CHAPTER TWO

REVIEW OF LITERATURE

This study describes the metacognitive and cognitive strategies used by 10 ESL learners while reading in print and hypertext. It especially explores the processes these students use while reading hypertext. This chapter will describe the theory and research in the area of literacy, hypertext and reading comprehension. The main research tool, think-aloud protocol used in this study will also be discussed.

2.1 Literacy

What is literacy? Is it just about reading and writing or is it about how we respond to and understand our world? (Earle, 2005). Today, television, film, computer, and the Internet are rapidly becoming our dominant cultural tools for selecting, gathering, storing and conveying knowledge in representational form. ICT, with its new forms of text and its multimodal possibilities for narrative, has made educators reassess what literacy means. The primary function of literacy is to empower individuals to engage with the knowledge and culture of society. Due to this literacy has evolved over the last century and with it the definition of literacy has changed. However, today it is changing at a pace never before experienced as new technologies for information and communication appear rapidly (Leu, 2000 ; Leu & Kinzer, 2000). Also, Coiro, 2003; Karchmer, 2001; Reinking, and Mckenna, Labbo, & Kieffer, 1998, concur that the Internet and other technologies are changing the nature of literacy.

The general definition of literacy in the past is the ability to read and write. In other words it is simply a matter of acquiring the technical competence that enables people

to read and write. Literacy research conducted from this point of view only focuses on how people learn to code and decode printed text. Therefore, to be literate meant to have competence with printed texts and to possess the mechanical skills of encoding and decoding.

Today the definition of literacy has expanded from traditional notions of reading and writing to include the ability to learn, comprehend, and interact with technology in a meaningful way (Selfe cited in Pianfetti, 2001). Younie. (2001) says that literacy is taken to mean an understanding of how to read, create, and analyse texts in order to participate in society. Texts are taken to convey meaning and new ways of producing texts require new ways of reading and processing information. Some text requires understanding the interplay between image, sound and text.

As a result there has been a shift in educational thinking in that literacy is more than the ability to read and write. Many now consider literacy to be the ability to locate, evaluate, use and communicate using a wide range of resources including text, visual, audio, and video sources. It would seem that literacy now requires understanding and manipulating the processes used to create messages in the modern world.

Now, reading, reading instruction and more broadly conceived notions of literacy and literacy instruction are being defined by change in even more profound ways as new technologies require new literacies to effectively exploit these potentials (Coiro, 2003; Kinzer & Leander, 2003; Leu, 2000). In recent years, the many dimensions of “new

literacies” like computer literacy, cultural literacy, technological literacy, visual literacy, media literacy, information literacy, networking literacy, document literacy,

scientific literacy, television literacy, environmental literacy, film literacy and many others have emerged (Paterson, 1996). Information literacy, visual literacy and media literacy are often used interchangeably.

However, the most essential new literacies for schools to consider revolve around the Internet and allow the students to exploit the extensive ICT'S (Interactive Computer Technology) that have become available in an online, networked environment. Traditional definitions of literacy and literacy instruction will be insufficient if we seek to provide students with the future they have to cope with.

A more precise definition of these new literacies may never be possible to achieve because their most important characteristic is that they change regularly; as new technologies for information and communication continually appear. (Bruce, 1997; Leu, 2000; Reinking, 1992). These "new literacies" are needed to successfully negotiate today's complex information and technology world.

Leu, Kinzer, Coiro and Cammack, 2004 have begun to frame a new concept of new literacies around the following definition, "The new literacies of the Internet and other ICT's include the skills, strategies and dispositions necessary to successfully use and adapt to the rapidly changing information and communication technologies and context that continuously emerge in our world and influence all areas of our personal and professional lives. These new literacies allow us to use the Internet and other

ICT's to identify important questions, locate information, critically evaluate the usefulness of that information, synthesize information to answer those questions, and then communicate the answers to others."

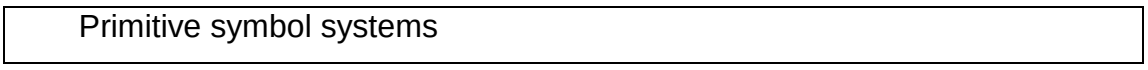
It is important to remember that most definitions of literacy of the past and present have generally shared three commonalities:

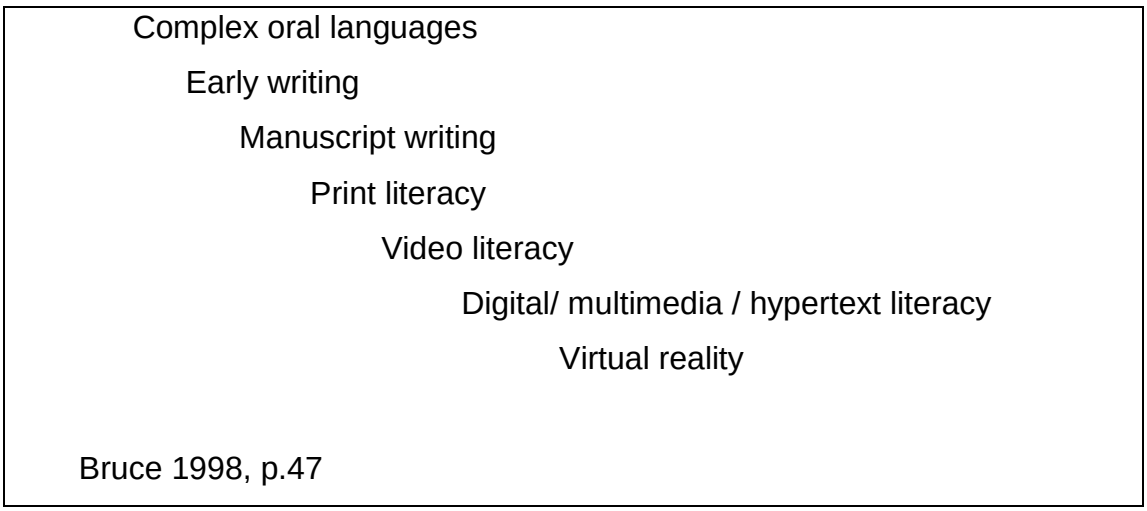
1. the ability to engage in some of the unique aspects of reading and writing
2. contextualization to some extent with the broad demands of society
3. some minimal levels of practical proficiency.

McCarthey and Raphel (1992) noted that definitions of literacy evolve as a result of the consensus of members of society. In 1800's literacy was seen as being able to recognize and pronounce words; in the 1920's literate students were expected to silently read passages and be able to answer comprehension questions. In addition, they were required to make inferences about texts as a sign of basic literacy. Today, being literate includes the ability to read, comprehend, and interact with technology in a meaningful way.

The figure on the next page shows the changes in our conception of literacy and the role of literacy in society.

Figure 1 : Literacy Transformation





From this we can see that in the past, literacy has been defined in many ways, changing as new advances were introduced. Mosenthal (2000) commented that reading is defined in terms of the interplay of agendas that are set and implemented by different levels of society. At one time literacy was entirely shaped by the technologies of the printing and publishing industries and their associated cultures. Now, however with the rapid rise of new media of communication and information, there are more new and different technologies available. Furthermore, the International Reading Association (2002) suggested that the Internet and other forms of information and communication technology (ICT) such as word processors, web editors, presentation software, and e-mail are regularly redefining the nature of literacy.

Within just 20 years, we have seen the widespread appearance of, among other word

processing technologies, electronic database technologies, multimedia / hypermedia technologies, e-mail technologies, and Internet technologies. Each has helped to redefine the nature of literacy. In addition, Mayer (1997) discuss that in the past, our

concept of literacy has been based on the assumption that print is the primary carrier of information in our culture and that the most important skills are those that enable students to understand and express themselves in text. The new definition of literacy is based on a different assumption, that digital technology is rapidly becoming a primary carrier of information and that the broader means of expression this technology makes possible are now critical for education. Text literacy is necessary and valuable, but no longer sufficient. We know that the use of the digital technologies affect how we read and write, how we teach reading and writing and how we describe literacy practices.

Leu, et. al (2004) discuss that there are three forces causing the convergence of literacy instruction and networked technologies for information and communication and the changes taking place in literacy and literacy instruction. These forces are:

- Global economic competition within economies based increasingly on the effective use of information and communication.

The world of work is undergoing fundamental transformation (Bruce, 1997; Drucker, 1994; Glister, 1997; The New London Group,2000). These researchers say it is important to note that it is this social context of global economic competition that has resulted in numerous changes to ICTs and to literacy. Therefore, effective use of the Internet should be a necessary component of the

literacy curriculum. Today's work is characterized by the effective use of information to solve important problems within a globally competitive economy. In addition, new technologies provide increasingly greater access to larger amounts of information.

