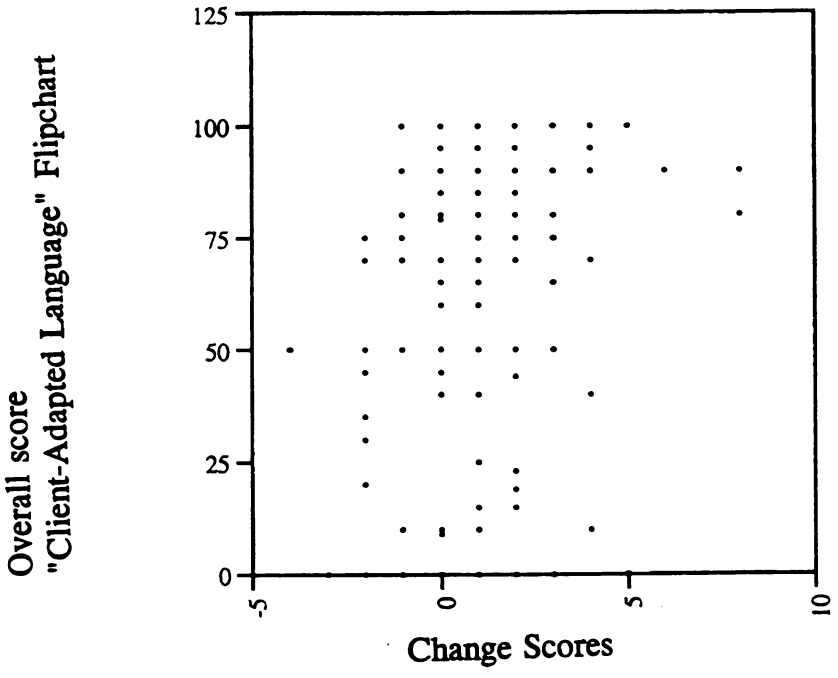


Figure 8. Comparison Survey Overall Scores for the Client-Adapted Language Flipchart vs. Knowledge Survey Change Scores

V. Benefits, Strengths and Limitations of the Study

Benefits

From the results of this study, EFNEP program planners and staff have become aware of the average reading level of a sample of its population and have received detailed information about the readability of its written materials in the area of maternal nutrition. The organization administrators can use this information when making changes in existing materials or purchasing new materials in the future. Procedures followed in the material development phase, could be followed to revise other EFNEP lessons. Michigan EFNEP has been provided with all materials produced during this project for use in teaching pregnant women about nutrition. Furthermore, Michigan EFNEP clients who are pregnant will have access to acceptable, informative written materials at an appropriate reading grade level. Finally, information gathered in the study will be useful to other nutrition educators who are interested in assessing the readability of nutrition education materials or in producing written materials at the appropriate literacy level for particular populations.

Strengths and Limitations

According to Fitz-Gibbon and Morris (1987), the critical characteristic of an evaluation is that it provides the best possible information that could have been collected under the circumstances at the time of the research. In this study, several steps were taken to increase the strengths of the research design and increase the validity and usefulness of the results.

A. The Research Design

The greatest strength of this study lies in the research design. Participants were selected from five Michigan counties and randomly assigned to one of two treatment groups (Research Procedures). Although the sample selection does not involve random selection from all Michigan counties, all new clients in the selected counties were asked to participate and treatment assignment was random. This random assignment of clients to groups distributed the effects of individual differences between the two groups. Therefore, the change in knowledge scores between the pretest and posttest of the two groups could be compared because the groups were equivalent. This design provides information about change in knowledge within and between groups, while controlling several threats to validity. The effects of history, maturation, attrition, and regression were assumed to be distributed equally

between the groups because random assignment of subjects to groups was used.

Other threats to validity were addressed by this research design. Client anxiety during testing can interfere with obtaining valid results. Therefore, in the Preliminary Phase of this research, the SORT was given to women in their homes by their instructors to minimize embarrassment associated with limited reading skills. Also, in the Data Collection Phase, all surveys were administered individually by the EFNEP instructor in the client's home or regular meeting place to decrease anxiety. However, it was impossible to control for ringing telephones, noise from children, or other interruptions which could have decreased the attention clients gave to the surveys. Response bias, a bias due to the desire to please (Henerson et al., 1987) could have played a role in the results of the Materials Acceptability Survey. Greater than 70% of all clients agreed that the flipchart they used first was easy to understand, informative and useful, regardless of which flipchart they were given. Although respondents were told that responses would not affect their standing in EFNEP, individuals could have responded favorably in an effort to please the instructor or these results could reflect true quality and appropriateness of materials.

The issue of the validity of the test instruments was addressed, also. According to Morris et al. (1987) mistakes

made when scoring a test decrease the measure's validity. Therefore, steps were taken to decrease scoring errors. All scores were entered into a computer by the primary investigator and checked independently, by a second researcher to minimize discrepancies in scoring. All scores were entered in number form, eliminating subjective scoring. All instructors were trained in specific procedures for data collection to minimize variation in procedures or assistance to clients.

Ideally, the results of this study would be generalizable to the Michigan EFNEP population. The total sample size of the Data Collection Phase was intended to be 331 participants, large enough to generalize results to the Michigan EFNEP population as a whole. However, the length of time estimated to process each client was underestimated by the investigator and EFNEP, resulting in 240 participants. However, the results of this study are generalizable to the EFNEP population in the five participating counties in southern Michigan.

B. Test Instruments

Appropriate evaluation requires valid and reliable test instruments. Assessments of validity and reliability help to determine the amount of faith people can have in the results of an instrument (Morris et al., 1987). For the Preliminary Research Phase, a standardized instrument was

used (the SORT) that had been previously tested for validity and reliability (Appendix B). The scores obtained from the SORT test have been shown to correlate well with scores of the reading grade level of text. Therefore, text with a reading grade level of 6 would be appropriate for clients with a SORT score of 6. Limitations of the SORT include variations in administration and assistance of instructors. Instructors were trained in the administration of the SORT to minimize possible variations.

For the Data Collection Phase, three instruments were developed by the investigator (Knowledge, Material Acceptability and Materials Comparison Surveys) and tested for validity. The Knowledge Survey was tested for reliability, also.

Reliability can increase the usefulness of an instrument because it determines whether the instrument will yield consistent results. Reliability of an instrument pertains to the specific audience for which the instrument is tested. An instrument might prove reliable for one group, but not for another; therefore, there is a need to test the internal consistency of an instrument with the specific population with which it will be used (Fitz-Gibbon and Morris, 1987). In this research, internal consistency was determined by using a KR-20 formula on the results of the pilot test. For this assessment, the value of the score lies between zero and one with the higher score indicating a

higher correlation of test items. The Knowledge Survey had a score of .874, indicating a strong intercorrelation of test items.

Reliability is necessary, but alone it is not sufficient to justify the use of an instrument (Talmage and Rasher, 1981). Unless an instrument is valid for a specific purpose, a high reliability coefficient has little value. According to Morris et al., 1987, judgements of validity determine if the instrument assesses what is intended to be measured. In order to be valid, an instrument must match the depth and scope of its intended topic, must be reasonable and understandable to the target audience and must bear a measurable relationship to the characteristic it is intended to assess (Talmage and Rasher, 1981). All of these issues were considered in the development of test instruments for this research.

Construct validity, the extent to which you can be sure the instrument represents the subject of interest (Morris et al., 1987) was assessed for the Knowledge Survey by calculating a discrimination index of results of the pilot test. Items with a low score (<.33) would have been revised or omitted, but no items scored below .33. Difficulty of the items was assessed by calculating the percent of people who answered each question correctly (difficulty index). Only one item scored below 20% (difficult), but it was not removed or revised because it met the EFNEP objectives.

Content validity, the extent to which an instrument measures specific behaviors (Morris et al., 1987) was assessed through expert review. For the Knowledge Survey, competencies of the EFNEP curriculum "Eating Right...for Two" were obtained and used for the development of questions. Two questions were developed for each competency. All three surveys underwent expert review by six individuals with expertise in one or more of the following areas: familiarity with EFNEP, knowledge of nutrition in pregnancy, knowledge of data analysis or experience with survey development. In addition, all surveys were measured for readability and found to have Flesch scores $\leq$ 8.3, the median reading level of a sample of the Michigan EFNEP population.

C. Other Materials Developed by the Primary Investigator

The strengths of the materials produced by the primary investigator in the Materials Development Phase of the study (Client-Adapted Language flipchart, Readability Scorecard and Pica handout) included: participation of members of the target population in the wording of the Client-Adapted language flipchart, assessment of the materials for readability and expert review of content. Actual quotes from EFNEP-eligible pregnant women were used to develop the Client-Adapted Language flipchart. Nitzke (1987) found this method beneficial in developing a snack pamphlet for low-

income, low-literate mothers. She reported that the target audience found the pamphlet more personally relevant and readers were less likely to reject the information expressed in peer language than the same information expressed in the language of nutrition educators. In this study, the flipchart developed using peer language significantly increased maternal knowledge of nutrition in pregnancy.

In other studies, a serious disparity has been found to exist between the reading level of the target population and the skill required to read health-related materials (Freimuth, 1979; Meade et al., 1989). Therefore, in this study the Client-Adapted Language flipchart and Pica handout were written at or below the median reading level of a sample of the target population ($\leq$ 8.3 Flesch score) and other characteristics of readability not measured by formulas were assessed using the readability scorecard.

The Readability Scorecard, Client-Adapted Language flipchart and Pica handout underwent pilot-testing and/or expert review by individuals with expertise in the subject area. The Readability Scorecard was pilot-tested with graduate students to assess clarity of instructions, then underwent expert review by individuals with experience in readability: Dr. Jenny Bond, Dr. Anne Murphy, Ms. Char McKay and Ms. Pat Hammerschmidt. The Client-Adapted Language flipchart was produced and the wording reviewed for accuracy by Dr. Jenny Bond. The flipchart was not pilot-tested

because the research committee and the investigator felt that the major part of the study was testing the flipchart. However, pilot-testing might have been beneficial in detecting specific words that could have been offensive to the target audience.

In addition, a handout on pica was developed as an outgrowth of the Client-Adapted Language flipchart after EFNEP clients expressed an interest in the topic. The handout was written by the primary investigator and reviewed by Dr. Carolyn Lackey of North Carolina State University, an expert on the subject of pica.

RECOMMENDATIONS

Based on the results of this research, the primary investigator has several suggestions for the development and testing of nutrition education materials, training data collectors and future research.

A. Working within the EFNEP

This study was conducted with the assistance of several individuals at the Expanded Food and Nutrition Education Program at Michigan State University. This assistance was invaluable. However, the primary investigator did not have direct and regular contact with EFNEP workers in the counties during the planning of the project. Many questions arose during the planning of the data collection phase (i.e. Do clients ever read the flipchart? or How many clients can one instructor see in two months?) that could have been best answered by individuals working in the counties. Representatives from the counties would be an asset in planning the data collection because they could highlight differences between counties and give researchers an idea of what is a realistic timeline. In the future, researchers working with EFNEP clients might benefit from having county Extension home economists and instructors serve as an advising committee to be involved in the initial and on-going decision making process.

