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## ISSUES RELATED TO TEXT COMPREHENSIBILITY: THE FUTURE OF READABILITY

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### 1. Introduction

INTEREST IN THE GENERAL ISSUE of language comprehensibility, readability, or its parallel listenability can be traced back to biblical times, cf. Klare (1963). Chapter 14, Verse 9, Corinthians I states:

*«... except ye utter by the tongue words easy to be understood, how shall it be known what is spoken? For ye shall speak into the air!»*

The first recorded attempt to examine what has come to be called readability was made by religious leaders. As early as 900 A.D., word and idea counts were made by Talmudist scribes who used frequency of occurrence to distinguish usual from unusual words. The purpose of making such counts was to divide weekly Torah readings into comparable units of comprehensibility, cf. Lorge (1944).

Educators have long regarded text comprehensibility as critical. Carefully chosen vocabulary was an important consideration as long ago as 1840 when the McGuffey Readers were compiled, cf. Klare (1963). While teachers were concerned that children not become frustrated with materials that were too difficult, librarians, on the other hand, crusaded for more readable adult materials. This attention intensified with the increased automation that began in the 1920s when advancements in technology led to more leisure time. Freedom from work stimulated interest in reading both for enjoyment and for

“do-it-yourself” information. A greater emphasis on adult vocational training and re-education for the unemployed during the depression also prompted requests for technical information that was easier to read.

But other professionals also recognized the need for clarity of expression. In 1921, for example, publishers of the *Chicago Evening Post* and *Century Magazine* claimed elite status because articles in their newspapers contained multisyllabic words and longer sentences, cf. Klare (1963). In contrast, after World War II the editor of the *Wall Street Journal* ran full page ads in the leading literary magazines of the day promoting the idea that his newspaper had the most “readable” front page in the country, cf. Dale & Chall (1948). In the business field, union-management contracts, client agreements, as well as employee handbooks and corporate reports were assessed for readability. Journalists and those in mass communication became concerned not only about the readability of magazine articles, but also the readability of best selling novels and advertising copy. Leaders both in the legal and medical professions took steps to ensure that documents, government publications and health brochures were more comprehensible. Research to assess the difficulty level of materials in languages other than English was also carried out, primarily to meet the needs of English speaking students who were studying foreign languages, cf. Klare (1963, 1984) and Rabin (1988).

In the majority of these cases, determining the comprehensibility of materials has been synonymous with the application of readability formulas. But formula scores have all too often been accepted uncritically as final pronouncements on the difficulty of a text, cf. Klare (1963). Because of the problems associated with assessing readability through formulas, we propose to do the following: 1) review the development of present day formulas; 2) examine the drawbacks associated with estimating text difficulty levels by means of formulas only; 3) explore factors that influence text comprehensibility; and 4) consider readability from the perspective of the educator.

While the Zakaluk-Samuels nomograph (1988) took an innovative step with its integration of inside- and outside-the-head factors to estimate text difficulty for a particular reader, we nevertheless are of the opinion that formulas need to be applied judiciously because so many other variables influence comprehensibility that it is almost impossible to quantify them. Formulas alone are not sufficient, at the present time, for making highly accurate predictions regarding comprehensibility. For beginning readers, such factors as the familiarity of the story itself, the familiarity of the underlying theme, the formality of the language, the complexity of the sentence patterns, the presence and nature of repetitions, the vocabulary, the format, and the complementary

nature of the illustrations all influence readability. Comprehensibility variables that need to be considered when matching older readers with appropriate materials include such outside-the-head factors as whether the text structure is narrative or expository, whether there is an explicit statement regarding the author's purpose, and whether causal links are specifically stated or need to be inferred. Inside-the-head factors, including the reader's metacognitive knowledge and ability to self-question during reading, also influence text comprehension. Thus outside-the-head factors such as text structure and causal network theory as well as inside-the-head factors such as the reader's purpose, and level of metacognitive awareness also play a role in text comprehensibility. Determining how difficult or how easy a particular book may be for a particular reader is a complex task.

## 2. Formula Development

Formulas to calculate the comprehensibility of communicative materials appeared rather recently in the history of the concept of text comprehensibility, commensurate perhaps with the scientific thinking that prevailed in the 20s. J. B. Watson had warned psychologists that they must not delve into the "black box" of the mind because of problems of unreliability. Research on outside-the-head factors such as sentence length and word frequency was acceptable because these factors could be accurately measured. Hence, the interest in estimating readability using variables found within the text itself.