This makes the efficient use of information skills in the competitive workplace contexts even more important (Glister, 1997;. It is the access to information and the ability to use information effectively that enables individuals to meet the new challenges of literacies.

Traditionally, industrial-age organizations were organized in a vertical, top-down mode. Most decisions were made at the highest levels and then communicated to lower levels, thus wasting much of the intellectual capital within an organization. However, the Information-age organizations seeking to achieve greater productivity are organized horizontally, with teams within lower levels of the organization empowered to make important decisions related to their functions. As a result of this type of organization, individuals or teams would have to quickly identify problems, locate useful information related to the problems , critically evaluate the information they find, synthesize this information to solve problems, and then quickly communicate the solutions to others within the organization. These high performance tasks in the workplace have had a fundamental effect on the nature of literacy within these organizations. Therefore all these changes that are shaping the workplace today has important implications for the nature of literacy instruction (Leu, Kinzer, Coiro and Cammack, 2004). There is a need for education researchers to check if the literacy programs in the school are preparing the students for this. The students need to know how and where to locate useful information as well as critically read and evaluate information that is represented in hypertext.

- The rapid emergence of the Internet as a powerful new technology for information and communication

The Internet is rapidly becoming an important tool for one to be able to function effectively in the workplace, home and school. Therefore this has resulted in new literacy skills and strategies demanded by the Internet and other ICTs emerging. (Leu, Kinzer, Coiro, & Cammack, 2004).

- Public policy initiatives by governments around the world to ensure higher levels of literacy achievements including the use of the Internet and other ICTs

Governments around the world are aware of the consequences of global economic competition. They have responded by implementing policies to raise literacy so as to better prepare the children for the challenges that lie ahead. The governments have made great effort to provide new ICTs resources to schools to prepare children for the new literacies of the future.

The Malaysian government too has introduced programs which include developing new teaching methods which include the use of ICTs, connecting all schools to the Internet in the near future and providing all schools with new computers. The governments of the world have realized that knowledge and familiarity with new technologies will be an important dimension of employability in the information society. Therefore, our aim should be to create a learning environment that enables students to develop the attitudes, knowledge, understanding, and skills to enable them to succeed in the modern competitive economy.

It can be very clearly seen that the forces discussed above have placed the internet and other information and communication technologies in a central position in the classroom. There is a need to explore these new contexts for literacy and learning if we are to prepare children to be literate in today's world. It is important to remember

that literacy empowers the individual and therefore enables an individual to access and generate knowledge in today's society (Freire, 2001). Therefore, individuals need to meet minimum standards of literacy in order to function in society, and the responsibility of ensuring that individuals meet these standards falls upon the schools.

We are now moving beyond the constraints of literacy practices that are purely print-based. Therefore, just how do we go about shifting our strategies for teaching more or less print-bound literacy to help our students meet the fresh demands and challenges of literacies?.

As education becomes increasingly technologised and globally referenced, it not only constitutes a new text type but it also opens up new possibilities for learning and new skills to be developed (Coiro, 2003; Anderson, 2003; Leu, 2005).

2.1.1 Central Principles of New Literacies

Leu, et al (2004) have identified 10 central principles of New Literacies emerging from the Internet and other ICTs:

1. The Internet and other ICTs are central technologies for literacy within a global community in an information age.

In the past, literacy has definitely emerged from a variety of social contexts but has been shaped largely by the technologies of the book and the printing press. However, today the Internet and other ICTs are playing a significant role in defining the new literacies. Therefore, it becomes pertinent that educators identify the cognitive reading strategies that would help learners become efficient online readers.

2. The Internet and other ICTs require new elements of literacies to fully access their potential.

Although traditional elements of literacy such as word recognition, vocabulary knowledge, comprehension, inferential reasoning, spelling and other literacy skills, are important, they will be insufficient today, for one to fully utilize the Internet and other ICTs (Coiro, 2003; Leu, 2000; Sutherland-Smith, 2002). The new literacies include the skills, strategies, and disposition that allow us to use the Internet and other ICTs effectively to identify important issues, locate information quickly, critically read and evaluate the usefulness of that information on hypertext, synthesize the information, and then communicate the answers to others. According to Leu, Kinzer, Coiro & Cammack, 2004 we encounter new literacies nearly every time we try to read, write, and communicate with the Internet and other ICTs. It is important to equip the students today with the skills and strategies required to cope with these new literacies.

3. New literacies are deictic

According to Leu (1997, 2000) and Leu and Kinzer (2000) literacy is in a period of technological deixis. What this means is that the forms and functions of literacy

change as rapidly as new technologies for information and communication emerge and individuals construct new envisionments for their use. Therefore, deixis becomes the defining quality of the new literacies of the Internet and other ICTs. Our duty as educators is to keep up with these changes and to prepare students for a vastly different conception of what it means to become literate.

4. The relationship between literacy and technology is transactional.

Technology transforms the forms and functions of literacy (Reinking,et,al. 1998), but literacy also transforms the form and functions of technology. It is important to remember that as we use technology in new ways, we also transform the technology itself, creating additional new literacies in the process.

5. New literacies are multiple in nature

Unlike traditional text forms that typically include a combination of two types of media, print and two dimensional graphics, the Internet texts integrate a range of symbols. The New London Group (2000) defines multiliteratices like computer literacy, cultural literacy, technological literacy, visual literacy, media literacy, information literacy, networking literacy, document literacy, scientific literacy, television literacy, environmental literacy, film literacy, as a set of open-ended and flexible multiple literacies required to function in diverse contexts and communities.
Leu, Kinzer, Coiro, and Cammack 2004 state three different levels which are apparent to the multiplicity of new literacies.

- The first level is represented with multiple media forms. Internet texts integrate a range of symbols and multi-media formats including icons, animated symbols, audio, video, interactive tables, virtual reality environments, and many more (Bruner & Tally, 1999; Lemke,1989). Therefore, today as read we are confronted with new and different forms and

combinations of texts and images. This poses as a challenge to our traditional understanding of how information is represented and shared with others. Internet technologies require literacy educators to prepare their students with these new, complex and multiple forms of Internet literacies.

- The second level is that the Internet and other ICTs offer multiple tools for constructing multiple forms of communication. Therefore, those who can effectively assess their individual purposes for using the Internet and effectively read and evaluate information from the Internet to meet their need would go far.

- The third level consists of the new skills demanded by the students as they more frequently encounter information from individuals in different social context. The global sharing of information permitted by the Internet introduces new challenges for students who are now expected to interpret and respond to information from multiple social and cultural contexts that share profoundly different assumptions about our world. These multiple contexts for new literacies have important implications for educators preparing students to critically understand and interpret the meaning and images they find on the Internet.

6. Critical literacies are central to the new literacies.

The Internet permits anyone to publish anything on the Internet. This allows people who have strong political, economic, religious, or ideological stances to influence the nature of the information they present. Therefore, as educators we need to teach our

students to become more critical consumers of information they encounter on the Internet.

7. New forms of strategic knowledge are central to the new literacies.

Mayer (1997) has reminded us that the new technologies for networked information and communication are complex and require many new strategies for their effective use. Hypertext technologies, for example, embedded with multiple forms of media and unlimited freedoms of multiple navigation pathways, present opportunities that may distract some readers away from the important content unless they have developed strategies to deal with these distractions (Lawless & Kulikowich, 1996; Lawless, Mills, & Brown, 2002). Also other cognitive and aesthetic changes to text on the Internet may present new challenges to comprehension and information seeking as well. (Sutherland-Smith, 2002, Coiro, 2003)

8. Speed counts in important ways within the new literacies.

In a world of vast information resources, the new literacies of the Internet will be defined in important ways around the rate at which one can read, write, and communicate. Rapidly finding, evaluating, using, and communicating information will become central instructional issues. Highly literate individuals will be able to skim webpages, link to other webpages, and generally sift through large amounts of

information in a short time. Individuals who read slowly and haltingly will still be evaluating the first screen of information by the time a more rapid reader has already completed the informational task. Leu, et al (2004) have suggested that literacy educators need to address this issue.

9. Learning is socially constructed within new literacies.

Social learning strategies will be central to literacy instruction in the future. Leu, et al (2004) highlight two dimensions that are important;

- Social learning strategies will play an important role in the exchange of new skills and strategies needed to interact within a world of multiple new literacies framed by the Internet and other ICTs. Therefore, effective learning experience will be increasingly dependent on social learning strategies and the ability of a teacher to orchestrate literacy learning opportunities between and among students who know different new literacies. This will distribute knowledge about literacy throughout the classroom, especially as students move above the stages of foundational or traditional literacy.

