Every examination of the problems of our schools, of poverty, every question raised by troubled parents about our schools, every learning disorder seems to show some association with reading difficulty.

- Francis Kepple.

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CHAPTER II
THE CONCEPT OF READABILITY AND ITS MEASUREMENT

The comprehension of the material read depends largely upon the level of difficulty of the material. There can be as many levels of difficulty as there are readers. No reader is as good as other in the reading act. But for the sake of convenience the readers could be divided into three broad groups, namely, the average readers, the above-average readers and the below average readers. In our schools a single textbook for each subject is prescribed for all types of readers in a class. This is likely to create problems of reading for some of the readers. It is no use prescribing textbook which the average students are unable to read. The teachers, the publishers and all those who are concerned with the students should assess the difficulty level of a textbook and after thorough consideration place it before the authority for its prescription for the class. But their judgment regarding its readability would be purely subjective. In absence of scientific method of evaluating the textbook and measuring its readability it happens that the wrong and inappropriate textbook is prescribed though there is no such intention. In the previous chapter it is threshed out that the textbook is at the centre of educational programme in India. For many teachers, the textbook determines what is to be taught in the class, and in how much detail the topic is
to be dealt with. On the other hand the pupils hardly read anything else except the textbook. Therefore, improving the quality of the textbook is a crying need of to-day and to-morrow. There may not be an ideal textbook for the pupils but there can be a book which would help to attain the purpose better than any other. It is presumed by many teachers that the achievement in the subject is more when good textbook is placed in the hands of pupils to read. Here the meaning of the good textbook is that, it should be readable by the average pupils. Therefore, the investigator thought it worthwhile to describe the concept of the term readability, factors affecting readability and its measurement.

2.1 The Concept of Readability:

According to Webster's dictionary, 'readable' means legible, .... pleasing, interesting or offering no difficulty to the reader.¹ This led to say that the book which is neatly printed in proper size of the type, distance between words and lines could be said to be legible and interesting. This type of book can be read easily or without least difficulty. Hence it could be called a readable book. The book which does not have these qualities is a non-readable book or a book difficult to read. It means that the book lacks

in readability. The non-readable book hinders the process of reading. It ultimately affects the reading comprehension. This is the general meaning of the term readability. In order to understand the concept of readability, it is very essential to examine some of the definitions given by the persons who have done remarkable work in this area.

2.2 Definition of Readability:

Many attempts have been made to define the term readability. It seems as if there were no one good definition of readability. But it would be realized that many definitions of readability, on the contrary, have broadened its scope. While defining the term readability, different writers have emphasized different factors of readability. Readability is the term used to cover the various aspects of written materials which together determine the reading difficulty of a printed page.

2.2 (a) Bhagoliwal's Definition:

According to Mr. B.S. Bhagoliwal, "the most commonly emphasized factors of readability are legibility, interest and ease of reading and understanding. These three factors of readability are of course interrelated".2 Interest, for

example, depends on many internal and external factors such as the content of the subject-matter and theme, clarity and colour of printing and illustrations, the length of the subject-matter, the total get-up of the book, etc. The personal taste of a reader also determines whether a book is readable or not. Although interest in a subject has its own importance, it is not the only yardstick that is used in measuring readability. Ease of reading or understanding depends on the style of writing. It also depends on reader's interest in the subject-matter. Books on relatively familiar ideas are usually easier to read than those dealing with abstract and complicated ideas. The format of a book such as bold type, good paragraphing and summaries may affect ease of understanding. Again, poor legibility of a book will result into poor interest and ease of understanding. Thus, the factors of readability are highly interdependent.

2.2 (b) Dale and Chall's Definition:

Considering the interrelation of the various factors, Dale and Chall proposed a comprehensive definition of readability which states that "in the broadest sense, readability is the sum total (including the interaction) of all these elements within the given piece of printed material that affects the success, a group of readers have with it. The success is the extent to which they understand it, read it
at an optimum speed and find it interesting. Thus, besides other components of readability like legibility and the power to arouse interest amongst readers, understanding of the material given in the book is also considered as one of the important components of readability.

Therefore, the term readability also covers the content-matter, over and above other aspects which together determine the reading difficulty of a book. Readability equals difficulty, so the difficult books are described as being of 'high readability' and easy books, as being of 'low readability'. The student is likely to learn less from the book having high readability.