There are conflicting reports regarding the number of formulas that exist. By defining a formula narrowly as a predictive device that provides quantitative, objective estimates of text difficulty without involving the reader in any way, Klare (1963) identified 31 formulas with 10 variations, all published during the years 1923 to 1959.

All of the formulas cited by Klare were developed in psychometric research that tried to isolate particular elements within the textual material itself as indices of the difficulty level. The publishing of Thorndike's word books (1921, 1932) which provide a list of English words rated according to range and frequency of occurrence, served as a catalyst in the development of many formulas. The Lively and Pressey formula (1923), for example, considered only vocabulary burden. In assigning a readability level, these factors were taken into account: 1) the number of different words (range); 2) the frequency of occurrence (as designated by an index number assigned according to where in each block of 1,000 the word appeared on Thorndike's list); and 3) the number

of words not on Thorndike's list. These rare words were deemed to be a measure of technical vocabulary and given a weight twice that of the other counts, cf. Klare (1963).

In their 1928 formula to estimate readability, Vogel and Washburne added the number of prepositions and the number of simple sentences to counts of the number of different words and the number of uncommon words. This formula yielded scores that correlated .845 with the reading test scores of children who read and liked the books that were used as criteria in developing the formula, cf. Klare (1963).

In the years between 1934 and 1938, formulas began to take into account an ever increasing number of sentence and word factors. Dale and Tyler (1934) considered 25 factors in their formula. These factors were roughly grouped according to technical vocabulary, easy words, hard non-technical words, type and length of sentences, number of clauses and prepositional phrases, number of personal pronouns, number of monosyllabic words and miscellaneous factors, cf. Klare (1963). In estimating readability, Ojemann (1934) recognized the importance of qualitative factors such as the level of abstraction, obscurity and incoherence in expression. But because it was difficult to quantify these qualitative factors, he restricted his formula to such considerations as sentence complexity and vocabulary burden.

The general pattern of formula development that emerged involved counting text factors believed to affect text difficulty and correlating them with some sort of criterion. For Gray and Leary (1935), the criterion was a series of graded passages that were ranked according to difficulty. The difficulty level of the criterion passages used by Gray and Leary was established on the basis of the reading performance of adult readers who were required to answer a set of comprehension questions on each passage. The issue then became which text factors occurred most frequently as the difficulty of the passages increased. The most highly predictive text factors were then combined and weighted in a regression equation for use in predicting the readability of other materials, cf. Klare (1963).

During the next period of formula development from the late thirties to the fifties, efficiency of use began to outweigh the consideration of multiple factors. Many factors could be dropped from the regression equation without substantially sacrificing accuracy. The outcome was that in estimating text difficulty through the application of a formula, we now consider only two factors: word length or frequency, and sentence length. This is because these two factors represent the highest loadings on the regression equations to estimate the difficulty level of the text. All the other variables, such as the number of

personal pronouns, were dropped because adding them to the formula did not significantly increase the predictive value of the formula in explaining text comprehensibility.

### 3. Formula Drawbacks

In this section, we will describe the shortcomings of formulas when used to judge text comprehensibility and when used to guide writing. Zakaluk and Samuels (1988) have criticized the existing readability formulas according to the following issues: interformula reliability, criterion validity, disregard for higher level text organization and prescriptions for writing. A critical test of any formula is the comparison of its readability estimates with the readability levels obtained through the application of established formulas. Studies however indicate that depending upon which formula is employed, different readability levels result. That is the readability of individual selections will move from a position of most difficult through the application of one measure to the position of least difficult through the application of another. McConnell (1982), for example, found discrepant results for nine college level introductory economics texts. One text had a grade equivalent of 11.1 when readability was calculated by the Dale-Chall formula, 8.2 when the modified Dale-Chall formula was used, but 10.7 when readability was estimated by the Fry formula. What is even more striking is that the rank order of difficulty for the texts changed according to the particular formula employed. The difficulty level of one economics text, for example, moved from the easiest among the nine texts in the sample to next to the hardest, through the application of a different formula.