- The second is that it is not only how important information is learned or comprehended but also how information is constructed within the technologies themselves (Leu, et al 2004). It would seem that both the workplace and the home, the new technologies of literacy allow us to take advantage of the intellectual capital that resides in others, enabling us to collaboratively construct solutions to important problems by drawing from the expertise that lies outside ourselves. The construction of knowledge will increasingly be a

collaborative venture within the learning spaces defined by the Internet and other technologies and thus, introduce new instructional challenges for educators.

10. Teachers become important, though their role changes, within new literacy classrooms.

Teachers will play a vital role in planning and orchestrating learning experiences within information environments that are richer and more complex that print media for students. The new literacies will require teachers to be;

- aware of emerging technologies for information and communication
- capable of identifying the most important new literacies that each requires, and
- proficient in knowing how to support their development in the classroom.

Leu & Kinzer (2000) tell us that it is essential to begin to integrate these new literaces into classrooms if we hope to prepare all students for the literacy futures they deserve. Most governments around the world have realized this need and have or are in the processing of trying to introduce new literacies in the classrooms. However, Leu, 2000 ; Leu & Attaya, 2002 suggested that the literacy curriculum has not begun to recognize the important new literacies these technologies require. The learners need to be equipped with the necessary strategies to engage effectively in an online environment.

In conclusion, the New Literacies Perspective (Leu,Kinzer,Coiro, & Cammack, 2004) highlights three important issues:

- Using technologies in the classroom does not assure that students are acquiring the new literacies they require. The soft ware packages designed to

support the acquisition of foundational literacies will not prepare students for the new literacies of the Internet and other ICTs. It does nothing to develop the essential skills, strategies, and dispositions that define the new literacies (Leu,et al 2004). It is important to note here that using software programs to teach foundational literacies is the only vision many have for integrating literacy and technology in classrooms.

- A central challenge for educators and researchers is that because new literacies continuously change as new technologies appear, we require new instructional practices that keep up with the rapid changes we anticipate.

- It is essential to implement the New Literacies Perspective in classrooms if we hope to maintain economic advantage to all.

Along with the introduction of the new Literacies Perspective, we need to identify the essential strategies that learners need to be equipped to engage effectively in an online environment.

2.1.2 What does it take to be literate today?

The World Wide Web has become an indefinitely large, semi-chaotic collection of information in a profusion of texts, graphics, images, and multimedia material. Anyone can put anything on the Web, making it essential that users have the ability to discriminate between high quality, reliable information and misleading, inaccurate information, and everything in between. The Internet and other information and

communication technologies are changing the nature of literacy and literacy learning as they become an increasingly important part of our lives (Karchmer, 2001; Kinzer & Leander, 2003; and Reinking, Mckenna, Labbo, & Kieffer 1998). These researchers have argued that global economic changes have generated new information technologies that generate new literacies. Therefore, what becomes crucial to our students' literacy future is the ability to identify important problems, gather rapidly and critically evaluate relevant information from information networks, use this information to resolve central issues, and then clearly communicate the solutions to others (Leu, 2002). Most educators agree that literacy now involves being able to make sense of and navigate through several forms of information, including images, sounds, and animation for comprehension.

As a result, Shetzer and Warschauer (2000) suggest that as teachers we need to rethink our instructional goals, techniques, and objectives in order to prepare students for literacy in both paper and electronic mediums. As educators, we are not being fair to our students if we expect them to read, comprehend, and extract information from the Web without first providing explicit instruction in the unique skills needed for these tasks. Moreover, these are the skills that modern academia and the global workplace will demand of our students in the future.

Firstly, in order to help our students it would be good to know how these students read hypertext. This is because reading hypertext is a unique, nonlinear experience that cannot be easily equated with reading traditional, linear printed text. Most educators agree that the students need specialized strategies and skills, which are different from those used with print, to access and read online information. In addition, students need critical thinking skills and strategies to examine and evaluate

that information, much of which is unregulated. In conclusion, in the Industrial era, knowledge was mostly paper based and readily organized into books. Retrieval was dependent on the research skills of knowing how to locate texts, use a library, understand referencing, cataloguing, indexing and so on. To be literate then was to know how to use paper based information.

However, now the Internet requires new literacies to achieve high levels of reading comprehension but we know very little about what these literacies are or how best to teach them. The report of the Rand Study Group (2002), points out that accessing the Internet makes large demands on individuals' literacy skill and very little is known how to analyse those skills. Leu, Kinzer, Coiro, & Cammack, 2004 suggest that research needs to be directed to better understand the new skills, strategies and dispositions required to effectively use the Internet and other ICTs. Scholars who study reading comprehension, for example, need to examine the various components of meaning construction to help us understand the extent to which comprehension processes are similar or different within the multimedia, hyperlinked contexts of the Internet and other ICTs (Coiro, 2003). Reading comprehension is likely to be a major area of investigation because the Internet and other ICTs focus so much on information and learning text.

According to Leu, et. al 2004 there are many questions that await investigation:

- What new aspects of comprehension are required when reading information on the Internet?
- Are inferential processes and strategies similar or different on the Internet?
- How do other aspects of comprehension process change?

Reading comprehension strategies within this context are likely to be important, and we need to know what these are. It is only when we know this that we are able to teach students these strategies. This research study hopes to provide some insight in this area.

2.2 Reading Comprehension

2.2.1 Reading

Reading is a complex process in which readers use a number of strategies to comprehend what they read. Koda (2005) states that an individual's awareness of text structures contributes to reading comprehension. Similarly, Kintsch and Gernsbacher (2006) report that L1 reading research reveal that expository text structure awareness improves comprehension and learning. Furthermore, the act of reading also involves acquiring information from both printed text and non-print sources already stored in the reader's memory. This store of informative sources upon which a reader relies for more information is nonvisual information, or schema.

In addition to the information the reader already has on the content of a given text, this nonvisual information includes a working knowledge of language and of how to

read. It also includes experiences, attitudes, beliefs, and perceptions, all of which contribute to the reader's "theory of the world" (Smith, 1986). According to Smith, the more working knowledge of language and reading skills the reader has, the less visual information the reader needs. This creates a transaction between the reader and the text. When a discrepancy occurs, it creates a sort of functional blindness where the

reader physically looks at the text but fails to see it by means of processing it. In their pursuit of information, the reader is presented with a number of alternatives. These alternatives that Smith refers to are the vast amount of information the readers encounter. Therefore, the readers must discern and eliminate these alternatives in order to reduce the amount of uncertainty. According to Smith comprehension is a "state, the opposite of confusion". Smith asserts that we comprehend when we have no unanswered questions because we have no doubts about alternative interpretations or decisions in our mind. Information enables us to make sense of a situation, and comprehension aids that making sense, the resultant absence of uncertainty. Therefore for comprehension to take place, uncertainty must be eliminated. However, comprehension does not result necessarily from reading all of the information in a text but also from using the skill of knowledge to acquire information necessary to reduce uncertainty.

Another important variable that Smith claims that help readers interact and comprehend text is the organization and presentation of the text itself. The different ways in which various texts present their information is called "genre schemes" by Smith. These genre schemes differentiate one type of text from another. Genre schemes have become conventional (Smith, 1986). They are conventional in that they signal readers regarding the characteristics they might expect to encounter while

reading a particular text. These expectations help readers by allowing them to predict what a text will look like. Since readers have become accustomed to the genre schemes they regularly encounter, a text that does not comply with the characteristics of its genre scheme may cause problems for readers. Smith (1986) goes on to say that, if we do not know the relevant structures then we will not understand the text, or

our reading of it will be distorted. Therefore structure and organization play an important role in the skills readers employ in order to comprehend text. This supports what this study wants to find out, that is if there is a difference in the strategies used by ESL readers when reading hypertext as to reading printed text.

Rumelhart, 1997 said that the three important components involved in reading are, the reader, the text and the interaction between reader and text. On a similar note The Rand Reading Study Group (2002) defines reading comprehension as the process of simultaneously extracting and constructing meaning through interaction and involvement with written language. They provide a useful heuristic for conceptualizing reading comprehension which includes four interactive components:

Characteristics of

- the reader
- the text
- the comprehension activities and
- the sociocultural context.

These components rarely operate in isolation and need to be considered to understand the reading comprehension processes. This idea is illustrated in the diagram below.