B. Pilot-Testing of Materials

The surveys used in this project were pilot-tested for understandability of the wording used, but the Client-Adapted Language flipchart was not pilot-tested. The research committee and the investigator felt that the testing of the flipchart was part of the data collection phase of the project. However, pilot-testing could have provided valuable information on whether the message in the material attracted attention, was understood, was personally relevant, was believable or offensive (USDHHS, 1982). Researchers have reported that developers of nutrition education materials should seek audience feedback on prototypes even when prototypes were developed with the help of the audience (Shepard et al., 1994). In the process any errors in translation of reported preferences can be corrected.

Several written comments (3.5%) were returned complaining about the insulting nature of specific words. These words could have given women using the flipchart a different perception of the writing than the same flipchart with the words changed to more acceptable wording. In the future, all materials developed by the researcher should be pilot-tested with the target audience. Pilot-testing only strengthens the actual research project.

C. Instructor Training

When working with an organization such as EFNEP, confidence in the validity of the data is only as good as the confidence in the individuals collecting the data. In this case, EFNEP instructors were trained by the investigator in data collection procedures to minimize variations that could threaten validity. During training questions arose in some counties as to why instructors or clients must read the flipchart to the client if they ordinarily paraphrased it. Other instructors expressed frustration because they thought the goal of the research project was to replace the original flipchart with the Client-Adapted Language flipchart and they had not been consulted about the development of the new material. Still other instructors complained about some of the wording as not sounding professional. The researcher explained that the idea was to test the process of using the clients' own words to make materials in the future and not to replace the existing flipchart or force instructors to read flipcharts in the future. The instructors were willing to follow the research procedures for data collection, but steps could have been taken to minimize the initial frustrations. Listed are some ideas for decreasing those frustrations in future research:

1) The material chosen to be tested should be one (i.e. a handout) that the client normally reads

anyway.

2) Instructors need to be involved in the development of materials by helping with collecting quotes or pilot-testing or playing some other role in the process.

3) Instructors need to be motivated to use materials that they might think are less than professional if the materials increase client knowledge of nutrition. County Extension home economists need to be consulted during project planning about the details of the project and encouraged to motivate their instructors.

4) Results of studies such as this one need to be shared with EFNEP program directors, county Extension home economists and instructors working with materials in the field to convince everyone involved of the benefits of the process of using client input to produce materials.

SUMMARY

The Client-Adapted Language flipchart consisted of 20 written pages of text on nutrition in pregnancy developed using direct quotes from EFNEP-eligible women in Kalamazoo County. When EFNEP women used this flipchart, their knowledge of nutrition in pregnancy increased to a greater extent than women using the original EFNEP "Eating Right...for Two" flipchart as indicated by significant differences in Knowledge Survey posttest and change scores. The age, race, highest level of education achieved, pregnancy status or number of babies delivered by the women seemed to have no bearing on Knowledge Survey outcomes. These results show promise for the future development of written materials for EFNEP clients of all ages, races and education levels using input from EFENP clients.

However, for EFNEP women to use written materials to increase their knowledge, the materials must be acceptable. Most study participants agreed that either flipchart was easy to understand, informative, easy to read, interesting, useful and answered their nutrition questions. The Client-Adapted Language flipchart scored slightly higher than the original "Eating Right...for Two" flipchart in all of these areas, and lower in the area of easy-to-read. Several women commented (3.5%) that the words "thing" and "stuff" used in the Client-Adapted Language flipchart were insulting or not

professional. In the future, problem words that might be perceived negatively should be weeded out during pilot-testing.

When the two flipcharts were compared many women thought that the flipcharts were about the same in the areas of understandability, usefulness, interest and helpfulness. More women chose "Eating Right...for Two" as the flipchart that women in EFNEP would like better than chose the Client-Adapted Language flipchart. The reasons for this choice as stated in the written comments included, "Eating Right...for Two is for more educated women" and "The Client-Adapted Language flipchart used slang and stuff." There were many positive written comments on the Client-Adapted Language flipchart, also. Women stated that it helped them understand the importance of weight gain, had more information, was more personable and was easier to understand. In the final survey question when women were asked to rate each flipchart from one to one-hundred, there was no significant difference between the two ratings.

The process of using quotes from members of a population to produce written materials for that population has a major advantage of producing understandable materials that can increase knowledge. The challenge now is to make everyday spoken language as acceptable as polished, more professional language that might not be as understandable, regardless of reading grade level. Some issues to be

addressed when repeating this process are:

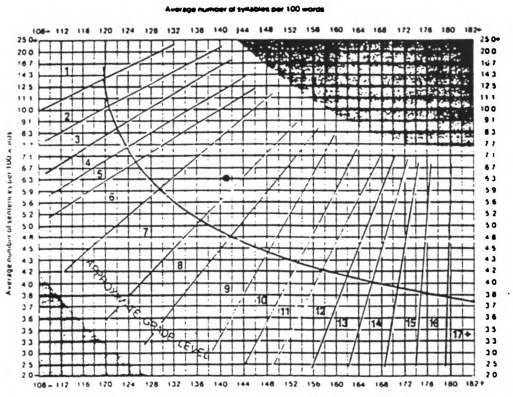
a) to pilot-test all materials, looking for specific words that might be perceived as insulting.

b) to motivate instructors to portray the materials in a positive light for the benefit of the client, regardless of personal desires for "professional" materials.

APPENDICES

APPENDIX A

Fry Graph



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:	SYLLABLES	SENTENCES
1st Hundred Words	124	6.6
2nd Hundred Words	141	5.5
3rd Hundred Words	158	6.8
AVERAGE	141	6.3

READABILITY 7th GRADE (see dot plotted on graph)

APPENDIX B

SORT Test

To find a child's raw score for reading, count the total number of words he was able to pronounce correctly in all lists and add the words below the starting list for which he automatically receives credit. To obtain the Reading Level, look up the value of this raw score in Table 1 below. A simple way to determine the Reading Level is to take half the raw score. For example, if the raw score were 46, half of this number would be 23 and the Reading Level would be 2.3 or the 3rd month of 2nd grade.

SCORE	GRADE	SCORE	GRADE	SCORE	GRADE	SCORE	GRADE
0-1	0.0	26-27	1.3	52-53	2.6	78-79	3.9
2-3	0.1	28-29	1.4	54-55	2.7	80-81	4.0
4-5	0.2	30-31	1.5	56-57	2.8	82-83	4.1
6-7	0.3	32-33	1.6	58-59	2.9	84-85	4.2
8-9	0.4	34-35	1.7	60-61	3.0	86-87	4.3
10-11	0.5	36-37	1.8	62-63	3.1	88-89	4.4
12-13	0.6	38-39	1.9	64-65	3.2	90-91	4.5
14-15	0.7	40-41	2.0	66-67	3.3	92-93	4.6
16-17	0.8	42-43	2.1	68-69	3.4	94-95	4.7
18-19	0.9	44-45	2.2	70-71	3.5	96-97	4.8
20-21	1.0	46-47	2.3	72-73	3.6	98-99	4.9
22-23	1.1	48-49	2.4	74-75	3.7	100-101	5.0
24-25	1.2	50-51	2.5	76-77	3.8	102-103	5.1

SCORE	GRADE	SCORE	GRADE	SCORE	GRADE
104-105	5.2	130-131	6.5	156-157	7.8
106-107	5.3	132-133	6.6	158-159	7.9
108-109	5.4	134-135	6.7	160-161	8.0
110-111	5.5	136-137	6.8	162-163	8.1
112-113	5.6	138-139	6.9	164-165	8.2
114-115	5.7	140-141	7.0	166-167	8.3
116-117	5.8	142-143	7.1	168-169	8.4
118-119	5.9	144-145	7.2	170-171	8.5
120-121	6.0	146-147	7.3	172-173	8.6
122-123	6.1	148-149	7.4	174-175	8.7
124-125	6.2	150-151	7.5	176-177	8.8
126-127	6.3	152-153	7.6	178-179	8.9
128-129	6.4	154-155	7.7	180-200	H.S.

List P (20)	List 1 (40)	List 2 (60)
1. see	1. with	1. game
2. look	2. friends	2. hide
3. mother	3. came	3. grass
4. little	4. horse	4. across
5. here	5. ride	5. around
6. can	6. under	6. breakfast
7. want	7. was	7. field
8. come	8. what	8. large
9. one	9. bump	9. better
10. baby	10. live	10. suddenly
11. three	11. very	11. happen
12. run	12. puppy	12. farmer
13. jump	13. dark	13. river
14. down	14. first	14. lunch
15. is	15. wish	15. sheep
16. up	16. basket	16. hope
17. make	17. food	17. forest
18. ball	18. road	18. stars
19. help	19. hill	19. heavy
20. play	20. along	20. station

List 3 (80)	List 4 (100)	List 5 (120)
1 safe	1 harness	1 cushion
2 against	2 price	2 generally
3 smash	3 flakes	3 extended
4 reward	4 silence	4 custom
5 evening	5 develop	5 tailor
6 stream	6 promptly	6 haze
7 empty	7 serious	7 gracious
8 stone	8 courage	8 dignity
9 grove	9 forehead	9 terrace
10 desire	10 distant	10 applause
11 ocean	11 anger	11 jungle
12 bench	12 vacant	12 fragrant
13 damp	13 appearance	13 interfere
14 timid	14 speechless	14 marriage
15 perform	15 region	15 profitable
16 destroy	16 slumber	16 define
17 delicious	17 future	17 obedient
18 hunger	18 claimed	18 ambition
19 excuse	19 common	19 presence
20 understood	20 dainty	20 merchant

List 6 (140)	List 7 (160)	List 8 (180)	High School (200)
1 installed	1 administer	1 prairies	1 traverse
2 importance	2 tremor	2 evident	2 affable
3 medicine	3 environment	3 nucleus	3 compressible
4 rebellion	4 counterfeit	4 antique	4 excruciating
5 infected	5 crisis	5 twilight	5 pandemonium
6 responsible	6 industrious	6 memorandum	6 scrupulous
7 liquid	7 approximate	7 whimsical	7 primordial
8 tremendous	8 society	8 proportional	8 chastisement
9 customary	9 architecture	9 intangible	9 sojourn
10 malicious	10 malignant	10 formulated	10 panorama
11 spectacular	11 pensive	11 articulate	11 facsimile
12 inventory	12 standardize	12 deprecate	12 auspicious
13 yearning	13 exhausted	13 remarkably	13 contraband
14 imaginary	14 reminiscence	14 contrasting	14 envisage
15 consequently	15 intricate	15 irrelevance	15 futility
16 excellence	16 contemporary	16 supplement	16 enamoured
17 dungeon	17 attentively	17 inducement	17 gustatory
18 detained	18 compassionate	18 nonchalant	18 decipher
19 abundant	19 complexion	19 exuberant	19 inadequacy
20 compliments	20 continuously	20 grotesque	20 simultaneous

SCORE

List P_____
List 1_____
List 2_____
List 3_____
List 4_____
List 5_____
List 6_____
List 7_____
List 8_____
List H. S._____

Raw Score_____

(Total number of correct words including the words below starting level.)

APPENDIX C

Irwin/Davis Checklist

Readability checklist

This checklist is designed to help you evaluate the readability of your classroom texts It can best be used if you rate your text while you are thinking of a specific class. Be sure to compare the textbook to a fictional ideal rather than to another text. Your goal is to find out what aspects of the text are or are not less than ideal. Finally, consider supplementary workbooks as part of the textbook and rate them together. Have fun!

Rate the questions below using the following rating system:
5 - Excellent
4 - Good
3 - Adequate
2 - Poor
1 - Unacceptable
NA - Not applicable

Further comments may be written in the space provided.