2.2 (c) Guthrie's View of Readability

Guthrie distinguished between 'learnability' and 'readability' of texts:

'Learnability refers to the extent that new learning results from reading a passage. The result of step-wise regression analyses of text characteristics on learning scores showed that the same characteristics which predict reading comprehension (e.g. word difficulty and sentence length) also predict new learning'.


This definition leads to state that learnability is also a function of reading comprehension. The learnability of a book is said to be better if the reading comprehension derived from it is better. Therefore, he concluded that "the classic readability formulas may be used to estimate the learnability as well as the readability of text materials".

From the above discussion it could be threshed out that the term 'readability' includes three factors which are mentioned below:

i. Legibility of handwriting.

ii. Interest-Value of the reading material and

iii. Ease of understanding or comprehension resulting from the style of writing.

From the study and analysis of a few definitions of readability, it becomes very essential to look into the factors affecting the readability of the book, with a view to drawing some definite conclusions about these factors.

2.3 Factors Affecting Readability:

From the analysis of the various definitions described in the foregoing paragraphs and research in the area of readability the following three major factors which affect the readability of books have been identified.

---------------------
I  The difficulty of the subject matter or content;
II  The format of the book;
III  The style of writing.

(I)  Difficulty of the Subject Matter:

The most important factor determining the readability of books is the extent to which concepts and generalizations are made clear to the readers. Every subject has its own concepts. To be familiar with the subject, these concepts should be acquired as a primary objective. Such an objective demands that student should construct a clear picture in his mind of the object, event or idea under study. Difficult concept and its ambiguous or vague presentation in the book would hinder understanding because mere words do not help to shape the concept in the mind of the student. Therefore, he may be able to cram it from the book but there is no or very little understanding of it. Thus he may get good marks in a written examination but his understanding is superficial and limited. Closely related to concept development is another aspect of content - the accuracy with which the book is written. In many textbooks minor errors and inaccuracies are found. Sometimes totally erroneous statements can be detected. If inaccurate and erroneous writings are once learnt from the book, they are difficult for students to forget. Therefore, in the development of concept, correct and accurate writing is very important.
Another aspect of the content, which is crucial to determining readability is the number of sub-topics dealt in the unit or lesson. If too many sub-topics are dealt with in one unit or lesson, it becomes lengthy. Not only this, but it becomes difficult even for the writer to give proper weightage and treatment to all concepts and understanding to be described in the unit. Moreover, the concepts presented in a topsy turvy way are likely to create problems for students. This may add to the difficulties that students have in developing concepts. The obvious result is that the book turns out to be high in readability which lessens the comprehension of the students.

Over and above this, the manner in which a textbook is organised also contributes to its readability. Suitable topics for a given grade level may be found in a book but if it is poorly organised, it would make the book unreadable. In the organisation of textbook material, logical sequence is as important as language used in describing the concepts, understanding and ideas. Chapter introduction, words and sentences and summaries tend to make the content more understandable and hence more readable.

Another factor which makes the content or reading material readable is the interest which arises simultaneously during the process of reading. When textbooks discuss topics appropriate for a particular grade level and give
familiar comparisons and concrete examples, they attract attention of the readers and become interesting.

In short, in the most readable book, the content is well-organized and the major concepts and generalizations are explained and elucidated most accurately, the number of topics are limited and the interests of the students are kept in mind and accordingly catered to.

(II) The Format of the Book:

Another factor that affects the readability of the textbook is its format. Unattractive book seldom induces the reader even to hold it in his hands. On the other hand there are books which are unreadable though they are attractive. Thus, attractiveness alone does not guarantee that a book will be readable.

Illustrations like pictures, figures, charts, graphs etc. are other useful aids in making a book readable. But these must not be included merely for the sake of decorative value.

Good paper, clear print, tasteful bindings and attractive illustrations are welcome properties of a good textbook, though they add little to the comprehension of the content.

Whether the length of a topic or a book determines its readability is a question. Therefore, the style of writing
contributes more to the readability of the book is worth examining.