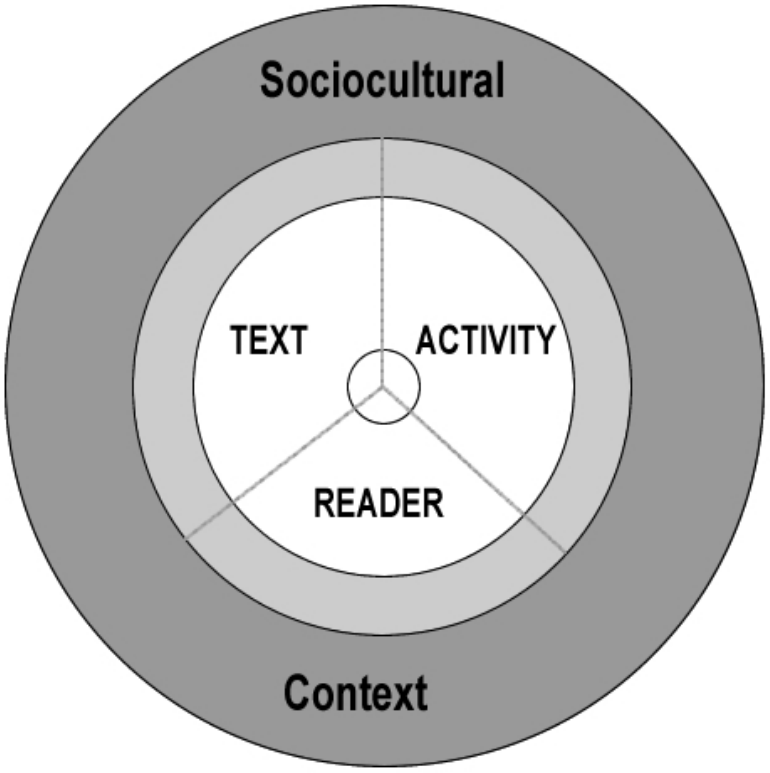


Figure 2 – A Heuristic for Thinking about Reading Comprehension

- The Reader

The reader needs to have a wide range of capacities and abilities for him or her to comprehend the text. These include cognitive capacities (attention, memory, critical analytic ability, inferencing, visualization ability), motivation (the purpose of reading, an interest in the content being read, self-efficacy as a reader) and other types of knowledge (vocabulary, domain and topic knowledge, linguistic and discourse knowledge, knowledge of specific comprehension strategies), and experiences. However there are inter-individual differences among these attributes as well as within an individual reader with regards to differences in text and activity. According

to the Rand Reading Study Group (2002), “the specific cognitive, motivational, and linguistic capacities and the knowledge base called in any act of reading comprehension depend on the texts in use and the specific activity in which one is engaged”.

- The text

We now live in a world that is experiencing an explosion of alternative texts that vary in content, readability levels, and genre. They incorporate multimedia and electronic options and pertain to a variety of cultures and groups (Rand Reading Study Group 2002). The features of any given text have a large effect on comprehension. In addition, Mcnamara, Best, & Castellano (2003) point out that text structure plays a crucial role in the ease with which text can be processed, recalled and interpreted. The proliferation of computers and electronic text has led reading experts to broaden the definition of text to include electronic text and multimedia documents as well as conventional print. The Rand Reading Study Group (2002) states that the electronic text can present particular challenges to comprehension such as, dealing with the non-linear nature of hypertext.

Some features that are inherent in the text like content presentation, vocabulary load, linguistic structure, discourse style, and genre are not matched to a reader’s knowledge and experience, the text may be too difficult for optimal comprehension to occur. According to the Rand Reading Group, “electronic texts that are the product of Internet searches typically need to be scanned for relevance and for reliability, unlike assigned texts that are meant to be studied more deeply. Electronic texts that

incorporate hyperlinks and hypermedia introduce some complications in defining comprehension because they require skills and abilities beyond those required for the comprehension of conventional, linear text". Therefore it is crucial that researchers and educators investigate how learners process hypertexts. This study hopes to provide some answers as to how learners read and comprehend hypertext.

- The Activity

Reading is done for a purpose, that is to achieve some end and according to the Rand Reading Study Group (2000), activity refers to this dimension of reading. The purpose is influenced by a cluster of motivational variables, including interest and prior knowledge. The reader will normally engage in reading operations designed to address the purpose. Readers interact with the text for several reasons. They decide what it is they want out of the text and how they will get it, and during the task they check their progress and revise their course (Dillon, 1996).

There are many different reading purposes, and different reading conditions or circumstances that necessitate different reading strategies. A study examining college students' knowledge about reading conditions showed that students distinguish at least nine distinct reading purposes: exam preparation; reading for research; class preparation; reading to learn; reading to apply; reading to self-inform; intellectually challenging reading; reading for stimulation; and light reading (Lorch, Lorch, & Klusewitz, 1993).

Rosenblatt's theories of reader response and transaction with texts points out two concepts of efferent and aesthetic responses to text. Efferent reading involves reading for the purpose of acquiring information. Aesthetic reading involves an active engagement with the text whereby the reader is genuinely engaged in and deriving pleasure from the transaction.

- The Context

It is important to remember that these three elements (Reader, Text and Activity) occur within a larger sociocultural context that shapes and is shaped by the reader and that interacts with each of the above mentioned three components (Rand Group, 2003). One of the effects of contextual factors can be seen in the types of literacy activities in which the reader engages. In fact, the difference among readers can be traced to the varying sociocultural environments in which children live and learn to read. Tharp and Gallimore (1998) explain that children's acquisition of knowledge and literacy is influenced by five characteristics of the sociocultural context: the identity of the participants, how the activity is defined or executed, the timing of the activity, where it occurs, and why children should participate in the activity, or the motivation for the activity.

Yet another way in which reading can also be studied is by looking at the structure of discourse and characteristics of texts, the text attack strategies needed to comprehend texts, the purposes of reading, the role of the reader, and the media utilized for reading. In the readers attempt to make sense of what they read, readers resort to a number of strategies which are deliberate plans readers execute when processing

textual information. It is therefore important today for researchers and educators to find out what sort of strategies learners resort to when reading hypertext.

Harold Herber (1978) on the other hand, defines reading comprehension by delineating a three-level process. During the reading process, the readers initially look at the text in order to determine what the writer is saying and what information is being presented. This is the literal level of comprehension. If students encounter problems at this level it is due to a lack of understanding of words' definitions. Students may skip the words and move straight to interpretation before reviewing the information provided. The second level is when the readers try to find relationships among statements within the text and then derive various meanings from these intrinsic relationships. The readers use their prior knowledge, experience and theories of the world to get an overall picture of the message. This is the interpretive level of comprehension. It is here at the interpretive level that readers "develop intrinsic concepts from the relationships they perceive in the authors' information" (Herber, 1978). The final level is the applied level of comprehension. The readers select "intrinsic relationships produced at the interpretive level of comprehension and synthesize them with concepts that are the product of previous knowledge and experience" (Herber, 1978). In other words the information the reader has just acquired will then combine with the information he or she already knows in order to embrace larger concepts that reside beyond the physical realm of the text. Herber like Smith (1986), also points out that genre schemes in texts play a key role in the process of comprehension. These genre schemes are a means of describing how authors present information, and "awareness of this information helps students develop an

understanding of the author's information and ideas expressed in the text" (Herber, 1978).

Frank Smith (1971) was one of the first researchers to characterize reading as a process by charting the reader's path through a text rather than making judgements of comprehension based on reading outcomes. In addition, Catherine Wallace (1993) stated that as we progress through a text, our choices of what to select are constrained by features within the text itself and our schematic knowledge, like knowledge of how texts are constructed, and familiarity with the discourses within the text to draw upon a relevant schema. However when reading hypertexts, the reader has numerous choices because of the presence of hyperlinks. The reader can choose his own path which can be totally different from the author.

According to Ken Goodman (1967), attempting to make sense of text drives the process of reading. The reader works through various levels of the text to come to an understanding of it. Adding on, he said that elements of a text, such as inflection, punctuation, and structure, direct the reader to read the text in a certain way, thereby affecting the text's meaning on some level. The gaps that exist between reader and text must be filled in based on existing schema. In addition, the readers search for meaning in texts, the need and opportunities to develop necessary strategies for making sense of the text arises. As they make sense of the text readers develop efficiency and effectiveness in comprehension. Based on Goodman's interactive model, 1967, reading is a constructive process requiring active engagement. In trying to make sense of the text there are four fundamental beliefs that he mentions, firstly reading is an active process in which readers use powerful strategies to comprehend

the text. Secondly, everything the readers do is part of their attempt to make sense of the text. Readers become highly efficient in using just enough of the available information to accomplish their purpose of making sense. Finally, the reader's knowledge that they bring to the text is as important for successful reading as anything they use from the text itself.