Textbook title: _____

Publisher: _____

Copyright date: _____

Understandability

A. ____ Are the assumptions about students' vocabulary knowledge appropriate?

B. ____ Are the assumptions about students' prior knowledge of this content area appropriate?

C. ____ Are the assumptions about students' general experiential backgrounds appropriate?

D. ____ Does the teacher's manual provide the teacher with ways to develop and review the students' conceptual and experiential backgrounds?

E. ____ Are new concepts explicitly linked to the students' prior knowledge or to their experiential backgrounds?

F. ____ Does the text introduce abstract concepts by accompanying them with many concrete examples?

G. ____ Does the text introduce new concepts one at a time with a sufficient number of examples for each one?

H. ____ Are definitions understandable and at a lower level of abstraction than the concept being defined?

I. ____ Is the level of sentence complexity appropriate for the students?

J. ____ Are the main ideas of paragraphs, chapters, and subsections clearly stated?

K. ____ Does the text avoid irrelevant details?

L. ____ Does the text explicitly state important complex relationships (e.g., causality, conditionality, etc.) rather than always expecting the reader to infer them from the context?

M. ____ Does the teacher's manual provide lists of accessible resources containing alternative readings for the very poor or very advanced readers?

APPENDIX D

Approval to Conduct Study

1. Approval to Conduct Study: The Preliminary Research Phase

MICHIGAN STATE UNIVERSITY

OFFICE OF VICE PRESIDENT FOR RESEARCH
AND DEAN OF THE GRADUATE SCHOOL

EAST LANSING • MICHIGAN • 48824-1046

July 23, 1992

Karen Schmitz
236 Food Science

RE: DEVELOPING NUTRITION EDUCATION MATERIALS FOR LOW-LITERATE AUDIENCES- DETERMINING EFNEP PARTICIPANTS' READING LEVEL, IRB #92-355

Dear Ms. Schmitz:

The above project is exempt from full UCRIHS review. The proposed research protocol has been reviewed by a member of the UCRIHS committee. The rights and welfare of human subjects appear to be protected and you have approval to conduct the research.

You are reminded that UCRIHS approval is valid for one calendar year. If you plan to continue this project beyond one year, please make provisions for obtaining appropriate UCRIHS approval one month prior to July 22, 1993.

Any changes in procedures involving human subjects must be reviewed by UCRIHS prior to initiation of the change. UCRIHS must also be notified promptly of any problems (unexpected side effects, complaints, etc.) involving human subjects during the course of the work.

Thank you for bringing this project to my attention. If I can be of any future help, please do not hesitate to let me know.

Sincerely,

David E. Wright, Ph.D., Chair
University Committee on Research Involving
Human Subjects (UCRIHS)

2. Approval to Conduct Study: The Data Collection Phase

July 26, 1993

TO: Ms. Karen Schmitz
236 Food Science Building

RE:	IRB #:	93-313
	TITLE:	AN EVALUATION OF THE READABILITY AND ACCEPTABILITY OF MATERNAL NUTRITION EDUCATION MATERIALS FOR EFNEP CLIENTS
	REVISION REQUESTED:	N/A
	CATEGORY:	1-A, 1-B
	APPROVAL DATE:	07/19/1993

The University Committee on Research Involving Human Subjects' (UCRIHS) review of this project is complete. I am pleased to advise that the rights and welfare of the human subjects appear to be adequately protected and methods to obtain informed consent are appropriate. Therefore, the UCRIHS approved this project including any revision listed above.

Renewal: **UCRIHS approval is valid for one calendar year, beginning with the approval date shown above.** Investigators planning to continue a project beyond one year must use the enclosed form to seek updated certification. There is a maximum of four such expedited renewals possible. Investigators wishing to continue a project beyond that time need to submit it again for complete review.

Revisions: UCRIHS must review any changes in procedures involving human subjects, prior to initiation of the change. If this is done at the time of renewal, please use the enclosed form. To revise an approved protocol at any other time during the year, send your written request to the UCRIHS Chair, requesting revised approval and referencing the project's IRB # and title. Include in your request a description of the change and any revised instruments, consent forms or advertisements that are applicable. the year, please outline the proposed revisions in a letter to the Committee.

Problems/ Changes: Should either of the following arise during the course of the work, investigators must notify UCRIHS promptly: (1) problems (unexpected side effects, complaints, etc) involving human subjects or (2) changes in the research environment or new information indicating greater risk to the human subjects than existed when the protocol was previously reviewed and approved.

If we can be of any future help, please do not hesitate to contact us at (517) 355-2180 or FAX (517) 336-1171.

Sincerely,

David E. Wright, Ph.D.
UCRIHS Chair

APPENDIX E

Questions to Obtain Client Language

Questions to Obtain Client Language

The following questions were asked of three separate groups of EFNEP eligible pregnant women who had just finished a parenting class which covered the information in "Eating Right...for Two" on nutrition during pregnancy. The purpose of the question/answer sessions was to obtain original language for the Client-Adapted Language materials used in this research.

1. Your friend Diane is three months pregnant. She asks you what foods she should eat while she is pregnant. What would you tell her?
2. Diane was normal weight for her height before pregnancy. Why should Diane be eating more food now than she ate when she was not pregnant?
3. Is it important to gain weight during pregnancy? Why?
4. What if Diane was overweight before pregnancy and she says she doesn't want to gain weight while she's pregnant.
    a. What advice would you give her?
    b. What if she said she wanted to diet while pregnant (reduce her weight)?
5. What if Diane says, "I don't want to gain weight so I can have a small baby." What would you say to her?

6. How much weight should a woman gain during pregnancy?
    a. In the first 3 months?
    b. In the last 6 months?
7. What does "slow and steady" weight gain mean to you?
8. When a woman gains weight during pregnancy, where does the weight go?
9. a. Why does the amount of blood in the woman's body need to increase during pregnancy?
    b. Why do breasts grow larger?
    c. Why does the uterus get larger?
10. What does "eat a variety of foods" mean to you?
11. Why should a pregnant woman eat a variety of foods?
12. How do nutrients get from the mother's mouth to the baby?
13. a. What nutrients do you need to eat more of during pregnancy?
    b. What foods contain calcium? Why do you need increased calcium? When?
    c. iron?
    d. folic acid?
    e. protein?
14. a. Should pregnant women take a vitamin/mineral supplement? Why or why not?

b. Are you taking a vitamin/mineral supplement? Why or why not?

15. a. Why shouldn't a pregnant woman smoke?

b. What else harms the baby and should be avoided by pregnant women?

16. a. Have you had any cravings for certain foods or even things that aren't foods?

b. Do you have friends or relatives that ate strange things while they were pregnant?

17. Have you heard any myths about pregnancy from friends or relatives, such as pregnant women shouldn't cross the railroad tracks?

18. Is there anything else that you think pregnant women should know about nutrition or healthy habits?

APPENDIX F

Knowledge Survey (First Pilot)

Knowledge Survey

Knowledge Survey: This survey will be called Pregnancy Survey I when given as a pretest and Pregnancy Survey II when given as a posttest.

Pregnancy Survey I (Pilot)

DIRECTIONS for instructors to read to homemakers: Please answer the first 4 questions by putting an "X" on the correct line. You can choose not to answer any item. Do not put your name on this form.

1. How old are you now? _____ years

   ____ I do not wish to answer

2. Are you pregnant now?

   ____ yes

   ____ no

   ____ I do not know/I do not wish to answer

3. How many babies have you had?

____ none

____ one

____ two

____ three or more

____ I do not wish to answer

4. What is your race?

____ African American/Black

____ Indian (American)/Alaskan Native

____ Asian/Pacific Islander

____ White

____ other what? _____

____ I do not wish to answer

Are you of Hispanic origin? ___ yes ___ no

5. What was the highest level of education you completed?

_____ grade

OR

_____ high school graduate or GED

_____ some college or professional school

_____ college graduate

DIRECTIONS for instructors to read to the homemaker: I will read the questions and each answer choice. You need to choose the best answer. Circle only one choice for each question. No flipcharts or handouts should be used while taking the survey.

1. Ann is pregnant. How many servings of milk or cheese or yogurt should she have each day?
   a) 1
   b) 2
   c) 3
   d) 4

2. A daily meal plan for a pregnant woman should include 3 to 5 servings of _____.
   a) vegetables
   b) fruits
   c) breads and cereals
   d) milk and cheese
   e) meat, poultry, fish, eggs and beans

3. Slow and steady weight gain in pregnancy means:
   a) gaining about 2 pounds per week throughout pregnancy
   b) gaining less than 25 pounds by the end of pregnancy
   c) gaining 5 pounds per month throughout pregnancy
   d) gaining about 1 pound per week, after the first 3 months of pregnancy

4. Weight gain in pregnancy is important because:

   a) the baby is growing

   b) the mother's breasts are getting larger

   c) the mother's uterus is getting larger

   d) a and b only

   e) all of the above

5. The need for calcium:

   a) increases during pregnancy

   b) decreases during pregnancy

   c) does not change from non-pregnancy to pregnancy

   d) Calcium is <u>not</u> needed during pregnancy.

6. The need for which nutrient(s) increase(s) during pregnancy:

   a) iron

   b) folic acid

   c) protein

   d) all of the above

   e) a and b only

7. Tina is pregnant. She needs to increase the number of servings of _____ from 2 to 3 each day.

   a) fruit

   b) milk and cheese

   c) breads and cereals

   d) all of the above

8. Betty is pregnant. Yesterday she ate the following:

   fruits: 2 servings

   milk and cheese: 3 servings

   meat, poultry, fish, eggs and beans : 4 servings

   breads and cereals: 4 servings

   vegetables: 3 servings

Betty needs to eat more _____.

   a) fruits

   b) vegetables

   c) meat, poultry, fish, eggs and beans

   d) breads and cereals

   e) milk

APPENDIX G

Knowledge Survey (Final Instrument)

Pregnancy Survey I (Final Instrument)

Pregnancy Survey I

DIRECTIONS for EFNEP Instructors: Please read each question and all the answers listed to the homemaker. Try to use the same tone of voice for all responses so you don't give away the correct response. Ask the homemaker to select the best answer without your assistance. If she does not answer right away, read the question and answers again. She can choose not to answer any item. Please answer the first 4 questions by putting an "X" on the correct line. Do not put the homemaker's name on this form.

DIRECTIONS for instructors to read to the homemakers: Please answer the first 4 questions by putting an "X" on the correct line. You can choose not to answer any item. Do not put your name on this form.

1. How old are you now? _____ years

   ____ I do not wish to answer

2. Are you pregnant now?

   ____ yes

   ____ no

   ____ I do not know/I do not wish to answer

3. How many babies have you had?

   ____ none

   ____ one

   ____ two

   ____ three or more

   ____ I do not wish to answer

4. What is your race or origin?

____ African American/Black

____ Indian (American)/Alaskan Native

____ Asian/Pacific Islander

____ Hispanic

____ White (not Hispanic)

____ other what? _____

____ I do not wish to answer

5. What was the highest level of education you completed?

_____ grade

OR

_____ high school graduate or GED

_____ some college or professional school

_____ college graduate

DIRECTIONS for instructors to read to the homemaker: I will read the questions and each answer choice. You need to choose the best answer. Circle only one choice for each question. No flipcharts or handouts should be used while taking the survey.

