# RESEARCH INTO READABILITY: PARADIGMS AND POSSIBILITIES

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**ABSTRACT**

*Readability refers to the process of matching the reader and the text. Research into readability was developed from the 1920s up to the middle of the 1990s. The developments in this research area appeared to stop at that point, however, and very little research has been reported recently. In general, research into readability focused on the development of practical methods for matching reading materials to the reading abilities of student and adult readers. These efforts centred on the development of easily applied readability formulae for teachers and librarians to use. More recent readability research has involved a period of consolidation in which researchers sought to learn more about how the formulae worked and how to improve them. In this paper, our aims are to describe:*

- *The major paradigms used by scholars in readability research;*
- *The impact of these paradigms on research in readability;*
- *Possible solutions to problems created by the application of these paradigms to research into readability.*

***Keywords:*** *Readability; Research paradigms; Texts; Reading*

## 1. WHAT IS READABILITY AND HOW HAS IT BEEN RESEARCHED?

Readability is mainly concerned with a basic problem encountered by those who need to select reading material for their own use or for that of others. This is a problem of matching. During the process of selecting reading material, the reader or selector will be influenced not only by the interests and reading skills of him/herself or of the intended reader(s) but also by the nature of the reading material itself in terms of its content, style and complexity. The process of matching the reader and the text has come to be called 'readability' (Gilliland, 1975).

Research into readability began in the 1920s. According to Chall (1974, p. 153), there was at that time a surge of interest in the use of quantification in developing a "scientifically-based" curriculum. To avoid subjectivity, the methods and materials of education were empirically tested. Hence, the study of readability was concerned with the search for factors in reading material which could be easily and objectively counted. From this perspective, the positivist paradigm appeared to be the obvious way of

looking at readability because it is underpinned by the belief that reality is 'out there' and can be measured objectively. Throughout the early years of the study of readability, researchers believed that reading difficulty was related to features of the reading material itself. Readability research focused on devising procedures and instruments that would reliably and validly distinguish easier from more difficult reading material. Within this paradigm, reading difficulty was influenced by four text factors: namely, content, stylistic elements, format, and organization. Stylistic elements were the most amenable to reliable quantitative measurement and verification (Chall, 1974). Among these elements, factors such as vocabulary load, sentence structure, idea density and human interest appeared to be significantly related to reading difficulty.

Researchers into readability believed that vocabulary diversity, that is, the number of different words used in the reading material, was the most significant criterion in reading difficulty. According to Chall, (1974) most studies showed that the smaller the number of different words, the easier to read was the material.

Another factor which seemed related to reading difficulty was vocabulary difficulty. Vocabulary difficulty had to do with the reader's understanding of the individual words in a text. Chall(1974) reported that most studies had found some measure of vocabulary difficulty to be significantly related to comprehension. Ways to measure vocabulary difficulty were either by reference to a set list of words deemed to be 'familiar', or by measuring the average length of the words in a text. It was suggested that the larger the proportion of unfamiliar or long words in a text, the harder it was for readers to grasp meaning. Vocabulary difficulty factors have been used in virtually all readability formulae.

Another way that researchers into readability predicted reader comprehension of reading material was by looking at its sentence structure, which seemed to have some link to comprehension difficulty. The best way to measure sentence structure was thought to be by sentence length. Generally, so the reasoning went, the longer the sentences were, the harder the text was to read and understand. Apart from looking at simple length, researchers also became interested in estimating text difficulty through counting the number of complex sentences, the number of simple sentences, and sentence length estimated by a count of syllables. They also suggested that sentence measures were interrelated and significantly related to reading difficulty (Chall, 1974).

There are, however, problems in looking at readability through a positivist paradigm. As a result, studies of the kind described above have more or less been abandoned for the past 15 to 20 years. In the next section of this paper, we will discuss the failure of the positivist paradigm in readability studies.