Therefore the process of text comprehension involves the reader in a complex, dynamic and ongoing interaction with the text (Goodman, 1967; Rumelhart,1977, reprinted in 1994). The total meaning of the text that is the sense of the written text depends on the interaction between the reader and the text (Rosenblatt, 1994). Also Leu (2002) and Reinking (1992), view reading as an interaction between reader and text is an idealized interpretation of the reading process. However, they point out that in electronic learning environments (i.e. hypertext, hypermedia or multimedia), the electronic medium is interactive, and therefore, the interaction between readers and texts becomes real. It is therefore essential that we identify the cognitive strategies readers engage in this interaction between reader and hypertext for comprehension.

2.2.2 Reading Strategies

Reading strategies are "the mental operations involved when readers approach a text effectively and make sense of what they read" (Barnett, 1988). He divides reading strategies into two categories: text-level strategies and word-level strategies.

Text-level strategies are strategies used by the reader to understand the whole text. These include surveying the text and making predictions about it, background

knowledge, skimming, and looking for the organization of a paragraph or a passage. On the other hand word-level strategies are strategies that involve individual words or phrases like guessing the meaning of a word from context and understanding the meaning of a word through recognizing word families. Paris et al. (1991) grouped reading strategies into three areas: before reading, while reading, and after reading strategies. Strategies for:

- before reading - previewing
- while reading - identifying main ideas, making inferences and looking forward and backward in the text.
- after reading - summarizing

Shinghal (2001) says that comprehension or reading strategies indicate how readers conceive of a task, how they make sense of what they read, and what they do when they don't understand. Therefore these strategies are processes used by the learner to enhance reading comprehension and overcome comprehension failures. These strategies include skimming and scanning, contextual guessing, reading for meaning, utilizing background knowledge, recognizing text structure and so forth. Coiro (2003), reaffirms that reading strategies are tools that assist a reader in unlocking meaning behind printed words. These strategies can be helpful before, during and after the actual reading event. Similiarly, Oxford (1990) offers a useful and comprehensive classification scheme of the various strategies used by learners when performing learning tasks. The following are the strategies:

- Cognitive strategies are used by learners to transform or manipulate the language. This includes note-taking, summarizing, paraphrasing, predicting, analyzing, and using contextual clues.

- Memory strategies refer to techniques used that help the learner to remember and retrieve information. Some of these techniques include creating mental images through grouping and associating, semantic mapping, using keywords, employing word associations and placing new words in context.

- Comprehension strategies include skills such as inference, guessing while reading, or using reference materials.

- Metacognitive strategies are behaviors used by the learners to plan, arrange, and evaluate their own learning. These include directed attention and self-evaluation, organization, setting goals and objectives. In the context of reading, self-monitoring and correction of errors are examples of metacognitive strategies.

- Learners also use affective strategies such as self-encouraging behaviour, to lower anxiety, and encourage learning.

- Lastly social strategies are those that involve other individuals in the learning process, and refer to cooperation from peers, questioning, asking for correction, and feedback.

It is important to recognize that the above strategies can be used to facilitate learning, or can be used to facilitate comprehension.

Besides the well established classification of language learning and reading strategies, there are new classifications that have been developed recently in the field of research of L2 reading strategy. Sheorey and Mokhtari (2001) and Mokhtari and Sheorey (2002) have developed a new instrument named Survey of Reading Strategies (SORS) designed to measure metacognitive reading strategies of L2 reading engaged in reading academic materials. A brief description of each SORS category and the number of items within each category are given below:

1. Metacognitive Strategies are those intentional, carefully planned techniques by which learners monitor or manage their reading. The strategies include having a purpose in mind, previewing the text as to its length and organization, or using typographical aids and tables and figures. (10 items)

2. Cognitive Strategies are the actions and procedures readers use while working directly with the text. These are localized, focused techniques used when problems develop in understanding textual information. These cognitive strategies include adjusting one's speed of reading when the text becomes difficult or easy, guessing the meaning of unknown words, and re-reading the text for improved comprehension. (12 items)

3. Support Strategies are basically support mechanisms to aid the reader in comprehending the texts such as using a dictionary, taking notes, or underlining or highlighting the text to better comprehend it. (6 items).

Many researchers like Alderson 2000; Cohen 1998, and Purpura 1998 have mentioned

that sometimes in research practice, the distinction between skills and strategies are vague and used interchangeably. In this study, strategies are viewed as distinct from skills, especially in reading comprehension in that skills refer to the largely subconscious nature of linguistic processes involved in reading while strategies refer to conscious cognitive processing. In other words, skills refer to information techniques that are automatic, whether at the level of recognizing grapheme-phoneme correspondence or summarizing a story. Skills are applied to a text unconsciously for many reasons including expertise, repeated practice, compliance with directions, luck, and naïve use. In contrast strategies are actions selected deliberately to achieve particular goals. An emerging skill can become a strategy when it is used intentionally. Likewise a strategy can become a skill. Indeed strategies are more efficient and developmentally advanced when they become generated and applied automatically as skills. Paris, Wasik and Turner (1991), stated that strategies are "skills under consideration"

Even the term strategy seems to be defined in a number of different ways (Purpura, 1998). According to Phakiti (2003) there are two issues that need to be addressed and made clear, in order to arrive at proper descriptions of the term strategies. First is that language learning strategies can be stipulated either within the focal attention of learners or within their peripheral attention. Peripheral attention refers to when learners can identify a strategy when asked immediately (Schmidt, 1994). If the learners cannot identify any strategy within their peripheral attention, it is unconscious and the behaviour referred to as a process, not a strategy (Cohen,1988). Faerch and Kasper (1987) argue that once learners have developed some strategies to

the point that they become automatic, those strategies maybe subconscious. Ellis (1994), on the other hand states that if strategies become automatic the learners are no longer conscious of employing them and they cannot be accessible for description, they lose their significance as strategies. In this study, strategies are viewed as conscious and deliberate. That is the actions that readers actively select and control to engage and comprehend the texts.

The second issue is whether a strategy is observable. Oxford, (1990) views strategy as observable whereas Pupura, (1999) is of the opinion that strategies are both observable and unobservable. In this study, strategies are seen as both observable and unobservable. This study also allows for the possibility that the learners might use a strategy but fail to report it. Therefore it may be wrong to imply that they did not use such a strategy

Reading strategies are of interest because of what they reveal about the way readers manage their interaction with written text and also how these strategies are related to effective reading comprehension. Research has shown the ESL readers use a wide variety of strategies to help them comprehend a text.

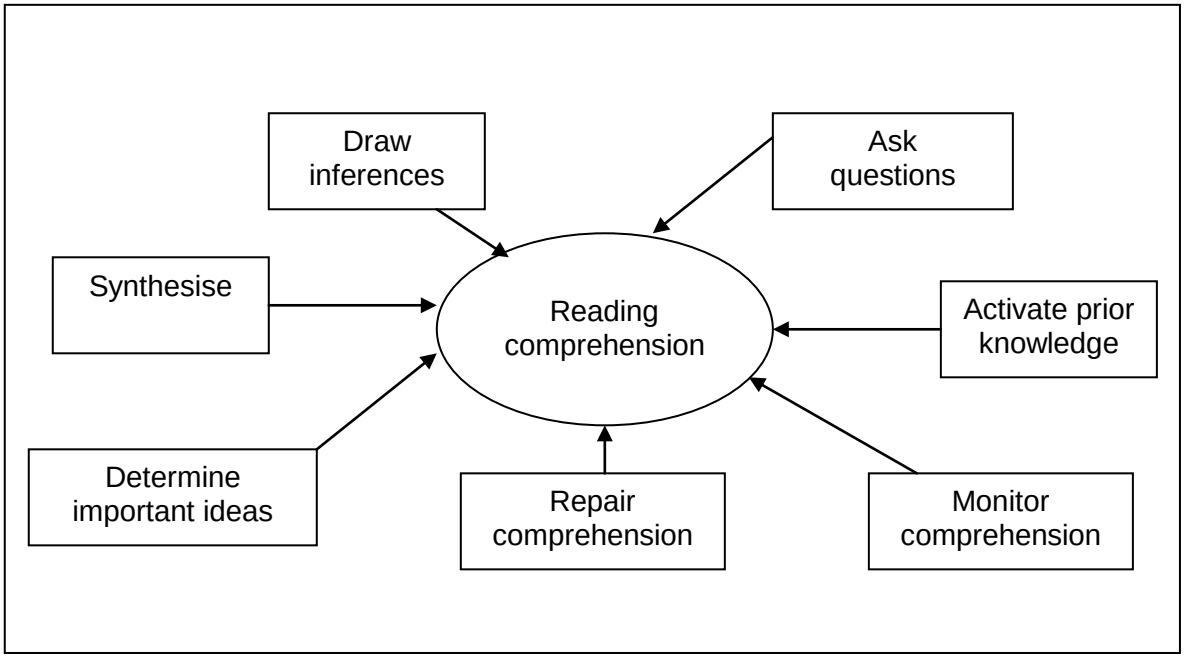
There have been numerous studies, both in L1 and L2, conducted to identify reading strategies used by learners of English in text comprehension of printed text. A major contribution of research on reading strategies also has been to identify the strategies used by good language learners and to determine how these strategies can be taught to others.