Because readability formulas focus on factors such as word frequency and sentence length, it is possible to randomize every sentence in a text without changing the readability level. What readability formulas ignore are critical factors such as text organization and cohesiveness. The readability level of an eight paragraph selection would be the same in jumbled order as it would in a coherent order, cf. Marshall (1979). Flesch (1948) recommended that formula study be part of the curriculum in composition, creative writing, journalism and advertising courses. But rewriting text to conform to a prescribed reading level may result in text that is more difficult to read. When the number of ideas is held constant, understanding is enhanced when ideas are elaborated, cf. Coleman (1971). In shortening long sentences to make the text comply with a lower readability level, writers often delete the subordinate conjunctions which indicate time (whenever, until, since); place (where, wherever); manner (just

as, as if); degree of comparison (as much as, as if); cause or reason (because, since, for); result (that, so that); condition (if, unless, as if); concession (though, although, even if); or purpose (so that, in order that, lest). This forces the reader to make an inference regarding how the two ideas are related. Kintsch and van Dijk (1978) suggest that "argument repetition" or the reiteration of key words and concepts from sentence to sentence enhances the flow of meaning, making the relationship between and among the ideas explicit and therefore enhancing comprehensibility. Reducing sentence length to meet the demands of readability formulas may detract from, rather than enhance comprehensibility.

Another way of reducing the readability level of a text is to substitute familiar words for rare, infrequently-occurring words. In the case of informational text, the inclusion of rare, technical words may be essential to the understanding of specialized fields of study. Both meaning and the aesthetic quality of the writing may also be destroyed when we tamper with words. As Finn (1975) observed, colourful words may carry nuances of meaning and connotations that familiar words lack.

Gourley (1984) goes further in decrying the harmful effects of using readability formula in writing text, especially when the text is being used to teach beginners. She suggests that the language in many primary readers that were in common use until the early 80s is not just overly simplified, but deviant in that both vocabulary and sentence construction are contrived. The distorted syntax often violates the higher order principles for structuring natural discourse. Instead of supporting literacy acquisition, as was the intention, the stilted language inhibits learning. Texts for beginners, Gourley suggests, need to be written in a discourse style that is more conversational, moving gradually to the use of more formal, literary book talk.

#### **4. The Comprehensibility of Books for Beginning Readers**

Peterson (1991) relates how in working with beginning readers, her adult perceptions of what constituted an "easy" or a "hard" book were continually being challenged by the actual reading behaviour of the children. Studies which compare students' reading of picture books with their reading of basal selections reveal that even though readability levels were lower for the basal texts, children were more successful with the storybook selections, cf. Gourley (1984) and Bussis & al. (1985). Children were more likely to develop useful reading strategies when they read from material that reflected the language they spoke.

As suggested by Rhodes (1979), when large chunks of text are repeated, when the story line and concepts are familiar, the material will be more predictable and hence easier to read.

Gourley (1984) challenged the use of conventional notions of readability when choosing books for beginning readers. She contends that through experiences with oral language and having books read to them, young children's knowledge of higher order discourse structures, such as story grammars, exceeds their knowledge of orthographic and graphophonic structures. She argues that this knowledge of higher-order discourse structure is useful for beginning readers, freeing up processing space so that they can concentrate on understanding how the code works.

Gourley compared the pattern of oral reading miscues for beginning readers who read eight different stories taken from basal reading programs. In a 1984 report on her study, she compared the children's miscue performance on two of the basal stories with their miscue performance on a picturebook not specifically designed for use in a beginning reading program. The picture book story did not breach children's expectations of textual cohesion and narrative voice in the same way that many preprimer stories in basal readers do.

Gourley developed an alternate version of each basal reading story, creating a second, more natural version of one particular story which contained the stilted repetition of names where pronouns would more naturally be used. She also developed a more natural version of a second basal story, which inappropriately used *the* instead of *a* when items were introduced for the first time.

She found that even though the readability level of the picture book story was slightly higher than that of the two basal stories, the rate of miscues was similar. Beginning readers were more successful when appropriate connectives, such as pronouns, conjunctions and articles were used to mark the relationships within the text. These were present in the two modified basal stories and in the picture book. When connectives were absent, children had to make the links themselves, often misinterpreting the author's meaning in the process.