1. Ann is pregnant. How many servings of milk or cheese or yogurt should she have each day?
   a) 1
   b) 2
   c) 3
   d) 4

2. A daily meal plan, including snacks, for a pregnant woman should include 3 to 5 servings of _____.
   a) vegetables
   b) fruits
   c) breads and cereals
   d) milk and cheese
   e) meat, poultry, fish, eggs and beans

3. Slow and steady weight gain in pregnancy means:
   a) gaining about 2 pounds per week throughout pregnancy
   b) gaining less than 25 pounds by the end of pregnancy
   c) gaining 5 pounds per month throughout pregnancy
   d) gaining about 1 pound per week, after the first 3 months of pregnancy

4. Weight gain in pregnancy is important because:

   a) the baby is growing

   b) the mother's breasts are getting larger

   c) the mother's uterus is getting larger

   d) a and b only

   e) all of the above

5. Which nutrients are <u>not</u> needed in extra amounts during pregnancy?

   a) protein

   b) folic acid

   c) calcium

   d) The need for each of these nutrients <u>does</u> increase during pregnancy.

6. The need for which nutrient(s) increase(s) during pregnancy:

   a) iron

   b) folic acid

   c) protein

   d) all of the above

   e) a and b only

7. Tina is pregnant. She needs to increase the number of servings of _____ from 2 to 3 each day.

   a) fruit

   b) milk and cheese

   c) breads and cereals

   d) all of the above

8. Betty is pregnant. Yesterday she ate the following:

   fruits: 2 servings

   milk and cheese: 3 servings

   meat, poultry, fish, eggs and beans : 4 servings

   breads and cereals: 4 servings

   vegetables: 3 servings

Betty needs to eat more _____.

   a) fruits

   b) vegetables

   c) meat, poultry, fish, eggs and beans

   d) breads and cereals

   e) milk

APPENDIX H

Characteristics of Readability: Scorecard

CHARACTERISTICS OF READABILITY: SCORECARD

According to Pickert and Elam (1985), use of readability formulas should be supplemented by other means of judging the quality of printed text. This checklist is designed to help assess many of the characteristics of readability that are not necessarily taken into account by formulas that measure reading grade level. The checklist compares written text to recommendations made by experts in education and nutrition education: Sticht, 1975; Klare, 1976; Laubach and Koschnick, 1977; US DHHS, 1982; Doak et al., 1985; Fry 1988; Nitzke, 1989.

Directions: Assess the following ten characteristics of a written text (or of three randomly selected pages for long texts) using the instructions for assessment outlined on the following page.

Characteristics or Readability: Assessment

Characteristic	Description of Assessment
1) Use of voice	The number of times the passive voice (PV) was used, rather than active voice, were counted. Total number of sentences were counted. Use of voice = PV/total number of sentences.
2) Type size	The size of type of the main body of the text was compared to known type sizes printed in Laubach and Koschnick, 1977.
3) Font type	The font type of the main body of the text was compared to Roman serif type. The type was determined to be either Roman serif or not Roman serif.
4) Abbreviations	The number of abbreviations (AB) in the text were counted. Contractions of words were not counted as abbreviations. The total number of words were counted. Percent of AB = (total number of AB/total number of words) x 100
5) Emphasis on action	The number of times negative action (NA) was emphasized, as opposed to positive action, in a command or suggestion were counted. Any sentence telling the reader what not to do was counted. Percent NA = The total number of NA/total number of sentences.
6) Letter type	The main body of the text was examined. It was noted that the text was written in either capital letters or lower case letters (excluding the first letter of each sentence).

Table (continued)

7) Symbols	The total number of symbols (NS) used in the main body of the text were counted. Some examples include "+", "%" and "&". Percent symbols =(NS/total number of words) x 100
8) Headers	The number of headers (H) used in the text were counted. The title was counted if it appeared on a written page of text being analyzed. The number of paragraphs (P) in the text were counted. Percent headers = (H/P) x 100 Note: Computer programs count a new paragraph any time there is a break in the leading. For accuracy, you might want to count paragraphs by hand.
9) White space: Margins and area around headers	Boxes were drawn around blocks of text and around headers. Boxes were drawn as close to the text as possible, but boxes were always in a rectangle shape. Any time there was a space greater than the leading of the main body of the text, a box was finished and new box was started. The area of the page was calculated (length x width). The area of the boxes were calculated and totaled. The percent white space = [1 - (total area of text/area of page)] x 100.
10) Leading	The leading of the main body of the text was compared to known leading sizes (Laubach and Koschnick, 1977).

Characteristic	Score	This text
1) Type Size	≥ 12 point = 2 points < 12 point = 0 points	_____
2) Font Type	Roman serif = 2 points All others = 0 points	_____
3) Abbreviations	0% words abbreviated = 2 points ≤ 2% words abbreviated = 1 point > 2% words = 0 points	_____
4) Use of voice	0% passive = 2 points ≤ 10% passive = 1 point > 10% passive = 0 points	_____
5) Emphasis on action	0% negative = 2 points ≤ 2% negative = 1 point > 2% negative = 0 points	_____
6) Letters	Lower case (except first letter of sentence) = 2 points Capital letters (or any other combination of capital and lower case letters) = 0 points	_____
7) White space: margins and headers	≥ 58% = 2 points 40-57% = 1 point <40% = 0 points	_____
8) Leading	≥ 2 points = 2 point < 2 points = 0 points	_____
9) Symbols	0% symbols used = 2 points ≤ 1% symbols = 1 point > 1% symbols = 0 points	_____

10) Headers	≥ 56% headers = 2 points 24-55% headers = 1 point < 24% = 0 points	_____

If the text scored:

17-20 The text contains many characteristics that aid readability.

13-16 The text contains some characteristics of readability, but might need to be reviewed to further increase readability.

<12 The text contains few characteristics of readability. It should be reviewed and improved to increase readability.

APPENDIX I

Material Acceptability Survey (First Pilot)

Material Acceptability Survey (Pilot)

DIRECTIONS for instructors to read to the homemaker: I need to ask you some questions about the pregnancy nutrition materials we have just used. There are no right or wrong answers. Your opinions will help us improve the EFNEP nutrition materials used with pregnant women. Please select only one response for each question (questions 1 to 14). You might write your answers or ask me to write them for you. You can choose not to answer any of these items if you desire. You might look at the flipchart and handouts when answering the questions.

How much do you agree with these statements:

1. The flipchart is easy for me to understand.

a. strongly agree b. agree c. disagree

d. strongly disagree e. I have no opinion

2. The way the flipchart is written is insulting to me.

a. strongly agree b. agree c. disagree

d. strongly disagree e. I have no opinion

If you answered yes, which part was insulting? _____

_____

3. The flipchart uses words that are similar to words I use.

a. strongly agree b. agree c. disagree

d. strongly disagree e. I have no opinion

4. The flipchart helped me learn about nutrition information.

a. strongly agree b. agree c. disagree

d. strongly disagree e. I have no opinion

5. The flipchart is easy to read.

a. strongly agree b. agree c. disagree

d. strongly disagree e. I did not read the flipchart

f. I have no opinion

6. The flipchart is interesting.

a. strongly agree b. agree c. disagree

d. strongly disagree e. I have no opinion

7. The flipchart would be useful to pregnant homemakers in EFNEP.

a. strongly agree b. agree c. disagree

d. strongly disagree e. I have no opinion

8. I would be able to understand the flipchart without an instructor helping me.

a. strongly agree b. agree c. disagree

d. strongly disagree e. I have no opinion

9. The flipchart answered the questions I had about nutrition during pregnancy.

a. strongly agree b. agree c. disagree

d. strongly disagree e. I didn't have any questions

10. The number of pages in the flipchart made it:

a. too long b. too short c. about right

d. I have no opinion

11. The appearance of the flipchart (the pages with the writing on them):

a. is too crowded b. has too much blank space on the pages

c. is OK d. I have no opinion

The appearance could be improved by _____

_____

_____

12. The size of the print used in the flipchart is:

a. too large b. too small c. about right

d. I have no opinion

For question 13, circle any or all responses you agree with:

13. The pictures in the flipchart:

a. are interesting b. helped me to understand the information

c. are insulting d. could have been left out

In my opinion, the flipchart pictures are _____

_____

_____

_____

14. How could the flipchart be improved? _____

_____

_____

_____

For questions 15 to 20 circle any or all responses you agree with:

15. Your instructor left four pregnancy handouts with you to read. Circle the handouts that you read:

a. Iron b. Folic Acid c. Protein/Calcium

d. Discomforts during Pregnancy

e. I didn't read any handouts (Skip questions 16 to 20).

16. Which handouts were easy to understand? (Circle any or no responses).

a. Iron b. Folic Acid c. Protein/Calcium

d. Discomforts during Pregnancy

17. Which handouts were easy to read? (Circle any or no responses).

a. Iron b. Folic Acid c. Protein/Calcium

d. Discomforts during Pregnancy

18. Which handouts helped you learn about nutrition information? (Circle any or no responses).

a. Iron b. Folic Acid c. Protein/Calcium

d. Discomforts during Pregnancy

19. Which handouts were interesting? (Circle any or no responses).

a. Iron b. Folic Acid c. Protein/Calcium

d. Discomforts during Pregnancy

20. Which handouts would be useful to pregnant women in EFNEP? (Circle any or no responses).

a. Iron b. Folic Acid c. Protein/Calcium

d. Discomforts during Pregnancy

Note: Have you circled <u>all</u> of the responses that you agree with in questions 15 to 20? Thank you for completing this survey!

APPENDIX J

Materials Acceptability Survey (Final Instrument)

Material Acceptability Survey (Final Instrument)

DIRECTIONS for the instructor: Please administer this survey to the homemaker after you have used the first set of pregnancy materials and after she has completed the Pregnancy Survey II. You should read the directions aloud first. Then read aloud each question and all possible answer choices. The homemaker (or yourself if she prefers) should circle only one answer for each question.

IMPORTANT: Circle the set of materials you have just used with the homemaker.

The EFNEP materials (Eating Right... for Two) "Flipchart X"	or	The new client materials "Flipchart Y"

Material Acceptability Survey (Final Instrument)

DIRECTIONS for instructors to read to the homemaker: I need to ask you some questions about the pregnancy nutrition materials we have just used. There are no right or wrong answers. Your opinions will help us improve the EFNEP nutrition materials used with pregnant women. Please select only one response for each question (questions 1 to 14). You might write your answers or ask me to write them for you. You can choose not to answer any of these items if you desire. You may look at the flipchart and handouts when answering the questions.

How much do you agree with these statements:

1. The flipchart is easy for me to understand.

a. strongly agree b. agree c. disagree

d. strongly disagree e. I have no opinion

2. The way the flipchart is written is insulting to me.

a. strongly agree b. agree c. disagree

d. strongly disagree e. I have no opinion

If you answered yes, which part was insulting? _____

_____

3. The flipchart uses words that are similar to words I use.

a. strongly agree b. agree c. disagree

d. strongly disagree e. I have no opinion

4. The flipchart helped me learn about nutrition information.

a. strongly agree b. agree c. disagree

d. strongly disagree e. I have no opinion

If you read the flipchart answer question 5, otherwise go to question 6.