## 2. THE FAILURE OF THE POSITIVIST PARADIGM

Many reasons have contributed to a change of approach in research into readability. One of these is that the characteristics of written material which readability studies suggested were correlated with comprehension difficulty can be questioned. The essential problem lay in identifying the characteristics of printed material which appeared to account for comprehension difficulty and the mechanisms of influence of these characteristics in the comprehension process (Simons, 1971). Simon suggested that factors such as idea density and human interest are such vague concepts that they had not been measured very successfully. Further he mentioned that, in readability studies, vocabulary was measured most accurately by the number of words in a passage rather than in a given list of frequent words, and that sentence structure was most accurately measured by some index of sentence length. But these factors appeared to be approximate measures of some underlying variables that were intrinsic to the comprehension process. He went on to argue:

> *In order for these factors to help in understanding reading comprehension the processes underlying them must be explained. An understanding of the reading comprehension process will then answer questions such as: What is it about*

*sentence structure and vocabulary load that influences comprehension difficulty? What are idea density and human interest and how can they be described more precisely? (Simon, 1971, p. 351).*

Another reason why readability studies are now considered unrelated to the comprehension process stems from research in cognitive science in the 1980s that identified problems with texts that had been manipulated or written to satisfy readability constraints. Horn, writing in 1937, had already cautioned against the mechanical use of word lists and readability formulae for selecting and rewriting books in the social studies. He mentioned that word lists and readability formulae did not pay sufficient regard to the possibility that it was the conceptual difficulty of text that may cause poor understanding, although the words may be common and 'easy'. He added that words of high frequency were also likely to cause greater difficulty if a reader attributed the wrong meaning to them. He gave an example from the study of his students that negligible improvements in comprehension might result merely from simplification of vocabulary.

Research within the cognitive science perspective not only identified the problems inherent in texts being manipulated or written to satisfy readability constraints, but also conceptualised the process of reading rather differently (Alexander, 2006). Cognitive research marked a paradigm change in studies of readability. This is because understanding of the concept of reading itself changed and with it the conceptualization of the comprehension process. This was no longer considered as an input - output process and no longer a simple matter of getting the meaning from the page. Critics of previous conceptualisations of the comprehension process in general and readability in particular, argued that readers had been considered as passive recipients of the information in the text (Dole, 1991). In other words, meaning was seen as residing in the text itself, and the goal of the reader was to reproduce that meaning. This is in contrast with the cognitive perspective which emphasized the interactive nature of reading and the constructive nature of comprehension (Dole, 1991).

There has, therefore, been a vast change in definitions of and ways of looking at reading. These changes have directly affected the ways in which the comprehension process is perceived (Dole, 1991). Comprehension is now seen as a higher cognitive process that searches for relations between a given object or aspect with other objects or aspects, and establishes a representational model for the object or aspect by connecting it to appropriate clusters of memory (Wang & Gafurov, 2003). Therefore, research into reading and comprehension has begun to come much closer to finding answers about what really happens in readers' minds during reading.

Changes in views about and definitions of reading and comprehension processes have had a huge effect on our understanding of readability. Since reading and comprehension are interactive processes, readability has also become an interactive process – a transaction between the reader and the text. Furthermore, it is now clear that comprehension is related to the cognitive process of searching for meaning. Therefore, meaning is no longer viewed as coming from the text, but, rather, from the readers' mind in interaction with the text. At this point, it is clear that the positivist paradigm is no longer appropriate to guide research into readability. Readability is no longer 'out there'.

## 3. THE INTERPRETIVE PARADIGM IN READABILITY RESEARCH AND ITS CRITICS

Research in reading has gone through many changes during the last 50 years. The history of reading research has shown a transformation and merging of physiological, psychological, and sociological dimensions. In the era of a physiological dimension the focus was based on biological, chemical, and neurological aspects of human performance, and it was clearly located in the behaviourist orientation where reading was a 'conditioned response' (Alexander, 2006, p. 57).