However, “one area in which strategy research has not been integrated into other areas

of investigation is the work related to online reading. Researchers have done very little to explore the reading strategies that learners use while engaged in online reading tasks" (Neil J. Anderson, 2003). One study that explored reading strategies that learners use while reading on the Internet was by Elizabeth Schmar-Dobler (2003). She used observation and interviews with adolescent Internet readers who provided examples of the comprehension strategies these readers apply to the reading of text on the Internet. Her findings revealed that these Internet readers have the seven strategies that Pearson et.al.(1992) mentioned for reading print text and applied them to reading of Internet text. Furthermore, she also indicated that for the present and the future, students need to rely on speed, efficiency and understanding of how to make reading on the Internet an effective tool in their world of work and learning.

Given below is the diagram for the seven strategies.

Figure 3 – Seven Comprehension Strategies for Reading Comprehension



Seven comprehension strategies for reading comprehension

- Activate prior knowledge - Strategic readers use what is known about the topic of a text and the way a text is organized to check their comprehension and make mental connections between new information and existing knowledge.

- Monitor Comprehension – Reading rate and strategies are adjusted when a reader needs to understand different kinds of text.

- Repair Comprehension – When meaning has been lost, fix-up strategies such as rereading and skipping are used by strategic readers to move back on track.

- Determine important ideas – Making predictions and identifying the most important ideas of the text come before, during and after reading.

- Synthesize - Throughout reading, strategic readers mentally summarize information as a way to check their comprehension.

- Draw Inferences - Strategic readers combine prior knowledge with textual information to make inferences about the text. Gaps in understanding are filled in through predictions, inferences and new ideas.

- Ask Questions - Questions are developed and answered by strategic readers throughout the reading of the text to activate prior knowledge, check comprehension, clarify ideas and focus attention

The process of text comprehension involves the reader in a dynamic interaction with the text. It is important to note that readers employ strategies to comprehend the text and thus lend it meaning, but different reading conditions, text structures, purposes or circumstances necessitate different reading strategies.

If this is so, this study hopes to find out if the students need to be specifically trained in certain reading strategies to enhance their reading performance when reading hypertext and also, if any one reading strategy plays a more significant role in one medium than the other.

2.3 Hypertext

The ability to read texts is considered one of the most important skills that University students of English as a Second Language need to acquire. In the current Internet age, with its proliferation of information needed for academic purposes, students are exposed not only to conventional text presentation but also to electronic texts. While students used to read in English primarily through text on paper; now they often do most of their reading online. The Internet has significantly changed how we read. The explosion of information and negotiating these online learning tools add an additional challenge to Second Language readers. They must be able to navigate through various hypertext forms to construct meaning.

A hypertext reading environment differs from the traditional printed text environment in that the hypertext reader has the ability to self-select the type and sequence of information to be acquired rather than following a path provided by the author of the

text. Brown (1986) described hypertext as non-sequential written text that allows branches and multiple paths to be selected by the reader. Sequential flow imposed by authors in the printed medium is replaced by flow initiated by the reader. Therefore hypertext requires the readers to take on an active role in determining the quality and coherence of the texts they read (Burbules and Callister, 2000). According to McDonell (2003), reading on the Internet now truly represents Goodman's (1967) interactive mode and students really do use a "psycholinguistic guessing game" (P.L.Carrell, Devine, Joanne, Eskey, David,E, 1988) as they read these texts. This dynamic aspect is the main difference between text and hypertext. Hypertexts support activities that are impossible or difficult to perform with paper (Joanassen, 2004).

Given below are some of the characteristics of hypertext:

- Hypertext is not simply a nonlinear text. Winklemann (1995) argues that while print is static, e-text or hypertext is dynamic and malleable. Hypertext is defined as "more than text" as hypertexts have links that form connections between nodes, or organized chunks of text (Joanassen, 2004). The reader selects a link and is taken to a related node of text. These linking nodes provide the readers with immediate access to definitions of words and explanations of difficult concepts. The meaning of what is read may not be limited to a single closed set of words on that same page but instead may be linked elsewhere depending on that writer's cognitive map or mental representation of space. Therefore these links give the reader the freedom to choose his or her own path. The hypertext offers the reader the choice of progression (Brown, 1986). Each link in the hypertext is linked to others in a

mesh type arrangement rather than in a sequential flow like the printed material. Brown argues that the reader can diverge, explore, then return and continue with the text. This multiple entry and exit of the links can create reader disorientation and cognitive overload (Conklin, 1986). When students read printed text the page retains the information about the topic that the students are reading so that the students may look back and forth in a text. However McDonell, 2003 states that when a student chooses a hyperlink that may take him or her to a page where all the information is new, the student needs to make inferences about the reading from the start. Therefore hyperlinks change the pages information continuously and this may change the context of that information.

- Each hyperlink in the hypertext exposes the reader to different navigational and structural contexts, leading to disorientation. The author of the hyperlink allows the reader to gather additional material and synthesis into their own framework of understanding. Also, the reader is able to see the various texts that influenced the author. This could pose as a problem according to Kamil and Lane (1998), because there is no way to predict whether or not the link will be useful. Therefore if the students do not process the information correctly through the hypertextual links, then the students will not be able to include the information into any form of comprehensible output in their research. This could be also due to the constant shift in the reader's focus.

- Intertextuality is an important characteristic of hypertext. Intertextuality is

based on the assumption that texts derive their meaning from their relationship to other texts. The hyperlinks give the reader an insight into all the materials used by the author in the construction of his or her text.

- The pace of hyperlink is quick. It involves the reader scanning rather than reading the information most of the time. This is because there is so much of information presented to the reader through the hyperlinks.

- Hypertext supports synchronous communication. The reader is able to have direct contact with the author. This is not possible for printed text.

Therefore the key difference according to McDonell (2003) between hypertext and traditional print relate to textual boundaries, mobility and navigation. The reader is given the freedom to make the directional choice.

In a study by Anderson-Inman, Horney, Der-Thang, and Larry (1994), they reported three types of hypertext readers based on the Electro Text Project.

- The Book Lover is a person who typically reads everything in linear form, and uses available resources sparingly.
- The Studier is an individual who navigates through the text in a linear form, uses backward navigation for reviewing and checking and more frequent use of comprehension monitoring question.
- The Resource Junkie is an individual who spends most of his or her time looking for and using resources. His or Her navigation patterns and strategies are the most varied and complex.

Some reading educators (Coiro,2003; Anderson, 2003; Leu, 2005; Destefano & LeFevre, 2005) concur that there is limited research on the impact of hypertext on the reading process. McDonell (2003) argues that most of what we know about college reading comes from what we know about traditional texts and textbooks. We know little about how text is read on the Internet. A lack of a thorough theoretical foundation is a major breakdown of current hypertext research. We do not have a general theory of hypertext or a model of the cognitive processes describing reading in a hypertext environment (Rouet and Levonon, 1996). Due to this, researchers' characterization of hypertext has pointed out two issues involved in hypertext research: the similarities and differences between linear and non-linear texts, and the problems embedded in navigation while reading hypertext.

Recent research has suggested that the navigational opportunity of a hypertext changes the nature of how individuals interact with the information. The reader when reading hypertext is provided with more flexibility in choosing where to go in the text, more methods of finding relevant information and also more options for moving about in the text (Foltz, 1996). Hypertext and the World Wide Web may foster the cognitive flexibility needed to understand information and to construct knowledge through a broad range of sources. Therefore one area of concern would be how L2 language learners are able to comprehend frames of pages as it has the possibility of drowning the reader in information overload. Furthermore, unlike printed text there is no sequential flow or standard structure that the reader can adhere to. There are many pathways that the reader can follow. Hypertext increases individual freedom because users are entirely free to follow links wherever they please (Landow, 1997). Lanham, R (2000) says that the perceptual field of the reader becomes considerably richer and more complex in electronic display.

It is evident that navigating a text network is a complex cognitive activity in which various strategies are involved (Spiro and Jehng 1990; Rouet, 1989). A few researchers have reported that there is a need to investigate the cognitive aspects in hypertext reading in order to understand the nature of hypertext reading process (Esperet, 1996).