(III) The Style of Writing:

Most of the quantitative research on readability has been done with regard to the style in which a book is written. Certain elements of style such as vocabulary, sentence length and sentence structure could be analysed without difficulty, to examine the readability of the book. This aspect can be examined objectively whereas the difficulty of the concepts and ideas described in a book could not be measured and evaluated objectively. This aspect of style of writing can be examined objectively by means of readability formula and it is emphasized by all the research workers in estimating the readability level of the book. Hence the factors affecting the style of writing are examined in greater detail because of their bearing on the present study.

(i) Sentence length:

One aspect of style in general which makes a book difficult to read is the use of long and complicated sentences. A few long sentences together with frequent use of shorter sentences would make the subject matter easier for the normal high school reader. But a book full of long sentences has an inevitable factor of reading difficulty.
affecting many readers. In this connection Prof. Aukerman reports that "several researches have found that as many as fifty per cent of the high school students they examined cannot read the textbooks in their classes. In a large number of cases, this is due to the length of sentences in these texts."  

Psychologists provide an explanation for this. A long sentence contains more than one concept in sequence. Many students cannot hold several concepts into an organized whole and hold them so for a longer period. To do this a sharp visual memory is needed which is not found among most of the students. Again, some students may not be able to separate many individual concepts found in a long sentence. If short sentences, each containing one or two concepts, are employed, the students may find the reading easier and interesting too.

(ii) **Types and Complexity of Sentence**

Simple sentences will cause little difficulty to normal or below normal students to read them. A compound sentence consisting of two co-ordinates is also not very difficult for normal students. But certain compound and mixed sentences are very difficult for comprehension because

it becomes very difficult for the students to hold two related concepts together in mind. Thus, the compound sentences affect the understanding of the students.

Complex sentences are even more difficult than the compound ones. Complex sentence is used to place concepts and sub-concepts in their proper relationship to each other. Students having normal and above normal abilities would have less difficulty in understanding sentence pattern and the thought presented in such complex sentences; but the slow learners having below normal intelligence would not be able to grasp the meaning from them. Referring to this aspect of complexity of sentences, Prof. Auerman states:

"Textbooks which consist of sentences with subordinate clauses should be considered highly complex and rated as having a level of readability that is above average for high school students, even if none of the other factors of readability are measured. It should also be noted that sentences technically classified as 'simple' or 'compound' may contain elements, such as inverted order or numerous modifiers which make them too difficult for many students. This kind of complexity is also to be avoided when a textbook of low readability is sought".7

Therefore, it could be said that even a book with controlled and selected vocabulary load may be extremely difficult to read because of long and obtuse sentences having inverted order and countless unnecessary modifiers.

7. Ibid., p. 22.
Sentences can be written with three or four ideas each of which requires digestion, not just verbal recognition. According to Mallinson G.C., "Such sentences can be unduly difficult even with 'easy terms'. Materials should be written so that the sentences contain but one major idea and seldom more than one contributing sub-idea. Sentences that contain several major ideas and several supporting ideas are likely to be difficult for even sophisticated readers, particularly when the material is unfamiliar."

From this discussion it could be threshed out that long sentences whether simple or compound or complex do affect the readability of the material adversely. Besides this, vocabulary also plays an important role in increasing or decreasing the readability of the material.

(IV) Vocabulary:

For poorer students, a heap of words in a textbook create a formidable problem. A vocabulary load of a book can be determined by computing a ratio of number of new words to number of running words. It is expressed as shown in the formula given below:

\[
\text{Vocabulary Load} = \frac{\text{No. of new words}}{\text{No. of running words}} \times 100
\]

-------------

But it would be a gross measure of vocabulary load. There are other angularities of vocabulary which contribute to reading difficulty of the students. They are described below:

(a) **Complicated or Unfamiliar Vocabulary**:

Strange, new as well as unfamiliar words, the meanings of which are not known by the students, cause great difficulty in comprehension. Spoken words in print may raise the level of readability of the material. Some authors are habituated to use words which are foreign to the students' vocabulary list. Such authors have no idea regarding the reading abilities of the students for whom they are writing. There exists a natural gap between the vocabulary of author and that of readers. This is particularly so when the author serving in higher institution writes the material for the secondary students whose limited knowledge of vocabulary is not known to him. The natural consequence of this situation would be that the reading material would have high readability level. Because the number of unfamiliar words not known by the students increases the readability level of the material. Therefore, many readability formulas include a count of unfamiliar words.