Current research in reading places greater emphasis on the psychological and sociological dimensions of the reading process. Within these dimensions the stress is on mental processes and socio-cultural influences. In the psychological orientation, mental processes of the mind are the most apparent

(Alexander, 2006). Here, research into reading focuses directly on the process and the function of the mind. Reading research is no more a process of focusing on input and output, but it is a more interesting process which describes what happens in the mind during reading (Alexander, 2006). Research has explored this through such approaches as error and miscue analysis, and the use of think aloud protocols (Alexander, 2006). Within the sociological dimension, the importance of socio-cultural perspectives has been taken into account during observations of the reading process, and the social location of this process has been explored. These different ways of observing and measuring the reading process have demanded a new paradigm. The paradigm now is interpretive rather than positivist, and reality is no longer believed to be 'out there' but instead resides within the minds, and the shared minds, of the people engaged in the reading.

Within this new paradigm, reading research has shifted to a focus on what is happening in readers' minds during reading, as for example in studies of errors and miscues. The term "miscue", first coined by Kenneth Goodman in the 1960s, describes any difference between what a reader actually reads and the actual words in the text. Goodman defines a miscue as:

> *A miscue, which we define as an actual observed response in oral reading which does not match the expected response, is like a window on the reading process. Nothing the reader does in reading is accidental. Both his expected responses and his miscues are produced as he attempts to process the print and get to meaning. If we can understand how his miscues relate to the expected response we can also begin to understand how he is using the reading process* (Goodman, 1973, p.5).

The idea that the analysis of oral reading errors could be used to increase our understanding of a child's reading process was revolutionary in its effects not just on conceptualisations of reading but also on suitable methodologies for examining this process. Goodman's suggestion was that it was not important how many miscues a reader made but what their effect on meaning was. His approach brought researchers much closer to an understanding of how readers processed meaning as they read.

Another research approach that has focused on the way the human mind works during the process of reading is the 'Think Aloud Protocol'. Studies using this methodology have argued that some information about mental activity is consciously available in the working memory of the reader, and that he/she is able to describe this activity after engaging in a reading event (Ericsson & Simon, 1993). In such studies readers are asked to think aloud, that is, they are encouraged to produce whatever thoughts come into their mind after reading sentences from a text. Therefore, the readers are not asked to introspect concerning the process of reading or to guess about the meaning of their thoughts. Researchers analyse the content of the think alouds in order to make inferences about the strategies, information, and mental processes occurring during reading. Magliano and Millis (2003) carried out a series of research studies assessing understanding while reading. They employed a protocol analysis system that discriminated between different comprehension tactics that could be related to the information activated during reading. They found that readers were able to make use of information, to give details about why something had happened or been mentioned, to forecast what would occur next, and to elaborate or embellish upon the details of the story world. They also indicated that explanations which dominated the thoughts produced while thinking aloud were consistent with the notion that deep comprehension was guided by explanatory reasoning.

Studies using Think Aloud Protocols have provided useful insights into the nature of reading and comprehension processes. The studies have shown how the process in the human mind can be predicted by asking the participants what they were thinking about during the reading process, and expecting them to give an opinion that immediately came into their mind after reading sentences in a text. This activity of think aloud is one of the ways to detect what happens in the human mind when reading. Hackos and Redish (1998) have argued that by recording a verbal protocol, *"you will be able to… detect cognitive activities that may not be visible at all"* (p. 259)

An alternative means of exploring what happens in the brain as reading proceeds has come from the relatively new field of neuroscience. Neuroscience is the study of the brain and the nervous system, and it uses the technique of neuro imaging. This involves the use of X-ray and magnetic resonance

imaging (MRI) to detect abnormalities or trace pathways of the nerves' activities in the central nervous system. One contribution of neuro imaging is that it provides a tool for localizing the brain regions that are active during reading. Fiez and Petersen (1998) have reported a review of nine neuro imaging investigations of reading. The aim of their study was to reveal a set of areas that were active during the reading of words, and they argue that the challenge is to use neuro imaging as a tool for understanding how reading is accomplished.

Another field of reading research has also emerged which takes a *social-cultural perspective* on reading. The social-cultural approach has developed into what is generally known as New Literacy Studies (NLS). An NLS perspective has placed language and literacy into their full cognitive, social, cultural, institutional and historical contexts. Within a NLS perspective, there is actually no such an issue as 'literacy'. Instead, people adopt different "ways with printed material", within different social-cultural practices, for different purposes and functions. Furthermore, "ways with printed material" within such social-cultural practices are always integrally and inextricably linked with ways of talking, thinking, believing, knowing, acting, interacting, valuing, and feeling. In these practices, humans are always 'meaning producers', not just 'meaning consumers' (Gee, 2001, p. 30).