Gourley concluded that reading selections are more difficult for children to read when the text fails to use the narrative voice, lacks a conversational tone and uses the present instead of the past tense. The children in her study also experienced difficulty in cases in which storytelling conventions that had to do with the repetition of words, phrases or sentences were broken. Repetitions were not helpful when they failed to consider the overall meaning or structure of the story. Repetition, however, did contribute to comprehensibility when full sentences were repeated in sequence as part of a number of episodes



describing similar events. Finally, Gourley explained that pictures are an important component of books for beginning readers. When pictures complement the text, they become an important resource in support of meaning making. Both the content of the pictures and the language of the text need to be familiar. All of these text characteristics, which Gourley demonstrated were important to beginning readers, fall outside of the domain of conventional readability measures.

Peterson (1991) provides guidelines for sorting beginning reader books along a continuum from easier to more complex, based on the premise that children who are familiar with the story and who know both the story sequence and the refrain will be able to use that knowledge to predict the upcoming text. In Peterson's view, text for beginning readers should facilitate the process of cross-checking that we teach beginning readers to use — judging whether their reading: 1) makes sense, 2) follows a familiar language pattern, and 3) conforms to the print on the page. When the stories and the language pattern are unfamiliar, children will likely experience much more difficulty. Thus the reader's experiential background, knowledge and expectations influence comprehensibility.

Stevenson has identified criteria for ranking beginning reading books into 20 levels which she clusters into groups of 4. At levels 1-4, when young readers are primarily learning to control directional movement and the word-by-word matching of speech to print, the following criteria apply: 1) the language must be similar to the speech of young children with comparatively short sentences and repetitive phrases, 2) the illustrations must support the text, 3) the story line must reflect children's experiences, having to do with such topics as families, pets or animals, and 4) the text must be consistently placed on the page.

Although the criteria for placing books within the next set of levels, 5 to 8, still considers repetitive patterns important, the repetitive pattern at these levels does not dominate the text to the same extent as in levels 1 to 4. Unlike pictures in books at earlier levels, the illustrations are less likely to serve as prompts to word identification, and dependence on pictures as prompts to word identification is gradually reduced. The language patterns, however, must still be informal and closely reflect natural speech. The opening and closing sentences of stories at levels 5-8 nevertheless often represent departures from the predominant pattern.

The criteria to apply for classifying books for use at levels 9 to 12 provide for a great deal of variation in sentence patterns with dependent clauses and longer sentences beginning to emerge. Idiomatic expressions may also appear. A single event may carry forward over several pages and illustrations provide

only moderate support. Above level 9, there are fewer and fewer repetitions of entire sentences. At levels 13-15, more literary language and specialized vocabulary begin to appear. Finally, books that are categorized as having a difficulty level of 16 to 20 are made up of longer stories that reflect more elaborate episodes and events. The events are often more imaginary than real. There may be extended descriptions, rich and varied vocabulary, and well developed characterization. The language found in texts at levels 16 to 20 is more formal and booklike. Illustrations do not purposely depict the story content and pages may in fact be full of print.

Instead of determining the difficulty of text through the application of a readability formula, there seems to be a movement toward applying more descriptive criteria in determining whether a particular book is at an appropriate level for a particular beginning reader. Inside-the-head, reader factors, which include the range of the child's life experiences, his/her language competence, the match between the child's language and the language of the text as well as outside-the-head, text factors which include such physical features as print size and placement on the page, the clarity and relevance of the illustrations, and the repetitive nature of the language also influence how difficult a particular text will be for a particular reader.

Research, cf. Dunkeld (1970), Johnson & Kress (1965) and Scarborough, Bruns & Frazier (1957), suggests that students make optimal achievement gains when instructed at a level at which they can succeed. An important instructional mandate therefore is to match the difficulty level of the material with the reading ability of the child. In making this match, perhaps an interactive procedure is best. First we need to measure the actual reading behaviour of the child — through such procedures as recording miscues in daily running records, cf. Clay (1979, 1993), and then we need to interpret the performance. When word recognition falls below 90 percent, cf. Betts (1957), the book is at the child's frustration level. When there is one only one miscue in every 20 running words, the text is appropriate for reading instruction.