In addition, Charney (1994) points out a few basic problems of reading hypertext, for example, it imposes a greater demand on short-term memory or working memory. Also readers may find that navigation becomes arbitrary through a lack of cues to the meaning of links between nodes. She also states that hypertext may disable the reader's existing knowledge about how texts are structured and about different text genres. In addition, Kamil and Lane (1998) argue that one of the problems with Internet reading is the unpredictability of knowing where one will go when choosing the hyperlink because there is no way to predict whether the link is useful or not. Therefore if the students have difficulty processing the information correctly through the hyperlinks, then the students cannot put this reading into any form of comprehensible output for any of their research papers. This would be especially true for low proficiency ESL learners.

While many computer and cognitive scientists are devoted to the idea of designing better hypertext environments and exploring the mental processes and consequences of learning with hypertext (Spiro & Jehng, 1990; Mc Allese, 1990), far less research has been done by first and second language reading researchers or reading educators to assess the potential impact of hypertext on and implications for reading and literacy (Altun, 2003).

We cannot deny that the Internet has significantly changed how we read and most of what we know about students and text processing is through the printed words of textbooks, books, magazines and newspaper. Furthermore, Kamil (1998) argues that there is limited research on technology and reading. He points out that there is only a small body of research on hypertext and hypermedia and very few of the empirical studies discuss the cognitive consequences of reading this type of text. In order to contribute to the understanding of this area, this study will compare comprehension of printed texts versus hypertext.

2.4 Verbal Protocols

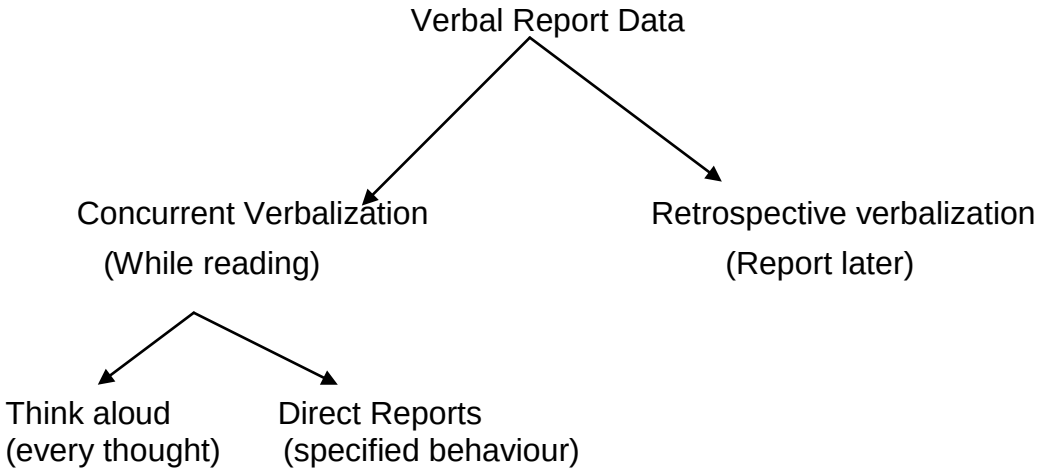
2.4.1 Introduction

Verbal Protocol is any collection of verbal reports during a task, interviews or self-deposited accounts of events or problem solving strategies reported by people during or after a task. In other words, verbal protocol serves to identify mental processes occurring during or after the solution of a given task. The individual is required to say what he or she is thinking during the task or provide a retrospective report after the task has been completed.

Green (1998) points out that the term verbal protocol specifically refers to verbalization which has been generated by a subject instructed to either talk aloud or think aloud. The subject is required to tell the researcher all that he or she is thinking as the task is being carried out, or after the task has been completed. Green (1998) goes on to say that Verbal protocol analysis is a qualitative methodology in which verbal data is analyzed in order to identify inferences about cognitive processes that produced the verbalization.

Ericsson and Simon (1980) concur that verbal protocol refers to subjects verbalizing their thoughts while or immediately after completing the task. According to Ericsson and Simon 1984;1993, Smagorinsky 1995 concurrent and retrospective verbalization are the two broad categories of verbal report data.

Figure 3 Verbal Report Data and Think Aloud



Concurrent verbalization refers to the subjects verbalizing information while simultaneously attending to the task, thus providing a verbal report concurrently with the performance of the task. Think aloud protocols and Direct reports come under concurrent verbalization. Think aloud protocols is where the subjects verbalize every thought that comes to mind. Think alouds are a special type of verbal self-report developed by Newell and Simon (1972) to probe cognitive processes. On the other hand, in Direct reports only specified behaviours are reported (Smagorinsky, 1995).

In retrospective verbalization, the subject is required to report on cognitive processes that have occurred at an earlier point in time. Once the task is completed, the subject is then asked to report on his or her thoughts when attending to the task. The time interval between task completion and start of the verbal report is important.

In the context of this reading research, Anderson (1991) and Block (1989,1991) recommend think alouds because by employing think aloud protocols, information of the unobservable behavior of reading comprehension can be obtained. In order to ensure completeness of the think aloud report, the researchers followed Haasrrup's (1987) suggestion that the think aloud procedure be supplemented by a retrospective interview.

According to Gill R, (2004), combining the think aloud protocols with the retrospective stimulated recall interview report assured the completeness of the subjects' verbalization. It allowed for triangulation of data.

2.4.2 Think aloud Protocol

The mental activity involved when learners read is crucial to the understanding of the reading process as a comparative analysis of the final product. The final product often provides an incomplete and often misleading way into the reading process, hiding both successful strategies and problems. Insofar as it is not possible to directly observe the human mind at work, a number of attempts have been made at indirectly accessing the learners mind. One such attempt, which has been steadily gaining

ground in reading research, has been to ask the learners themselves to reveal their mental processes in real time while carrying out the task. Such a method of data collection, known as think-aloud is not new to scholars working in psychology and cognitive science.

The think aloud protocol is a technique in which students verbalize their thoughts as they read and thus bring into open the strategies they are using to understand the text (Coiro, 2003). Thinking aloud differs from other forms of introspective report because during think-aloud protocol readers report their thoughts and behaviors without theorizing about these behaviors. Thus, think-aloud protocols provide a direct view of a reader's mental activity, a kind of window into these processes which are usually hidden.

This has resulted in the use of think-aloud protocols and other verbal report formats have increased in L1 and L2 reading research. As both a research tool and as a class activity, such protocols provide useful information about the hidden processes that language learners use on all four language skills, as well as be able to identify test taking strategies and teacher decision making processes. In each case, the individual is asked to reflect upon what he or she is thinking about or doing while being engaged in a task.

Within the last 15 years, this research tool has been used as a source of data on the strategies of learning in a second or foreign language, thereby contributing to our understanding of learners' learning strategies. However, a major impetus of this research technique has been its successful use in first language studies, especially in

research on cognitive processes in reading and writing.

The research on think-aloud protocols spans over 40 years. It was initially used by Newell and Simon (1972) as a research tool to examine strategies and processes involved in thinking and problem solving. Since reading according to Thorndike (1917) could be considered as a kind of problem solving activity, think-aloud is also used in reading research. In the 1980's think aloud was viewed as a technique to model to students the reading strategy teachers use to comprehend text so as to help students improve thinking and reading comprehension. Then in the 1990's think aloud was viewed less as a tool or strategy and more as an "aspect of social interaction, specifically as an aspect of the discourse in social contexts designed to teach reading comprehension (Kucan and Beck, 1997). Often methods such as classroom observation produce indications or clues as to the strategies learners use, rather than instances of actual strategy use. Hence, researchers have had to rely to some extent on their own intuitions in order to produce descriptions of strategy use. The verbal report measures provide a more viable – perhaps the most viable – means of obtaining empirical evidence as to strategy use.

Think aloud protocols belong to a larger category of verbal protocol analysis. Verbal protocol analysis is a qualitative methodology in which verbal data is analyzed in order to develop inferences about the cognitive processes that produced the verbalization (Green, 1998). The data may also be coded and quantified in order to identify trends for purposes of comparison.

2.4.3 Theoretical framework of think-aloud protocol

The use of verbal report data as a research tool emerged from the cognitive sciences. According to Smagorinsky, 1995, Newell and Simon, 1972 described a detailed procedure called protocol analysis which they used to study the thought processes related to problem solving activities. This has resulted in the use of verbal report data to study the thought processes of individuals involved in a wide variety of activities. The theoretical framework for think-aloud protocol experiments is provided mainly by the work of Ericsson and Simon (1984; 1993). These researchers' analysis of the cognitive processes underlying verbal report of thinking is based on the information processing theory of human cognition provided by Newell and Simon, 1987. This theory postulates that a cognitive process can be seen as a sequence of internal states successively transformed by a series of information processes. Cognitive processing is thus viewed as a sequence of states in which each state corresponds to information that is attended to or heeded whilst it is in the short term memory.