This rather 'strong' statement within the social-cultural perspective about the nature of reading shows a conviction that meaning comes from the human mind and contrasts with a view that reality is 'out there', as the positivist paradigm suggested. Combined with our understandings of the ways in which error and miscue analysis studies, and think aloud protocol studies, validate how the human mind plays a crucial role during the process of reading and comprehension, it is now very clear that reading and comprehension processes come from within the reader. Therefore, the interpretive paradigm can be an obvious approach within which to study reading. Research into readability needs, naturally, to be closely aligned to research into reading, and so, it can be argued that the study of readability should also be based in the interpretive paradigm.

Within the qualitative interpretive paradigm, inferences about what happens in the human mind during the reading process can be made. Evidence about what people are thinking while reading can be obtained. However, it is not quite so simple to get this evidence or to interpret it. Several unanswerable questions remain which mean that we cannot truly know what a person is really thinking when he/she does something. Researchers using miscue analysis or think aloud protocols, for example, may stop readers and ask them at a certain point what they are thinking about. Questions such as this can provide some evidence about what readers are thinking, but it cannot be guaranteed that they are <u>really</u> thinking about those things. What can be explored is simply what they say they are thinking about. It may also be that the reader's thoughts, or what they choose to reveal about these thoughts, are strongly influenced by the presence of a researcher (or teacher). There is also some evidence (e.g. Xu, Cui, & Chen, 2007) that actually people do not have access to their own mental processes. If human beings cannot really see what is happening inside their heads, then this will limit the amount that can be accurately gleaned about their mental operations while reading.

Additionally, the 'think aloud protocol' may also have limitations. Miscue analysis has brought up theoretical and psychometric questions about the relationship between oral reading behaviour and overall reading efficiency. There are theoretical problems also associated with how psycho-linguistically based measures of oral reading can be related to comprehension (O'Brien, 1988). The puzzling relationships between oral reading, comprehending and comprehension product measures may be the product of incompatibility between the operational definition of meaning construction within schema-based notions of comprehension, and of the ways meaning construction is operationally defined in miscue analysis (O'Brien, 1988). McKenna and Picard (2006),in a critique of miscue analysis, have argued that '*the popularity of the Goodman model prompted numerous researchers to investigate its validity. Working independently and employing a variety of methodologies, their findings converged in a single conclusion: The model is wrong*' (McKenna& Picard, 2006, p. 379). There are indications, therefore, that miscue analysis studies have their own weaknesses in terms of illuminating what really happens in the human mind during the reading process.

Drawing on the limitations in the methods detailed above, it seems that there are still weaknesses in this paradigm when applying it to research into reading and, therefore, into readability. Simply moving to a new paradigm does not seem to provide a total answer.

## 4. CONCLUSION

To sum up, research in reading has been through a major change in the last 50 years. The change in research in reading has had an effect on readability research as well. In this paper, we have shown that readability research has been investigated in a certain way within the framework of a positivist paradigm. We have also shown that the study of readability within this paradigm was rather inadequate simply because our ways of understanding the reading process have changed. Hence, in order for readability research to be related once more to reading research, a new paradigm for readability research has been suggested, namely the 'interpretive paradigm'. Within this paradigm researchers try to find out what is in the readers' minds when they are reading, by interpreting what these readers say.

However, there are still weaknesses within this proposed alternative paradigm. Therefore, a combination of the strengths of positivism and of the interpretive paradigm might be suggested as the best way to investigate readability in the future. This combination could be used to investigate what is really happening while readers read and how this is related to readability and comprehensibility. Initial research using this combined paradigm (Janan, 2011) has suggested that it is a productive way forward, although we now need to find ways of using these insights which are practical for teachers whose task remains that of matching the reader and the text.

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