## **5. Learning from Text**

Research into comprehension processing during the last fifteen years suggests that a reader's knowledge of text structure and the ability to construct linkages among the ideas in the text exert powerful influences over comprehension and memory, cf. Kintsch (1988), Meyers, Shinjo & Duffy (1987), Samuels (1989) and Trabasso (1989). We have also learned from

Fletcher's (1986) work that memory limitations pose barriers to text comprehension, although when readers know the plans and goals of the characters in the text, they use that knowledge to facilitate memory. Brown and Smiley (1977) suggest also that the degree to which readers exercise deliberate control over their own thinking and learning affects what they remember after reading. One's purpose for reading and one's metacognitive knowledge therefore are inside-the-head factors that cannot easily be separated from the issue of text comprehensibility. The ability to monitor one's comprehension by generating self-questions is another reader factor that also has an effect on how well a text is understood and remembered, cf. Trabasso, van den Broek & Liu (1989).

### *5.1 Narrative text*

Determining the overall structure of a text and how the various text segments are connected helps the reader construct a mental representation of the material. When we understand a series of events in a story, we do not experience them as isolated, individual occurrences, but as a coherent set of happenings.

A model developed by Trabasso and his colleagues (1989) illustrates the structural relationships and connections in a single episode narrative. In a story, there are six structural components that readers use to construct a representation of the story: a Setting, Initiating Event, Reaction, Goal, Attempt and Outcome. The setting functions somewhat as a artist's canvas in that it provides the backdrop for the story, introducing not only the characters, but also the time and place. An initiating event identifies the problem that is experienced by the main character(s) which causes an emotional reaction. The emotional reaction is such that it propels the main character(s) to formulate a goal. The goal leads to actions which in turn culminate in an outcome. Thus the parts of a simple narrative are connected in a causal chain which links the opening statements in the narrative with the final resolution. Although the causal links may be related to enablement or motivation, and may be psychological or physical, it is the causal links that help make the text memorable.

Not all narrative structures are simple, however. Some are complex and have a hierarchical structure with subordinate goals which have to be achieved before the final outcome can be satisfied. Perhaps the simplest way to illustrate a hierarchical narrative structure is to think of a graduate student whose ultimate goal is to obtain her doctorate. Before this culminating goal can be achieved, a number of subordinate goals must be satisfied, such as meeting course

requirements, passing written and oral preliminary examinations, developing a research proposal, having it approved, gathering and analyzing the data, and completing a dissertation. Within each subordinate goal, there are also a number of embedded elements consisting of a number of other attempts and outcomes. Thus a complex narrative has the same six components as a single episode story, but has sub goals within it. These must be achieved before the ultimate goal is achieved.

Still another type of narrative uses a win-lose structure. The plot from the movie "Arthur" illustrates this structure. Arthur is an extremely rich playboy from a wealthy family. He meets an attractive but poor young woman, and having fallen in love, wants to marry her. The obstacle in attaining this goal is his family. They insist that he marry a girl whose family also has substantial wealth. In fact, they inform him that if he marries the poor girl, he will be denied his inheritance. The conflict between Arthur and his family is such that regardless of which side wins, the other side loses. In order to understand this type of narrative, the reader must perceive the plot as two interacting narratives, each containing the six basic components with the goal of each story functioning as a barrier to the other. Many novels, movies and plays use the win-lose structure.

In narrative texts, both writers and readers share common expectations about the structure of a story. Consequently, there is an interaction between the writer who uses the well-known narrative structure to tell the story, and the reader, who has certain expectations about what to expect when reading the text. When readers' expectations are met, there is decided enhancement in text comprehension, cf. Samuels & al. (1988).

### *5.2 Expository text*

Although expository texts do not share a common structure, such texts do have certain other important characteristics which good readers use to enhance their comprehension. We can assume that in writing expository texts one of the goals of the author is to communicate information to the reader. This goal can be explicitly stated or inferred, but in either case, it is safe to assume that there is an intended goal or message in the text. Second, while there is no one formal structure, there is a structure nevertheless, which may be used by the reader to make connections among the ideas and to facilitate recall.