(b) **Obsolete Vocabulary**:

Words which are no longer in use are called obsolete words. They have lost importance in present vocabulary list.
of the people. Such words are seldom used by people and therefore they are not known by the younger generation. The younger educated people, when they come across these words in reading material, find it difficult to make out the meaning even in the context of the material. Therefore it is certain that obsolete words when used in a reading material can hinder comprehension unless they are explained to the reader. The use of obsolete vocabulary is difficult to avoid because the authors of the textbooks and the young readers are separated by a generation gap. Thus the words familiar to the author may be quite unknown to the young people of to-day. Many terminological vocabularies in Gujarati language are derived from Sanskrit. Their meanings and etymology are very strange; sometimes their pronunciations are also strange and difficult. Such words tend to increase the readability level of the material.

(c) Colloquial and Dialectical Vocabulary:

Colloquial and dialectical words present the same difficulty as obsolete words. Colloquial words are mainly spoken words. They have a general usage in speech but they are not recognized by the elite of a language. Similarly, words of different dialects in the same region have different connotations. Gujarati is the regional language of Gujarat State but there is a vast difference in the varieties of its spoken forms used in Saurashtra, north Gujarat, Central Gujarat and South Gujarat. When an author employs his own
dialect or the dialects of the people of certain region of the state in writing the book, the reader is at loss because he does not know the exact meaning of the dialectical expression. Again there may be rustic usage and their pronunciations also are quite different from the written words. This creates difficulty in comprehending material, although the words may be accepted more readily.

(d) Scientific, Technical and Specific Vocabulary:

Every subject has its own specific vocabulary. It uses certain words to convey meanings specific to it. These words may be scientific or technical or they may be ordinary words but they are given specific meanings in particular subject-area. The use of specific, scientific and technical words increases the difficulty of the reading material only when they are not properly explained and defined. The introduction of such words requires great skill on the part of the writer. When such words are not properly introduced or explained in context, they greatly vitiate the reading material and raise the readability level beyond the scope of the ability of the average student.

(e) Polysyllabic Vocabulary:

Prof. Aukerman says, "How often polysyllabic words are used is the greatest single factor in determining the level of readability." Therefore, frequent use of polysyllabic

words is likely to slow down the reading rate as well as reading comprehension. It is because of this fact that in several of the important readability formulas, a count of polysyllabic words is included. By and large, words having four or more syllables are considered as polysyllabic words. Such words are treated as difficult words because students have to use skill in structural analysis to understand them. The skill in structural analysis is very likely to be poor in the case of poor readers. In general, it can be said that the more the polysyllabic words in the textbook the higher is its level of readability.

(f) Abstract Concepts:

Concepts which are abstract in nature do not take shape in the mind and hence do not create a clear mental picture of them. Thus, their meaning and understanding are obscured. However, gifted students may find them somewhat easy. According to Prof. Aukerman, "Individuals with a low I.Q. should deal mainly with concrete concepts; abstract concepts are best handled by students having high I.Q." Abstract concept is represented either by a word or by a group of words or by a statement. At the same time it is also difficult to classify a concept into concrete and abstract. What is concrete to one may be totally abstract to another.

10. Ibid., p. 25.
Therefore, the consideration of abstraction is highly subjective depending upon the background and experience of the individual who does judging. Nevertheless, Prof. Aukerman tried to judge the readability level of the material in relation to the degree of abstraction. He is of the opinion that "any secondary school reading material that is 34 per cent abstract would probably be a total loss to more than half of the school population. Even well-trained adult readers find material that is one-third abstract extremely difficult to follow." 11

From this discussion it could be stated that abstract concepts do not lend themselves easily to objective consideration. Hence almost all readability formulas do not include a measure of abstraction. Why has this factor not been included in the readability formula inspite of the fact that there is a relationship between abstraction and difficulty of comprehension? The answer to this question is left to future researchers as it is not within the perview of the present investigation.

From all these discussions, it could be summarized in brief that the style of writing a textbook affects its readability, though of course, the reader's own ability to read the textbook also remains an important factor in

determining its readability. All the students in a grade may not be able to comprehend the textbook at the same level. Despite this, they are required to read the same textbook. As a result of this impasse, the students lose self-confidence, develop inferiority-complex and are frustrated. Therefore, it becomes the duty of the teacher to provide the students with the right type of textbook which suits their reading abilities. As Bond and Tinker commented, "to require a pupil to read a book he cannot read with understanding will only result in confusing him." In order to avoid such confusion, the textbook should be of a proper readability level. But how can the readability of the textbooks be determined? This leads us to the problem of the measurement of readability of the reading material.