The flipchart is easy to read.

a. strongly agree b. agree c. disagree

d. strongly disagree e. I did not read the flipchart

f. I have no opinion

6. The flipchart is interesting.

a. strongly agree b. agree c. disagree

d. strongly disagree e. I have no opinion

7. The flipchart would be useful to pregnant homemakers in EFNEP.

a. strongly agree b. agree c. disagree

d. strongly disagree e. I have no opinion

8. The flipchart answered the questions I had about nutrition during pregnancy.

a. strongly agree b. agree c. disagree

d. strongly disagree e. I didn't have any questions

9. The number of pages in the flipchart made it:

a. too long b. too short c. about right

d. I have no opinion

11. The appearance of the flipchart (the pages with the writing on them):

a. is too crowded b. has too much blank space on the pages

c. is OK d. I have no opinion

e. I did not see the pages with the writing on them.

The appearance of the flipchart could be improved by _____

_____

_____

_____

12. The size of the print used in the flipchart is:

a. too large b. too small c. about right

d. I have no opinion

For question 13, circle any or all responses you agree with:

13. The pictures in the flipchart:

a. are interesting

b. helped me to understand the information

c. are insulting

d. could have been left out

e. held my attention

In my opinion, the flipchart pictures are _____

_____

_____

_____

14. How could the flipchart be improved? _____

_____

_____

_____

For questions 15 to 20 circle any or all responses you agree with:

15. Your instructor left four pregnancy handouts with you to read. Circle the handouts that you read:

a. Iron b. Folic Acid c. Protein/Calcium

d. Discomforts during Pregnancy

e. I didn't read any handouts (Skip questions 16 to 20).

16. Which handouts were easy to understand? (Circle any or no responses).

a. Iron b. Folic Acid c. Protein/Calcium

d. Discomforts during Pregnancy

17. Which handouts were easy to read? (Circle any or no responses).

a. Iron b. Folic Acid c. Protein/Calcium

d. Discomforts during Pregnancy

18. Which handouts helped you learn about nutrition information? (Circle any or no responses).

a. Iron b. Folic Acid c. Protein/Calcium

d. Discomforts during Pregnancy

19. Which handouts were interesting? (Circle any or no responses).

a. Iron b. Folic Acid c. Protein/Calcium

d. Discomforts during Pregnancy

20. Which handouts would be useful to pregnant women in EFNEP? (Circle any or no responses).

a. Iron b. Folic Acid c. Protein/Calcium

d. Discomforts during Pregnancy

APPENDIX K

Materials Comparison Survey (First Pilot)

Comparison Survey (Pilot)

DIRECTIONS for the instructor to read to the homemaker: The purpose of this survey is to ask you to compare the two sets of materials. I will read all questions and answer choices. Please select one answer choice for each question (questions 1 to 7). You may write your answers or ask me to write them for you. There are no correct answers. These are opinion questions. You may look at either or both sets of nutrition materials (flipcharts and handouts) to help you answer questions if needed. Questions 1 to 8 apply to the flipcharts only.

1. In your opinion, which flipchart do you think is easier to understand?

a. Flipchart X b. Flipchart Y c. About the same

2. Which flipchart uses words more similar to the words you use?

a. Flipchart X b. Flipchart Y c. About the same

3. Which flipchart do you think contains the more useful information?

a. Flipchart X b. Flipchart Y c. About the same

4. Which flipchart is easier to read?

a. Flipchart X b. Flipchart Y c. About the same

d. I didn't read them

5. Which flipchart do you think is more interesting?

a. Flipchart X b. Flipchart Y c. About the same

d. Neither are interesting

6. Which flipchart do you think would be <u>more helpful</u> to women in EFNEP?

a. Flipchart X b. Flipchart Y c. About the same

7. Which flipchart do you think women in EFNEP would like better?

a. Flipchart X b. Flipchart Y c. About the same

8. Do you see any other differences between "Flipchart X" and "Flipchart Y"? _____

_____

_____

_____

9. Give each flipchart an overall score. The score can be any number between 0 (terrible) and 100 (wonderful):

   a. Which score would you give flipchart X? _____

   b. Which score would you give flipchart Y? _____

Thank you for taking this survey!

APPENDIX L

Materials Comparison Survey (Final Instrument)

Comparison Survey (Final Instrument)

DIRECTIONS for the Instructor: Administer this Comparison Survey after the homemaker has used both sets of materials. Both sets of materials (flipcharts and handouts) should be available for the homemaker to look at while answering the survey questions. This survey should be the last survey given to the homemaker. She should have completed the Pregnancy Survey I and II, and the Material Acceptability Survey before completing this survey. Please read the directions to the homemaker first. Then read all questions and answer choices to the homemaker. The homemaker (or you, if the homemaker prefers) should circle only one answer for each question.

IMPORTANT: Circle the set of materials you used first with this client.

1. The original EFNEP materials (Flipchart X) or
2. The new Client-Adapted Language materials (Flipchart Y)

Comparison Survey (Final Instrument)

DIRECTIONS for the instructor to read to the client: The purpose of this survey is to ask you to compare the two sets of materials. I will read all questions and answer choices. Please select one answer choice for each question (questions 1 to 7). You may write your answers or ask me to write them for you. There are no correct answers. These are opinion questions. You may look at either or both sets of nutrition materials (flipcharts and handouts) to help you answer questions if needed. Questions 1 to 8 apply to the flipcharts only.

1. In your opinion, which flipchart do you think is easier to understand?

a. Flipchart X b. Flipchart Y c. About the same

2. Which flipchart uses words more similar to the words you use?

a. Flipchart X b. Flipchart Y c. About the same

3. Which flipchart do you think contains the more useful information?

a. Flipchart X b. Flipchart Y c. About the same

If you read the flipchart answer question 4. If your instructor read the flipchart to you skip question 4. Go to question 5.

4. Which flipchart is easier to read?

a. Flipchart X b. Flipchart Y c. About the same
d. I didn't read them

5. Which flipchart do you think is more interesting?

a. Flipchart X b. Flipchart Y c. About the same
d. Neither are interesting

6. Which flipchart do you think would be more helpful to women in EFNEP?

a. Flipchart X b. Flipchart Y c. About the same

7. Which flipchart do you think women in EFNEP would like better?

a. Flipchart X b. Flipchart Y c. About the same

8. Do you see any other differences between "Flipchart X" and "Flipchart Y"? _____

_____

_____

_____

9. Give each flipchart an overall score. The score can be any number between 0 (terrible) and 100 (wonderful):

   a. Which score would you give flipchart X? _____

   b. Which score would you give flipchart Y? _____

Thank you for taking this survey!

APPENDIX M

Directions for Instructors

Instructions for SORT Testing

Instructions for the Paraprofessional:

Thank you so much for offering to help us with our research to try to make better materials for your clients. Please follow these steps with your clients:

1. Explain to your clients that we need their help. If we are to improve the materials we need some idea of the reading level of the clients.
2. Ask the client if she would be willing to read 10 lists of words into a tape recorder. We do not need to know her name. Her score will be kept confidential. Let her know that some words are difficult and she shouldn't feel bad if she doesn't know them.
3. If she is willing to participate, have her state into the tape recorder that she is willing to participate. Next, have her read the words in order from list one to ten. Please do not help her read the words. We need to know the true reading level without help from others. If she misses five in a row and does not want to continue, she may stop.
4. To avoid confusion, only test people who speak English as their first language.

Thank you for your time and trouble,

Karen Schmitz

Instructions for Data Collection:

Thank you for your help with this project to improve EFNEP materials. Please follow the steps below with each newly-enrolled, English-speaking client:

Day 1 (about 1 hour)

1. Read the letter of consent to the client. Ask her to participate.
2. If she agrees, give her the pretest. The directions are on the test.
3. Teach her the nutrition lesson using the appropriate flipchart, either X or Y.
4. Give her the posttest. The directions are on the test.
5. Leave the 4 handouts with her (Iron, Folic Acid, Protein/Calcium and Discomforts during Pregnancy) and ask her to read them before your next meeting (Day 2).

Day 2 (about 1 hour)

1. Give her the "Acceptability Survey." Make sure she has her handouts and the flipchart she used last time in front of her.
2. Read through the other flipchart (either X or Y) with the client (the flipchart she did not use on Day 1).
3. Give her the "Comparison Survey." Make sure she has both flipcharts in front of her.
4. Put all 4 surveys in the envelope. Put your initials on the back of the envelope and turn it in to the County Extension Home Economist.

APPENDIX N

Consent Forms

Please read to the homemaker:

Dear homemaker,

We hope that you can help us out with making new materials for EFNEP. In order to improve the materials we need to have an idea of the reading levels of the homemakers. Your participation is voluntary and we do not need to know your name. If you are willing to help, we ask that you read ten lists of twenty words into a tape recorder. The process should take 20 to 30 minutes. Some of the words are difficult, so don't feel badly if you can't make it to list ten. You may quit when you don't know 5 words in a row.

The instructor will also ask you if it is O.K. to give us information on your race, education and age. This information is optional. You may say no if you don't want to answer any or all of the questions.

Thank you for your time and trouble,

Karen Schmitz

Please read to the homemaker:

Dear homemaker,

We hope that you can help us out with making new materials for EFNEP. In order to improve the materials we need to know how well different materials help you learn about nutrition and your opinion of the different materials. Your participation is voluntary and we do not need to know your name. Your answers to questions will not affect your participation in EFNEP. If you are willing to help us, you will use two different sets of nutrition materials in your next two EFNEP lessons. You will be asked to answer several questions, by circling a response, before and after each lesson. The process should take about two one-hour sessions.

Your instructor will also ask you if it is o.k. to give us information on your age, race, education, and pregnancy status. This information is optional, you may say no if you don't want to answer any or all of the questions.

Thank you for your time and trouble,

Karen Schmitz

APPENDIX O

EFNEP Handouts

SPECIAL NUTRIENT NEEDS DURING PREGNANCY

FOLIC ACID

Folic acid (which is also called folate and folacin) is a B vitamin. It is used to form red blood cells and is used for growth of new cells. Your need for folate doubles during pregnancy.

Foods High In Folic Acid

Bean sprouts	Chickpeas (garbonzo beans)	Wheat germ
Liver	Fortified cereals	Greens
Asparagus	Kidney beans	Winter squash
Broccoli	Lima beans	Navy beans
Spinach	Beets	Pinto beans
Cauliflower	Cantaloupe	Black-eyed peas
Tofu	Whole grains	

NOTE: Cooking (heat) destroys some of the folate; raw vegetables provide more folic acid than cooked ones.

References: Basic Nutrition Facts, MSU Cooperative Extension Service and Michigan Department of Public Health.

Understanding Nutrition; Whitney, Hamilton, Rolfes, West Publishing 1990.

SPECIAL NUTRIENT NEEDS DURING PREGNANCY

IRON

Iron in red blood cells carries oxygen throughout the body. Some of your iron supply will be "donated" to the baby and some iron will be lost at birth (with blood loss). So it is important to eat foods high in iron every day to meet your increased need for iron.

Liver	Prunes/juice
Beef	Kale, chard
Pork	Black-eyed peas
Dried beans (navy, soy, kidney)	Whole wheat bread
Broccoli	Fish, seafood, shelfish
Lima beans	Enriched cereals (hot and cold)
Split peas	Raisins
Green peas	Molasses (blackstrap)
Enriched bread, rice & macaroni	Spinach

NOTE: Vitamin C increases iron absorption, so try to eat fruit, fruit juice or vegetables along with iron-rich foods.

SPECIAL NUTRIENT NEEDS DURING PREGNANCY

CALCIUM

Extra calcium is needed for your baby's developing bones and teeth.

Try to have three servings from the milk/cheese group daily. This group includes foods like:

- buttermilk
- nonfat dry milk
- lowfat milk
- skim milk
- evaporated milk
- yogurt
- cheese
- ice cream

Use the One Serving Is: Milk and Cheese handout to compare amounts of fat and calories in calcium-rich foods.