Several different key text structures have been described. Anderson and Armbruster (1984), for example, have listed seven different types. Among the

most common structures for expository text are: concept-definition; sequence; explanation, compare-contrast; problem-solution-result; cause-effect; goal-action-outcome; and proposition-support. These text structures or patterns can be diagrammed and connecting arrows drawn to indicate how the ideas within them may be related. The resulting frame serves as a cognitive map to identify the important ideas and the connections between them. Having students construct a map which captures the interrelationships among the ideas contained in an expository text can substantially facilitate comprehension, cf. Taylor & Beach (1984).

One could argue that the association between awareness of text structure and comprehension is a mere artifact, due perhaps to some other variable such as "intelligence" or "memory". That this is not the case and that knowledge of text structure actually influences comprehension has been demonstrated in a study by Taylor and Samuels (1983).

Fifth grade students were divided into an aware of text structure group and an unaware group. A well written expository passage from a fifth grade social studies text, labelled the "Good Structure" text, was selected. The passage was then altered so that while the conceptual content remained the same, the structure was modified. The modified passage was called the "Poor Structure" text. Students who were aware of text structure were randomly assigned to read either a "Good" or "Poor" structure passage, with the same assignment being given to students who were unaware of text structure.

Following reading, the students wrote everything they could remember and the protocols were scored according to the number of idea units recalled. A surprising finding was that students who were unaware of text structure had no better recall for the well structured passage than for the poorly structured passage. What was central to the study, however was the performance of the students who were aware of text structure. These students had superior comprehension only on the passage which had good structure. There was no difference in comprehension between the aware and unaware groups on the poorly structured passage.

This study demonstrated that there is superior comprehension for elementary students who are aware of text structure only when they read well structured text. When students who were aware of text structure were given poorly structured texts, their recall was no better than for students who are unaware of text structure. That superior comprehension is not due to some other variable such as superior memory or intelligence is ruled out by the fact that when the text structure was poor, there was no difference in the number of idea units recalled between the aware and unaware students.

Many of the same problem solving activities used with narratives are used when comprehending expository texts. The problem solving involves discovering the author's goals, the structure or organizational pattern of the text, the information which is to be instantiated within each part of the text structure, and how the ideas in the text interconnect. If the text is well written, the author will signal both the goals and the text structure. Often these signals are missing, which makes understanding the text difficult.

## 6. Metacognition

When skilled readers attempt to understand what they read, the activity is viewed as an active, goal-directed, problem solving process in which given the information in the text, the readers' task is to construct meaning. As Kintsch (1988) suggests, if readers have achieved their goal and understood the text, they should be able to summarize or paraphrase it, answer questions about it, or verify the accuracy of statements about it.

The problem solving activities associated with constructing meaning from a text will, like other complex tasks, require the use of cognitive resources. However, the degree of cognitive processing required will depend in part on inside-the-head variables such as the degree to which the readers' metacognitive reading strategies are automatic and in part on outside-the-head characteristics, such as the text organization and degree to which the author's goals are explicitly stated.

There are substantial differences in metacognitive problem solving abilities between good and poor readers. Poor readers, for example, instead of being actively engaged in generating questions and reading to answer them, read passively. They read as though their purpose was to get to the end of the selection whether or not they understand what they are reading. They often fail to set goals, note inconsistencies or make connections among the ideas in the text and may be unaware that their understanding of the text has broken down, cf. Garner & Taylor (1982). Good readers, in comparison, read purposefully. When there is a problem in understanding the text, they are aware that a problem has occurred and institute "fix-up" strategies to overcome the problem, cf. Wagoner (1983).

While knowledge of text structure is one powerful factor that can influence the comprehension of complex texts, another metacognitive strategy is knowledge of how to generate questions which can facilitate and promote comprehension, cf. Trabasso, van den Broek & Liu (1989). While teacher

generated questions can foster learning and understanding, there is a greater advantage when students generate their own questions, cf. Kestner & Borkowski (1979) and Turnure (1985).

### 6.1 Narrative text

When readers are metacognitively aware of the structure of stories, they can use that information as a basis for asking themselves questions about the story *before* they begin reading and use those questions to guide their comprehension *during* reading. They can use that information to instantiate the six components of a story and ask questions such as:

<i>Component</i>	<i>Questions</i>
<i>Setting</i>	Where and when does this story take place? Who are its main characters?  What conditions in the setting make the rest of the story possible?
<i>Initiating event</i>	What events happen in the story so that the main characters begin to take actions and form goals?
<i>Reaction</i>	What reactions take place in the main characters to cause the initiating events?
<i>Goals</i>	What goals do the main characters establish?
<i>Attempt</i>	What actions do the main characters engage in to achieve their goals?
<i>Outcome</i>	What happens as a result of each attempt to achieve the goal?