2.4 Measurement of Readability

For the past forty years or so, research workers are engaged in finding out some methods to determine the readability level of a book. For this purpose they approached the persons who were closely connected with the books such as teachers, students, publishers, librarians and general readers. The researchers working in the field of readability interviewed these persons. From the analysis of the answers given by different interviewees, they came to the conclusion that the style of writing is the chief factor, contributing

to the readability of the material. Then they started to analyse the 'style of writing' statistically. In examining the style of writing a book, grace or felicity in writing was not taken into account but the emphasis was laid on clarity or simplicity with which the material was presented because these were considered to be the main characteristics in determining the readability of the material. The researchers had applied various tests and statistical investigations to discover the particular components of writing which create difficulty in reading. They have counted the words which were not included in the standard wordlists; they have also counted polysyllabic words and sentences other than the simple ones. After this preliminary work, they were able to formulate complicated formulas for testing or predicting the level of difficulty or the readability of a book.

This interest on the part of the researchers has yielded many formulas for studying the readability. Each investigator has given his own formula thereby indicating that each has had differing views on the components of readability. The study of the different readability formulas led to say that some researchers have become more ambitious trying to develop comprehensive and complex formulas of readability than other researchers who selected simple measures of some components of readability. They incorporated a few components into their readability formulas. Some other
investigators worked on particular grades and they developed formulas for elementary school level while still others found out formulas which are applicable specifically to secondary school textbooks. Some formulas have also been evolved which are very specific; hence they are applicable only to particular materials, that is, periodicals, magazines etc.

So, 'readability formulas' are devices which have been evolved to determine the difficulty level of reading material. Prof. Aukerman defines readability formula:

"as an objective method of measuring several components of writing which, when considered in relationship to each other, result in a quantitative estimate of the reading difficulty of the sample." 13

The experimental analysis of mechanical qualities (rather than ideas or concepts) which affect difficulty has led to the development of readability formulas. Many such readability formulas are developed from pioneer work on vocabulary by R.L. Thorndike and the first major measures of readability developed by Gray and Leary and by Washburne and Morphet. Improved statistical analyses have simplified the Gray-Leary materials and added other items to be included in a count of factors which affect the difficulty level of a reading material.

---------

Study of the concept of readability and the general method of measuring it is largely based on the work of Mabel Vogel and Carelton Washburne carried out in 1928. They have been able to isolate four factors: (i) number of different words, (ii) number of unknown words, (iii) number of prepositions and (iv) number of simple sentences. Irving Lorge, the author of Lorge Readability Index, said that 'not only his formula, but the Flesch Readability formula and the Dale-Chall readability formula each followed the formula of multiple regression established by Vogel and Washburne'. Therefore, it will not be out of place to discuss here a few better known readability formulas.

2.3 Some Readability Formulas:

There are many formulas to determine the readability levels of reading materials. The formulas which incorporate the factors of readability such as vocabulary, sentence structures, length of sentence and technical expressions are usable statistically because such factors can be counted objectively. According to this criterion of objectivity, Dr. Wall believes that 'the most commonly applied formulas to establish the readability of written materials include Spache's formula for the primary levels, Lorge's formula for upper elementary levels and the Dale-Chall formula which

extends from the intermediate through college-levels.

(i) **Spache's Formula**

This formula is applied to measure difficulty for grades 1, 2, and 3. The base of measurement is the average sentence length and number of hard words beyond Dale-list of 769 words.

\[
\text{Readability Index} = \text{Average sentence length} + \text{number of hard words}.
\]

(ii) **Lorge Readability Formula**

According to this formula, the basic data required for the estimation of readability are: (i) the number of words in a sample, (ii) the average length of a sentence, (iii) ratio of prepositional phrases, and (iv) the ratio of hard words. There are three constants which are to be multiplied with the respective factor of readability and the fourth constant is to be added to arrive at the Lorge Readability Index. (L.R.I.)

\[
L.R.I. = 0.06 \times \text{ASL} + 0.55 \times \text{RPP} + 10.43 \times \text{RHW} + 1.9892
\]