Some people are lactose intolerant and have "trouble" digesting milk/products. For these people to obtain enough calcium they can drink special milk (Lact-aid), eat dairy foods with low levels of lactose (yogurt, cheddar cheese, swiss cheese), or eat non-dairy foods with calcium such as:

- dried beans
- broccoli
- canned sardines, mackerel or salmon with bones
- shrimp
- tofu
- spinach
- greens
- oysters

PROTEIN

PROTEIN is needed for growth and other functions.

Choose two servings of meat, poultry, fish or eggs or dried beans and peas every day. The three servings of milk or cheese that is recommended during pregnancy will also help to meet your protein needs.

DISCOMFORTS DURING PREGNANCY

You may have heard about these discomforts of pregnancy - "morning sickness," heartburn, and constipation.

It's true that one or more of these might affect you at some time during your pregnancy. They occur because of normal changes during pregnancy. However, you may find that you aren't affected by any of these discomforts!

Here are a few suggestions to prevent or decrease these problems.

MORNING SICKNESS

- ❑ Eat crackers, dry toast or cereal in the morning before getting out of bed.
- ❑ Have a snack before bed - cheese or a hard cooked egg are good choices.
- ❑ Eat small, frequent meals.
- ❑ Drink liquids between meals rather than with them.
- ❑ Sleep in a well ventilated room.
- ❑ Avoid foods that do not "agree" with you such as fried or spicy foods.

Morning sickness usually passes by the fourth month of pregnancy. Some women continue to have morning sickness throughout their entire pregnancy and others are not nauseous or sick at all. If morning sickness is affecting how much you are eating (or "keeping down") be sure to tell your doctor.

HEARTBURN

- ❑ Eat small frequent meals.
- ❑ Avoid foods that give you problems - maybe spicy or fatty foods.
- ❑ Avoid large meals.
- ❑ Don't lie down right after eating.
- ❑ Wear loose-fitting clothing.
- ❑ Eat slowly, chew food well.
- ❑ Do not drink liquids with your meals

CONSTIPATION

- ❑ Get some exercise - maybe a daily walk.
- ❑ Drink plenty of liquids - especially water, milk, and juices.
- ❑ Include plenty of fiber in your diet by eating fruits, vegetables, and whole grains

DO NOT take any drugs or medications without first asking your doctor about them. This includes laxatives, antacids and aspirin.

APPENDIX P

Pica Handout (Pilot and Final Forms)

Pica (Pilot form)

Many pregnant women have cravings. Some cravings for food won't harm the baby. These may include:

Chocolate	Ice cream
Pizza	Pickles
Tacos	Watermelon

What foods do you crave?

_____	_____
_____	_____

Some pregnant women crave stuff that <u>could harm</u> the baby. Avoid doing these things:

Eating baking soda, toilet paper, toothpaste, soap, cornstarch

OR

Smelling gasoline

OR

Biting matches

OR

Sipping pine sol

Do you do any of these things? Do you do other things that you think might harm the baby? If you think the answer might be yes, stop the behavior and talk to your doctor. Your baby's health depends on you!

Pica

Many pregnant women have cravings. Some women crave chocolate, ice cream, pizza, pickles or watermelon.

Other pregnant women crave things that aren't really foods. Some women report eating:

baking soda	toilet paper	facial tissue
toothpaste	soap	ashes
cornstarch	clay	laundry starch

OR smelling gasoline or pine sol

OR biting matches

Have you had a craving to eat or smell any of these things or other things that aren't really foods? List some here:

_____ _____

_____ _____

Eating or smelling things that are not real foods could harm you and your baby. Some things like cornstarch and laundry starch can make you gain extra weight. Other things like gasoline and pine sol are poisons.

Please tell your doctor or nutritionist about any items you have listed.

APPENDIX Q

Comments of EFNEP Clients

Materials Acceptability Survey Comments

Note: Comments have been transcribed word for word from surveys. No corrections in grammar, spelling or accuracy of information were made.

Question #2: If you answered yes (to the flipchart being insulting), which part was insulting?"

Client identification number:	Responses:
Flipchart X:	
006	"Made me feel dumb"
074	"The writing is not professional."
079	"Pictures"
Flipchart Y:	
039	"24M - the little thing"
045	"The way they used short grammar in a few sentences"
072	"It's written for people who have hardly any education."
097	"Stuff and thing"
101	"Don't like the word stuff."
105	"Too hard"
114	"It's not for and adult."

Question #10: The appearance of the flipchart could be improved by:

Flipchart X:	
010	"Pictures outdated"
019	"Being updated"
036	"Updating your pictures"

038	"Updated pictures and information"
044	"Like it how it is"
066	"Get real pictures"
095	"Pictures more realistic"
114	"Make it look like its for a adult"
115	"Pictures are outdated."
149	"Update pictures. Page 35M prescription bottle is dated 1985."

Flipchart Y:

001	"Better pictures"
007	"More updated pictures and info"
039	"Improving the pictures"
105	"More color"
116	"Pictures could be improved. They look generic."
183	"Pictures could be updated and realistic."

Question #12: In my opinion, the flipchart pictures are:

Flipchart X or Y:

001	"Outdated"
005	"Simple"
006	"Help me pay attention to instructions"
007	"Type expected in a health type class"
010	"Outdated"

013	"Easy to look at"
014	"Very basic"
019	"Good, okay"
020	"The pictures are ok"
021	"Ugly"
024	"Insulting"
026	"Very useful"
029	"Alright, it is better than just a book with no pictures."
032	"Fine"
036	"Needed for people who have problems comprehending what is read"
038	"Out of date"
039	"Insulting. They look like they should be used for a little child."
042	"Ok"
045	"They didn't catch my attention."
046	"Hard to see because they are upside down"
066	"OK for younger moms, but not experienced moms"
069	"Childish"
072	"Needing to be updated"
074	"Sorta ugly, could be realistic or real pictures??"
075	"Need to be updated in colors and figures. It looks like 60's material."
079	"Boring"

080	"Simple, really"
095	"More realistic"
111	"Helpful"
113	"Too much like comics"
116	"A little outdated"
122	"Like the pictures O.K."
146	"Old crud"
149	"They're eye catching, colorful"
158	"Not real enough. Using real pictures of people and food items makes it more inviting for people to listen and learn more."
159	"As good as can be expected for the space."
160	"Very educational and informative"
162	"Not real"
168	"Self-explanatory"
169	"O.K."
182	"Colorful"
183	"Dated"
184	"It seemed childish because of the cartoons."

Question #13: How could the flipchart be improved?

Flipchart X:

006	"I hate being read to"
010	"More realistic pictures"
019	"By being updated"

020	"It could be more interesting"
021	"Better pictures"
024	"Select better pictures. Make them more normal looking."
036	"Just update the pictures"
038	"Updated!"
039	"Its better if its not read word for word."
044	"Like it how it is"
046	"Turn the pictures around"
051	"Last week was nicer. Why change?"
066	"Use real pictures."
079	"I wouldn't have a flipchart unless used with illiterate people."
087	"I don't think it needs improvement."
095	"Make it more interesting"
108	"Made more easy"
110	"Not so tough"
111	"More detail"
112	"Charts"
115	"Update pictures"
144	"It good as it is"
146	"Be a little more realistic looking like real people rather than cartoonist"
149	"Make it shorter, smaller. New pictures"
150	"The wording"

154	"I think it is alright the way you have it"
158	"By using real pictures of people and food and changing page 37 from may to will. I do not like any written material about pregnancy and drugs and alcohol stating that they MAY only harm the baby. Because they DO harm babies."
168	"It fine by my opinion"

Flipchart Y:

001	"Update pictures"
005	"Okay"
007	"Statistics would be more int."
008	"Looks fine"
013	"It's fine"
039	"Update the pictures."
043	"Make the pictures more adult."
045	"Better to catch peoples attention"
047	"Explain good, well-worded"
069	"Realistic pictures"
070	"It is just OK. Clear, good, nice picture or diagram"
072	"Update pictures"
105	"More pictures"
116	"Improve pictures"
152	"Wanted a little more information about weight gain in pregnancy"

160	"No improvement needed."
162	"Real pictures"
167	"No cartoons for pictures"
169	"Real pictures"
182	"Give exact information. How many servings is needed for veggies isn't mentioned and why is weight gain in pregnancy important."
183	"Overall O.K., want real pictures of babies progress."

Materials Comparison Survey Comments

Note: Comments have been transcribed word for word from surveys. No corrections in spelling, grammar or accuracy of information were made.

Question #8: "Do you see any other differences between flipchart X and flipchart Y?"

Client identification number:	Response:
001	"X was easier to understand. The words made sense."
006	"Did not like Y wording as much."
009	"Y has more information than X does."
012	"They're both the same to me."
013	"Do not like stuff"
014	"Flipchart X seems to be geared more for an adult. Flipchart Y seems to be geared for teenagers."
016	"Y is better because I think that more young mothers will understand it better."
021	"Wording--don't make us feel stupid by using word stuff."
023	"Y is easier to understand."
024	"Word stuff is dumb."
029	"Wording was different. Chart Y would be easier for teens and some ethnic groups. I believe chart Y would be the best if some of the wording were changed (such as stuff). It helped that they list foods in the chart."

032	"Just a little different words."
036	"Yes, X is for a higher educated group. Y is for your younger (teenage) group.
039	"Yes, X is for a higher level and Y is for more common. Y is real good if they change words like stuff and little thing and the pictures are REAL BAD! Pictures look like they came from the seventies"
045	"X used better grammar."
046	"Stuff word needs to go."
047	"Flipchart X words things better than Y."
050	"Word stuff"
066	"X is for the more normal homemaker, Y is for younger, less experienced girl"
067	"X is taught on a more mature/adult level and Y is for the younger teenager."
070	"They define what you need to know and you understand the first after you read the flipchart easier"
073	"Y is not as professional."
077	"X seemed shorter."
089	"Sometimes hard to understand or remember. I'm not sure how well I done."
095	"The words in flipchart Y are not professional."
096	"Y is too long. Some of the details are not necessary."

099	"The wording in flipchart Y is insulting."
110	"Flipchart X is not so tough."
112	"Flipchart Y has more information."
114	"Flipchart X is less reading."
115	"Y was more personable, but you could leave out the 'stuff' and 'little thing.'"
116	"Y assumes you already know some things."
119	"The Y version may appeal more to the young."
121	"Wording is better in X. Sounds better"
153	"Flipchart X talks about more during pregnancy and flipchart Y is more about nutrition."
154	"Flipchart Y helps you more to understand the importance of weight gain"
156	"Y used slang and stuff. Talked down to the individual."
158	"The use of words like stuff and thing I don't care for. Page 37 talks about drugs and alcohol MAY cause problems - that is wrong."
162	"Y made me feel talked down to. X used proper english"
163	"Language - Y is childish - poor use of words 'thing' and 'stuff' - they are not informative words."
164	"Slang in Y"

182	"X answered questions exactly and how many servings was needed and also importance of gaining weight."
183	"X felt better and more like what homemaker feels comfortable with"
184	"Y = eliminate thing and stuff. Y = better for explaining smoking. Otherwise they are the same."

LIST OF REFERENCES

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Abrams, B. and R. Laros. Prepregnancy weight, weight gain and birth weight. American Journal of Obstetrics and Gynecology 154(3):503-509, 1986.