In order to construct a coherent representation of a narrative text, the student must determine which statements in the text are linked together. These connections can be linked through causal, enabling, temporal, emotional, physical, and psychological factors. In order to construct or discover the connections in the text, the student should ask questions such as the following:

- 1) What functions does the setting serve? Is there anything about the setting which connects to and makes the initiating event important?
- 2) What emotional effect does the initiating event have on the key characters? Why is the initiating event important? How does the initiating event influence the goal?

- 3) How do the key characters feel if their attempts to attain their goal fail? If there are repeated attempts to reach the goal, why do the characters keep on trying?
- 4) If after there is a successful outcome, how do the characters feel? Why do the characters stop in their attempts? Why does the story end the way it does?

### 6.2 *Expository text*

Many of the same problem solving activities used with narratives are used when comprehending expository texts. When reading expository text, the metacognitive problem solving entails discovering the author's goal, discovering the structure of the text, discovering the information which is to be instantiated within each part of the text structure, and discovering how ideas in the text interconnect. A metacognitively aware reader will look for cue words that signal the text structure that the author is using.

When reading expository texts, there are a number of self-generated questions which the reader can use to foster and monitor comprehension. Examples of reader generated questions are:

<i>Goals</i>	What is the author's goal? What was the author's purpose in writing this? What does the author want me to know?
<i>Structure and Organization</i>	What is the structure of this text? Is the information in this selection in sections?
<i>Information Instantiation</i>	What information in the text fits within the text structures?
<i>Interconnections</i>	How do the ideas and statements in the text connect?

In a previous study, cf. Zakaluk (1985), we showed that when the author's purpose was explicitly stated at the beginning of the text in the form of behavioral objectives or when questions were interspersed within the text to focus the reader's attention, comprehension performance was enhanced. In this discussion we have also shown that the overall structure of a text and the presence of connectives that explicitly link the ideas together also have an effect on how well the material is understood and remembered. These are outside-the-head actors that need to be considered in addition to conventional readability levels when estimating the difficulty of a particular text for a particular reader.



We are also suggesting that in addition to such inside-the-head factors as word recognition automaticity and prior knowledge of text topic considered in the nomograph, cf. Zakaluk & Samuels (1988), the reader's metacognitive knowledge and self-questioning ability also influence what is learned from text.

## 7. Conclusion

Readability formulas as we know them today originated during the period of Watson's behaviorism and were used to estimate the ease with which text could be understood. These formulas often relied on two outside-the-head variables to estimate the difficulty level of a text, word frequency and sentence length. Numerous other factors that are important to comprehension were not included in the formulas. From a pedagogical viewpoint, the formulas were designed to match a text with a student's level of reading ability. In time, however, the formulas took on another function. They were used inappropriately by writers to artificially reduce the level of text difficulty. High frequency words were substituted for low frequency words and long sentences were shortened by making two or more short sentences out of complex utterances. While the text appeared to be more understandable, in truth, critical words and connectives that showed relationships were often eliminated, making the text more, not less difficult. Today, the thinking is that formulas can be used to estimate comprehension difficulty, but human judgment is still required. The process may be compared to buying a loaf of bread. The nutritional label informs us about the amount of protein, fat and so on, but ultimately, we need to taste the bread to decide if it is what we want.

Realizing the importance of reader knowledge, in the mid 1980s Zakaluk and Samuels used inside- and outside-the-head factors as a new approach to estimating readability, and this endeavour brought an added degree of precision to the process.

The future of readability will probably incorporate much of what was learned in the past. Readability estimates will be used as one factor in predicting readability, but other factors will carry considerable weight and these factors may not easily be put into an equation. These other factors include such variables as the macro-structure of the text, and the cohesive ties that link the ideas together. Topic familiarity and metacognitive knowledge also play a role in the construction of meaning. There may be a time when even these elements may be used in a formula, but at this time, estimating comprehensibility requires a human, qualitative judgment.

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