Where

\[
\begin{align*}
\text{ASL} & = \text{Average sentence length.} \\
\text{RPP} & = \text{Ratio of prepositional phrases.} \\
\text{RHW} & = \text{Ratio of hard words.}
\end{align*}
\]

References:

17. Ibid., p. 450.
(iii) Flesch Readability Formula (1948): 18

It considers Reading Ease Score (R.E.S.) It predicts 'probable' readability for average reader in the upper elementary grades. It gives rough estimate of the difficulty level of the reading material. The formula is based on statistical analysis. The basic data necessary for arriving at R.E.S. are: (1) average sentence length and (2) number of syllables per 100 words.

\[
R.E.S. = 206.835 - 1.015 \text{ ASL} + 0.846 \text{ ns}
\]

Where

- ASL = Average sentence length
- ns = number of syllables per 100 words.

(iv) Dale-Chall Readability Formula 19

This formula predicts the readability of written materials for intermediate through college levels. Basic data required to determine the readability by this formula are: (1) average sentence length and (2) Dale score or percentage of words outside the Dale list.

The Dale-score or the percentage of words outside the Dale list is determined by using the following formula:

---

18. Ibid., pp. 444-447.
19. Ibid., pp. 447-450.
No. of words on the Dale list \( \times 100 \)

\[
\text{Dale score} = \frac{\text{No. of words in the sample}}{	ext{No. of words on the Dale list}}
\]

After finding out the Dale-score, the readability index is computed by applying the following formula:

\[
\text{Readability Index} = \text{Average sentence length} + \text{Dale score}
\]

(v) **Johnson Readability Formula (1930):**

Johnson took into consideration the percentage of the polysyllable words as the base of measurement of readability. The higher the percentage of polysyllable words, the more difficult the material.

(vi) **Farr, Jenkins and Paterson Formula (1951):**

In the formula developed by Farr, Jenkins and Paterson, the base of measurement is the number of one syllable words and the sentence length. The readability score is called New Reading Base Index and it is expressed as under:

\[
\text{New Reading Base Index} = 1.5999 \times \text{nosw} + 1.0155 \times \text{SL} - 31.517
\]

Where

- \( \text{nosw} \) = number of one syllable words
- \( \text{SL} \) = sentence length in terms of the number of words

\[21. \text{ Ibid., p. 17.}\]
(vii) **Robert Gunning's Formula (1952):**

A simple formula has been developed by Robert Gunning to find out an estimate of difficulty of the reading material. According to the formula given by Gunning, the following factors are taken into account:

1. average length of sentences per 100 words (ASL)
2. number of words of 3 and more syllables.

For finding out the Fog Index, the following formula is used:

\[
Fog \text{ Index} = 0.4 \times (\text{per cent words of 3 syllables and over} + \text{ASL})
\]

(viii) **Fry's Readability Graph (1968):**

Mr. Edward Fry presented a revision of his 'Readability Graph' together with some directions for its use and validity checks with several other formulas.

Application of the readability graph requires only (i) average (of 3 randomly selected 100 word passages) number of sentences per 100-words and (ii) average number of syllables per 100 words.

Fry reported high correlations of his readability ratings with Dale-Chiat, Flesch and student comprehension scores and pointed out that his readability graph was easy to use.

(ix) *Aukerman's Formula* (1972);  

Prof. Aukerman suggested a comprehensive yet practical formula for determining the "Weighted Readability Score" of a reading material. He took into account the various components of readability and experimented on various samples, the results of which correlated highly with other formulas. He suggested the following steps to be observed while computing the "Weighted Readability Score".

1. Select several representative samples of 500-words from each chapter.

2. Count the actual number of words (be exact in counting).

3. Count the actual number of sentences.

4. Find out the average sentence length.

5. Count the actual number of subordinate clauses.

6. Count the actual number of impedilexae for each sample.

7. Count the number of words of three or more syllables or difficult words for each sample.

---

After gathering the above necessary data, the readability score is computed with the help of the following formula:

\[ \text{Weighted Readability} = \text{ASL} + 3 \times \text{nsdl} + \text{npw} + 5 \times \text{ni}. \]

Where

- **ASL** - average sentence length
- **nsdl** - number of subordinate clause
- **npw** - number of polysyllabic words
- **ni** - number of impedilexae

From the above description of the various readability formulas, it appears that they take into consideration the one or more of the following components of readability while arriving at the readability score of the reading materials.