Abrams, B. and V. Newman. Small-for-gestational-age birth: maternal predictors and comparison with risk factors of spontaneous preterm delivery in the same cohort. American Journal of Obstetrics and Gynecology 164:785-790, 1991.

Abrams, B., V. Newman, T. Key and J. Parker. Maternal weight gain and preterm delivery. Obstetrics and Gynecology 74:577-583, 1989.

Acker, D., B. Sachs, K. Tracey and W. Wise. Abruptio placentae associated with cocaine use. American Journal of Obstetrics and Gynecology 146:220-221, 1983.

Aderman, B., S. Nitzke, S. Pingree and J. Voichick. Readers' responses to language experience approach materials. Adult Literacy and Basic Education 2(1):13-22, 1987.

Allen, E., J. Wright and L. Laminack. Using Language experience to alert pupils' critical thinking skills. The Reading Teacher 41(9):904-910, 1988.

American Dietetic Association. Recommendations concerning supplement usage: ADA statement. Journal of the American Dietetic Association 87:1342-1343, 1987.

Ashe, J., F. Schofield and M. Gram. The retention of calcium, iron, phosphorous and magnesium during pregnancy: the adequacy of prenatal diets with and without supplementation. American Journal of Clinical Nutrition 32:286-291, 1979.

Bailey, L. Folate status assessment. Journal of Nutrition 120:1508-1511, 1990.

Bailey, L., C. Mahan and D. Dimperio. Folacin and iron status in low-income pregnant women. The American Journal of Clinical Nutrition 33:1997-2001, 1980.

Beal, V. Nutritional studies during pregnancy. Journal of the American Dietetic Association 58:321-326, 1971.

Belizan, J., J. Villar and J. Repke. The relationship between calcium intake and pregnancy-induced hypertension. American Journal of Obstetrics and Gynecology 158:898-902, 1988.

Blackburn, M. and D. Calloway. Energy expenditure and consumption of mature, pregnant and lactating women. Journal of the American Dietetic Association 69:29-36, 1976.

Block, G., C. Cox, J. Madans, G. Schreiber, L. Licitra and N. Melia. Vitamin supplement use, by demographic characteristics. American Journal of Epidemiology 127(2):297-309, 1988.

Blocker, D., L. Ausman, C. Meadows and S. Thenan. Experimental maternal and neonatal folate status relationships in non-human primates. American Journal of Clinical Nutrition 50:120-128, 1989.

Bower, C. and F. Stanley. Dietary folate as a risk factor for neural-tube defects: evidence from a case-control study in western Australia. Medical Journal of Australia 150:613-617, 1989.

Brennan, R., M. Kohrs, J. Nordstrom, J. Sauvage and R. Shank. Nutrient intake of low-income pregnant women: laboratory analysis of foods consumed. Journal of the American Dietetic Association 83:546-550, 1983.

Brown, J., K. Berdan, P. Splett, M. Robinson and L. Harris. Prenatal weight gains related to the birth of healthy-sized infants to low-income women. Journal of the American Dietetics Association 86:1679-1683, 1986.

Brush, K., D. Woolcott and G. Kawash. Evaluation of an affective-based adult nutrition education program. Journal of Nutrition Education 18(6):258-264, 1986.

Byrd-Bredbenner, C., R. Martin, C. Lewis and B. Shannon. The effectiveness of two methods of delivering nutrition information to the general public. Journal of Nutrition Education 20(2):63-69, 1988.

Campbell, D. and J. Stanley. Experimental and Quasi-Experimental Designs for Research. American Education Research Association, Chicago, IL, 1963.

CEBU Study Team. Underlying and proximate determinants of child health: The CEBU longitudinal health and nutrition study. American Journal of Epidemiology 133:185-201, 1991.

Chanarin, D. Further observations on the relation between iron and folate status in pregnancy. British Medical Journal 2:81-84, 1971.

Chasnoff, I. Cocaine use in pregnancy. New England Journal of Medicine 313:616, 1985.

Council on Scientific Affairs. Fetal effects of maternal alcohol use. Journal of the American Medical Association 249:2517-2521, 1983.

Dale, E. A comparison of two word lists. Educational Research Bulletin 10:484-489, 1931.

Dale E. and J. Chall. A formula for predicting readability. Educational Research Bulletin 27:11-20, 1948.

Dawson, E. and W. McGanity. Protection of maternal iron stores in pregnancy. The Journal of Reproductive Medicine 32(6)(Supplement):478-487, 1987.

Doak, L. and C. Doak. Patient comprehension profiles: recent findings and strategies. Patient Counseling and Health Education 2(3):101-106, 1980.

Doak, C., L. Doak, and J. Root. Teaching Patients with Low Literacy Skills. J.B. Lippincott Co., Philadelphia, PA., 1985.

Doyle, W., M. Crawford, B. Laurance and P. Drury. Dietary survey during pregnancy in a low socioeconomic group. Human Nutrition Applied Nutrition 36A:95-106, 1982.

Dwyer, D., E. Krall and K. Coleman. The problem of memory in nutritional epidemiology research. Journal of the American Dietetic Association 87(11):1509-1512, 1987.

Endres, J., M. Sawicki and J. Casper. Dietary assessment of pregnant women in a supplemental food program. Journal of the American Dietetic Association 70:121-126, 1981.

Farkas, C, P. Glenday, P. O'Connor and J. Schmeltzer. An evaluation of the readability of prenatal health education materials. Canadian Journal of Public Health 78:374-378, 1987.

Fitz-Gibbon, C. and Morris, L. How to Design a Program Evaluation. Sage Publications, Inc. Newbury Park, Ca, 1987.

Flesch, R. A new readability yardstick. Journal of Applied Psychology 32(3):221-233, 1948.

Freimuth, V. Assessing the readability of health education messages. Public Health Reports 94(6):568-570, 1979.

Fry, E. Judging readability of books. Teacher Education 5:34-39, 1964.

Fry, E. A readability formula that saves time. Journal of Reading 513-516, 575-579, April 1968.

Fry, E. Writeability: The principles of writing for increased comprehension. In Readability: Its Past, Present and Future. International Reading Association, Newark, DE., 1988.

George, J. Language experience approach. Lifelong Learning: An Omnibus of Practice and Research 7(1):29-30, 1983.

Gormican, A., J. Valentine and E. Satter. Relationships of maternal weight gain, prepregnancy weight and infant birth weight. Journal of the American Dietetics Association 77:662-667, 1980.

Gray, W. Standardized Oral Reading Paragraphs. Bobbs-Merril Company, Indianapolis, IN, 1960.

Gunning, Robert. The Technique of Clear Writing. New York, New York, 1968.

Harman, D. Illiteracy: A National Dilemma, Cambridge Book, Co., New York, 1987.

Harman, S. and C. Edelsky. The risk of whole language literacy: alienation and connection. Language Arts 66(4):392-406, 1989.

Haste, F., O. Brook, H. Anderson, J. Bland, A. Shaw, J. Griffin and J. Peacock. Nutrient intakes during pregnancy: observations on the influence of smoking and social class. American Journal of Clinical Nutrition 51:29-36, 1990.

Haworth, J., J. Ellestad-Sayed, J. King and L. Dilling. Fetal growth retardation in cigarette-smoking mothers is not due to decreased maternal food intake. American Journal of Obstetrics and Gynecology 137:719-723, 1980.

Heller, L., R. Salkeld and W. Korner. Riboflavin staus in pregnancy. American Journal of Clinical Nutrition 27:1225-1230, 1974.

Heller, M. Comprehending and composing through language experience. The Reading Teacher 42(2):130-135, 1988.

Henerson, M.E., L.L. Morris and C.T. Fitz-Gibbon. How to Measure Attitudes. Center for the Study of Evaluation, University of California, Los Angeles, 1987.

Hibbard, B. Iron and folate supplements during pregnancy: supplementation is valuable only in selected patients. British Medical Journal 297:1324-1325, 1988.

Horn, E. Iron and folate supplements during pregnancy: supplementing everyone treats those at risk and is cost-effective. British Medical Journal 297:1325-1326, 1988.

Horner, R., C. Lackey, K. Kolasa and K. Warren. Pica practices of pregnant women. Journal of the American Dietetic Association 91:34-38, 1991.

Hunter, C. and D. Harman. Adult Illiteracy in the United States, A Report to the Ford Foundation. McGraw Hill Book Co., New York, NY., 1979.

Hytten, F. and I. Leitch. The Physiology of Human Pregnancy, 2nd edition. Blackwell Scientific Publications, Oxford, England, 1971.

Idstein, P. and J. Jenkins. Underlining versus repetitive reading. The Journal of Educational Research 65(7):321-323, 1972.

Institute of Medicine, subcommittee on Nutritional Status and Weight Gain During Pregnancy. Nutrition During Pregnancy. National Academy of Sciences. National Academy Press, Washington, D.C., 1990.

Irwin, J. and C. Davis. Assessing readability: the checklist approach. Journal of Reading 124-129, 1980.

Jacobson, M., C. Kirkland and R. Selden. An examination of the McCall-Crabbs Standard Test Lessons in Reading. Journal of Reading 224-230, 1978.

Johnson, L. Effects of underlining textbook sentences on passage and sentence retention. Reading Research and Instruction 28(1):18-32, 1988.

Jones, K. Pattern of malformation in offspring of chronic alcoholic mothers. Lancet 1:1267, 1973.

Kafatos, A., I. Vlachonikolis and C. Codrington. Nutrition during pregnancy: the effects of an educational intervention program in Greece. American Journal of Clinical Nutrition 50:970-979, 1989.

Kazemek, F. An examination of the Adult Performance Level Project and its effects upon adult literacy education in the U.S. Lifelong Learning 9(2):24-28, 1985.

Kazemek, F. Adult literacy education: an ethical endeavor. Adult Literacy and Basic Education 8(2):1984.

Kennedy, K. and S. Roeder. Using Language Experience with Adults: A Guide for Teachers. New Readers Press, Syracuse, New York, 1975.

Kirsch, I. and J. Guthrie. The concept and measurement of functional literacy. Reading Research Quarterly 13(4):486-507, 1977.

Klare, G. Assessing readability. Reading Research Quarterly 62-102, 1974-1975.

Klare, G. A second look at the validity of readability formulas. Journal of Reading Behavior 8:129-152, 1976.

Klare, G. The formative years, In Readability: Its Past, Present and Future, International Reading Association, Newark, Delaware, 1988.

Klein, L. Premature birth and maternal prenatal anemia. American Journal of Obstetrics and Gynecology 83:588-590, 1962.

Kleinman, J. and S. Kessel. Racial differences in low birth weight: trends and risk factors. The New England Journal of Medicine 317:749-753, 1987.

Lanese, R. and R, Thrush. Measuring readability of health education literature. Journal of the American Dietetics Association 42:214-217, 1963.

Langford, E., E. Thompson and S. Tripp. Smoking and health education during pregnancy: evaluation of a program for women in prenatal classes. Canadian Journal of Public Health 74:285-289, 1983.

Laubach, R. and K. Koschnick. Using Readability: Formulas for Easy Adult Materials. New Readers Press, Syracuse, New York, 1977.

Lechtig, A., J. Habicht, H. Delgado, R. Klein, C. Yarbrough and R. Martorell. Effect of food supplementation during pregnancy on birth weight. Pediatrics 56(4):508-520, 1975.

Lieberman, E., K. Ryan, R. Monson and S. Schoenbaum. Risk factors accounting for racial differences in the rate of premature birth. The New England Journal of Medicine 317:743-748, 1987.

Lorge, I. Predicting reading difficulty of selections for children. The Elementary English Review 16:229-233, 1939.

Lorge, I. The Lorge and Flesch readability formulae: a correction. School and Society 67(1730):141-143, 1948.

Mayer, R. Models for Understanding. Review of Educational Research 59(1):43-64, 1989.

McCall, W. and L. Crabbs. Standard Test Lessons in Reading. Bureau of Publications, Teachers College, Columbia University, New York, 1925; 1950 edition, 1950; 1961 edition, 1961.

McCormick, M. The contribution of low birth weight to infant mortality and childhood morbidity. The New England Journal of Medicine 312:82-90, 1985.

McLaughlin, G. SMOG grading, a new readability formula. Journal of Reading 639-646, May 1969.

Meade, C. and J. Byrd. Patient literacy and the readability of smoking education literature. American Journal of Public Health 79(2):204-206, 1989.

Meyer, M. How does maternal smoking affect birth weight and maternal weight gain? Evidence from the Ontarion Perinatal Mortality Study. American Journal of Obstetrics and Gynecology 131:888-893, 1978.

Meyer, M., B. Jonas and J. Tonascia. Perinatal events associated with maternal smoking during pregnancy. American Journal of Epidemiology 103(5):464-476, 1976.

Michigan Expanded Food and Nutrition Education Program. Michigan State University, Cooperative Extension Service, 1990.

Milunsky, A., J. Hershel, S. Jick, C. Bruell, D. McLaughlin, K. Rothman and W. Willett. Multivitamin/folic acid supplementation in early pregnancy reduces the prevalence of neural tube defects. Journal of the American Medical Society 262:2847-2852, 1989.

Mitchell, M. and E. Lerner. Weight gain and pregnancy outcome in underweight and normal weight women. Journal of the American Dietetic Association 89:634-638, 641, 1989.

Mohammed, M. Patients' understanding of written health information. Nursing Research 13(2):100-108, 1964.

Mora, J., B. deparedes, M. Wagner, L. denavarro, J. Suescun, N. Christiansen and M. Herrera. Nutritional supplementation and the outcome of pregnancy 1. Birth weight. American Journal of Clinical Nutrition 32:455-462, 1979.

Morris, L.L., C.T. Fitz-Gibbon and E. Lindheim. How to Measure Performance and Use Tests. Center for the Study of Evaluation, University of California, Los Angeles, 1987.

Moscovitch, L. and B. Cooper. Folate content of diets in pregnancy: comparison of diets collected at home and diets prepared form dietary records. American Journal of Clinical Nutrition 26:707-714, 1973.

Mulcahy, R., J. Murphy and F. Martin. Placental changes and maternal weight in smoking and nonsmoking mothers. American Journal of Obstetrics and Gynecology 106:703-704, 1970.

Naeye, R. Nutritional/nonnutritional interactions that affect the outcome of pregnancy. American Journal of Clinical Nutrition 34:727-731, 1981.

Naeye, R. Abruptio placentae and placenta previa: frequency, perinatal mortality, and cigarette smoking. Obstetrics and Gynecology 55(6):701-704, 1980.

Naeye, R. Causes of fetal and neonatal mortality by race in a selected U.S. population. American Journal of Public Health 69(9):857-861, 1979.

National Center for Health Statistics. 1990 Health U.S. 1989 DHHS Publication no. (PHS) 90-1232 NCHS PHS USDHHS, Hyattsville, MD 291pp.

NRC, National Research Council. Recommended Dietary Allowances, 10th ed. Report of the Subcommittee on the Tenth Edition of the RDA's, Food and Nutrition Board, Commission of Life Sciences. National Academy Press, Washington D.C. 1989.

Neggers, Y., G. Cutter, R. Acton, J. Alvarez, J. Bonner, R. Goldenberg, R. Go and J. Roseman. A positive association between maternal serum zinc concentration and birth weight. American Journal of Clinical Nutrition 51:678-684, 1990.

Nitzke, S. Developing materials for low-income, low-literacy audiences. Journal of Nutrition Education 18:226B-C, 1986.

Nitzke, S. Reaching low-literate adults with printed nutrition materials. Journal of the American Dietetic Association 87(suppl):73-77, 1987.

Nitzke, S. Improving the effectiveness of nutrition education materials for low literacy clients. Nutrition Today 17-23, September/October 1989.

O'Sullivan, J., S. Gellis, B. Tenney and C. Mahan. Aspects of birth weight and its influencing variables. American Journal of Obstetrics and Gynecology 92:1023-1029, 1965.

Philipps, C. and N. Johnson. The impact of quality of diet and other factors on birth weight of infants. American Journal of Clinical Nutrition 30:215-225, 1977.

Pichert, J. and P. Elam. Readability formulas may mislead you. Patient Education and Counseling 7:181-191, 1985.

Pickering, C. Whole language: a new signal for expanding literacy. Reading Improvement 26(2):144-149, 1989.

Picone, T., L. Allen, M. Schramm and P. Olsen. Pregnancy outcome in North American women 1. Effects of diet, cigarette smoking and physiological stress on maternal weight gain. American Journal of Clinical Nutrition 36:1205-1213, 1982.

Que Software, Inc., Rightwriter Software Program, Version 5.0, Prentice Hall Computer Publishing, 1992.

Raper, N., J. Rosenthal and C. Woteki. Estimates of available iron in diets of individuals one year old and older in the Nationwide Food Consumption Survey. Journal of the American Dietetic Association 84:783-787, 1984.

Recht, D. and L. Leslie. Effect of prior knowledge on good and poor reader' memory of text. Journal of Educational Psychology 80(1):16-20, 1988.

Reference Software, Inc., Grammatik III Software Program, Wang laboratories, San Francisco, Ca, 1989.

Rickards, J. and G. August. Generative underlining strategies in prose recall. Journal of Educational Psychology 67(6):860-865, 1975.

Rogozinski, H., C. Ankers, D. Lennon, J. Wild, C. Schorah, S. Sheppards and R. Smithells. Folate nutrition in early pregnancy. Human Nutrition Applied Nutrition 37A:357-364, 1883.

Rudd, J., N. Betts and J. Dirkx. Developing written information for adults with low literacy skills. Journal of Nutrition Education 25:11-16, 1993.

Samora, J., L. Saunders and R. Larson. Medical vocabulary knowledge among hospital patients. Journal of Health and Human Behavior 2(2):83-92, 1961.

Schuster, K., L. Bailey and C. Mahan. Vitamin B-6 staus of low-income adolescent and adult pregnant women and the condition of their infants at birth. American Journal of Clinical Nutrition 34:1731-1735, 1981.

Scientific Research Association Achievement Series, ed. Naslund, R., L. Thorpe and D. Lefevre, Science Research Associates, Inc., Chicago, IL, 1971.

Shah, R. and R. Rajalakshmi. Vitamin A status of the newborn in relation to gestational age, body weight, and maternal nutritional status. American Journal of Clinical Nutrition 40:794-800, 1984.

Shannon, P. The struggle for control of literacy lessons. Language Arts 66(6):625-634, 1989.

Shepherd, S., L. Sims, C. Davis, A. Shaw and F. Cronin. Panel versus novice focus groups: reactions to content and design features of print materials. Journal of Nutrition Education 26:10-14, 1994.

Slosson, R. Slosson Oral Reading Test. Slosson Educational Publications, New York, 1963.

Smith, S. and B. Alford. Literate and semi-literate audiences: tips for effective teaching. Journal of Nutrition Education 20:238B-238C, 1988.

Smithells, R., C. Ankers, M. Carver, D. Lennon, C. Schorah and S. Sheppard. Maternal nutrition in early pregnancy. British Journal of Nutrition 38:497-506, 1977.

Snowman, M. Nutrition component in a comprehensive child development program. Journal of the American Dietetic Association 74:124-129, 1979.

Spache, G. A new readability formula for primary-grade reading materials. Elementary School Journal 53:410-413, 1953.

Stahl, S. and P. Miller. Whole language and language experience approaches for beginning reading: a quantitative research synthesis. Review of Educational Research 59(1):87-116, 1989.

Stevens, K. Readability Formulae and McCall-Crabbs Standard Test Lessons in Reading. The Reading Teacher 413-415, January 1980.
Sticht, T. Reading for Working: A Functional Literacy Anthology. Human Resources Research Organization, Alexandria, VA., 1975.

Strychar, I., C. Achterberg, and L. Sullivan. EFNEP for pregnant teens. Journal of Nutrition Education 23:40C-40D, 1991.

Subar, A., G. Block and L. James. Folate intake and food sources in the U.S. population. American Journal of Clinical Nutrition 50:508-516, 1989.

Suitor, C., J. Gardner and M. Feldstein. Characteristics of diet among a culturally diverse group of low-income pregnant women. Journal of the American Dietetic Association 90:543-549, 1990.

Tajika, H., A. Taniguchi, K. Yamamoto and R. Mayer. Effects of pictorial organizers on passage retention. Contemporary Education Psychology 13:133-139, 1988.

Talmage, H. and S.P. Rasher. Validity and reliability issues in measurement instrumentation. J. of Nutrition Education 13:83-85, 1981.

Taper, L., J. Oliva and S. Ritchey. Zinc and copper retention during pregnancy: the adequacy of prenatal diets with and without dietary supplementation. American Journal of Clinical Nutrition 41:1184-1192, 1985.

Taylor, A., J. Skelton and R. Czajkowski. Do patients understand patient-education brochures? Nursing and Health Care 305-310, 1982.

Taylor, B. Good and poor readers' recall of familiar and unfamiliar text. Journal of Reading Behavior 11(4):375-380, 1979.

Taylor, W. Cloze procedure: a new tool for measuring readability. Journalism Quarterly 415-433, Fall 1953.

Thorndike, E. and I. Lorge. The Teacher's Word Book of 30,000 Words. New York Teachers' College, Columbia University, New York, 1944.

Tierson, F., C. Olsen and E. Hook. Influence of cravings and aversions on diet in pregnancy. Ecology of Food and Nutrition 17:117-129, 1985.

Trouba, P., N. Okereke and P. Splett. Summary document of nutrition intervention in prenatal care. Journal of the American Dietetic Association S21-S26, 1991.

USDHHS. Pretesting in Health Communications: Methods, Examples and Resources for Improving Health Messages and Materials. NIH Publications, no. 83-1493, Bethseda, MD., National Cancer Institute, 1982.

Van Raaij, J., C. Schonk, S. Vermaat-Miedema, M. Peek and J. Hautvast. Body fat mass and basal metabolic rate in Dutch women before, during and after pregnancy: a reappraisal of energy cost of pregnancy. American Journal of Clinical Nutrition 49:765-772, 1989.

Vaughan, J. Interpreting Readability Assessments. Journal of Reading 635-639, May 1976.

Vergel, R., L. Sanchey, P. Heredero, P. Rodriguez and A. Martinez. Primary prevention of neural tube defects with folic acid supplementation: Cuban experience. Prenatal Diagnosis 10:149-152, 1990.

Worthington-Roberts, B. and S. Williams. Nutrition in Pregnancy and Lactation. Times Mirror Publishing, Boston, MA., 1989.

Zakaluk, B. and S. Samuels. Toward a new approach to predicting text comprehensibility. In Readability: Its Past, Present and Future. International Reading Association, Newark, DE., 1988.