### TABLE I

The Components of Readability vis-a-vis Readability Formulas

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Components of Readability</th>
<th>The serial order of the formula which include the component</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Number of hard words beyond a specific word list.</td>
<td>1, 4.</td>
</tr>
<tr>
<td>2.</td>
<td>Average sentence length</td>
<td>1, 2, 3, 4, 6, 7, 8, 9</td>
</tr>
<tr>
<td>3.</td>
<td>Total number of words</td>
<td>2.</td>
</tr>
<tr>
<td>4.</td>
<td>Prepositional phrases</td>
<td>2.</td>
</tr>
<tr>
<td>5.</td>
<td>Number of syllables</td>
<td>3, 8</td>
</tr>
<tr>
<td>6.</td>
<td>Number of polysyllabic words</td>
<td>2, 3, 7, 9</td>
</tr>
<tr>
<td>7.</td>
<td>Number of monosyllabic words</td>
<td>6.</td>
</tr>
<tr>
<td>8.</td>
<td>Number of subclauses</td>
<td>9.</td>
</tr>
</tbody>
</table>
From table Nos. I and II, the following observations could be made:

1. that most of the readability formulas described above contain 'average sentence length' as one of the components of readability. It seems natural that frequent usage of longer sentences in the textbooks increases their level of readability. The long sentence, though simple, may prove to be difficult to comprehend at the first
reading. It could be emphatically said that the compound and the complex sentences contain more concepts and therefore they are more difficult to comprehend at first reading, even though their average length may be short. So sometimes the concept of the 'average sentence length' deceives the researchers. In order to guard against such an event, some sort of complexity factor which considers the structures of the different sentences should be considered:

ii. that four out of nine readability formulas incorporate the count of polysyllabic or hard words. Vocabulary load is the potent factor in increasing the difficulty of the reading material.

iii. the older formulas rely mostly on two components of readability for predicting the difficulty level of the reading material: (a) average sentence length and (b) polysyllabic words. They did not consider the complexity that results from the use of different sentence patterns. This structural difficulty introduces a syntactical complexity factor in reading the materials. This type of complexity is experienced when one reads compound and complex sentences. This 'syntactical complexity' is incorporated by a single formula and that is Aukerman's. This factor is also weighted heavily as it is multiplied by \((\text{constant})^3\).
iv. the older formulas did not differentiate between the polysyllabic hard words and the words which 'impede' learning. The meanings of the polysyllabic hard words may be known in context by natural intuition while the meanings of the words which impede learning - impedilexae - cannot be known through context. Such impeding words require frequent learning and teaching, before their exact meanings can be obtained. This differentiation between the hard vocabulary and 'impedilexae' has been made for the first time in Aukerman's formula. In Aukerman's formula, the factor of 'impedilexae' has been weighted strongly by multiplying by 5 as constant.

2.6 The Uses of Readability Formulas:

Readability formula, as such, is not a magic wand whereby reader's difficulty in reading a material could be predicted. The formula merely analyses the different components of the reading material and the predictions are attempted from them. According to McTaggart, "a readability formula gives only an estimate of difficulty of the reading materials. The true test of readability is whether the material can actually be read by people of a given reading ability".  

Therefore, the appropriate matching of reader and printed material should be the chief idea behind readability measurement. The assumption here is that different readers have differing reading abilities and abilities that the reading materials are of various levels of reading difficulty. Hence matching. This means that the purpose and significance of the readability formulas lies in the fact that they predict and control difficulty and furnish a tool for matching reading materials to the reader.

Besides these, they have also been used as tools in educational research and construction of reading tests to get passages of equal difficulty for retest purpose. The last but not the least, is the use of readability formulas to evaluate the educational attainments of the writers.

2.7 Limitation of Readability Formulas:

From the study of the various readability formulas, it has become possible to point out a few limitations of their use. Almost all formulas ignore the aspects of readability such as organization, abstract concepts, the nature of the content or the physical features of the material like figures, illustration, size and colour of type; They concentrate on the factors which are related to style as a determinant of reading difficulty. In spite of their limitations, however, they are being used to measure the difficulty level of the reading materials.