Haastrup (1987) states that the posit validity of verbal report protocols rests on Ericsson and Simon's information processing model. According to Ericsson and Simon's information processing model (1984), information is kept in different memory stores, with varying access and storage capabilities: short-term memory (STM) is characterized by easy access and severely limited storage space, while long-term memory (LTM) is characterized by more difficult access and larger storage space. Only information present in STM that is information which is being heeded by the subject can be directly accessed for further processing, such as producing think-aloud reports. An important assumption is that for verbally encoded information,

which can be reported in the same form as the one in which it was heeded, the verbalization does not interfere with the cognitive process. The only effect of think-aloud is to slow down the performance.

From the short term memory store, a subset of the heeded information passes into the very large capacity and relatively permanent storage of long term memory (LTM). Retrospective verbal reports draw on this information stored in LTM as well as its traces in STM. In order to provide the retrospective report, the information must first be retrieved from the long-term memory store, which is transferred to STM before it can be reported.

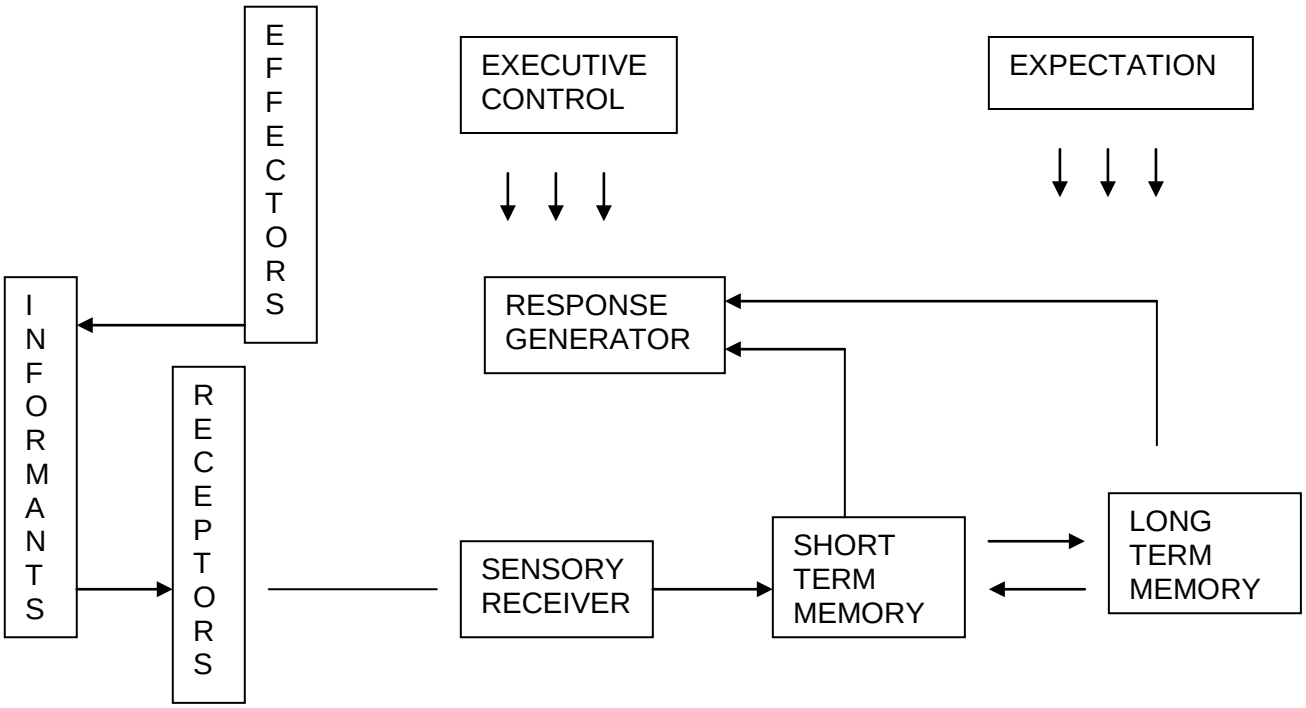


Figure 4: The Information Processing Mode (Ericsson and Simon, 1984)

The implications of this model are manifold, but only those relevant to this study will be discussed. Firstly, only concurrent verbalization of thoughts can be claimed to exhaustively reflect the mental states of a subject carrying out a relatively long task, which takes longer than ten seconds to complete (Ericsson and Simon, 1987). Ericsson and Simon assert that by instructing subjects to verbalize their thoughts, during the performance of the task, one can get a sequence of verbalizations corresponding to the sequence of generated thoughts. The think-aloud protocols that are elicited thus provide a stream-of consciousness disclosure of thought processes while the information is being attended to by the informant and comprise of data that are basically unedited and unanalyzed (Cohen,1998). The use of think-aloud is predicated on this premise.

On completion of such a long task, part of the information moves to LTM, leaving only retrieval cues in STM. According to Ericsson and Simon, in such cases post verbalization has been found difficult and often incomplete. Theoretically, therefore, think-aloud reports more accurately reflect the thought processes that are being reported than do retrospective verbalizations. Ericsson and Simon (1987) have advocated that asking questions about what was stored in short term memory, was seen as a means of making think aloud reports more reliable in that there is no strain on the memory to reconstruct past thoughts.

Secondly, in order to make sure that the reports actually reflect mental states without distorting them, it is important that the subject does not feel he or she is taking part in a social interaction. The interaction between subject and researcher should therefore be avoided or at least reduced to a minimum.

Thirdly, practice and experience may affect the amount of processing carried out in STM, so that fewer mental states will be available for verbalization to subjects' experienced in the task. This process, known as automation, is explained by Ericsson and Simon (1987), "…… before over learning has occurred, process has to be interpreted, with substantial feedback from intermediate processing stages in STM. Automatic processes are therefore faster and more efficient than processes which are under conscious control". Therefore, under the right circumstances (verbally-encoded information, no social interaction, no interferences, no instruction to analyse thoughts), verbalizing is assumed not to interfere with the mental processes and to provide a genuine account of the mental states. Ericsson and Simon's justification on the validity of concurrent type of reporting has resulted in the popularity of the use of think-aloud as a research tool. According to Gill (2004), think aloud protocol analysis is capable of providing insights into the cognitive mechanism and the processes that drive the working of this mechanism in reading and writing events. Therefore, think-aloud is used in this study to provide insights into the types of reading strategies used by ESL learners while reading a printed text and hypertext.

2.4.4 Challenges faced when using Think- Alouds

Cohen (1998) considers a series of challenging areas regarding the methodology; however these challenges can be dealt with. Gill (2004) in his study identified some of the problems encountered when he used think aloud protocols to collect his data. Given below are some of the challenges encountered and solutions.

- Setting

The researcher should be familiar with the working environment and have a trusting relationship with the subjects and also the lecturers involved in the development and validation of the materials and procedures used in the study (Marshall and Rossman, 1992). There is a need to develop a rapport with the selected subjects. This is to make sure that the subjects are not shy or reserved when verbalizing their thoughts and therefore not hinder the data collection. Gill (2004) asserts that having once determined the research focus, many potential problems can be reduced, if not avoided entirely through judicious selection of the research setting.

- Task

It is very important that the researcher and the subjects conceptualize the task in the same way and that the task implicates those behaviours that the researcher is interested in investigating (White, 1980). Also, Ericsson and Simon (1987) assert that a task analysis is necessary to ensure that the processes that are the focus of the investigation are in fact, implicated in the completion of the task.

- Verbal Facility

Garner, as cited in Matsumoto (1993), cautions that the subjects' verbal facility in the target language should always be considered in data collection process so that verbalization difficulties will not mask out the emergence of some important mentalistic data. The ability for the subjects to provide think aloud protocols is critical to the success of this technique.

Therefore, purposive selection is a useful strategy to preempt potential problems related to the subjects (Berg 1989). A rigorous purposive selection procedure will

allow for the identification of subjects with requisite English Language Proficiency.

- Subject Training

Ericsson and Simon (1987), see a need for subject training especially for think aloud protocols as it will increase the completeness of the verbalization. The researchers suggest that to ensure consistency, the subjects be given trials until they are able to make verbal reports.

However, Faerch and Kasper (1987) and Smagorinsky (1995), caution that demonstration of, and practice on tasks similar to the data collection task may affect the verbal report data by cueing particular responses since the processes or information that the subjects should attend to are identified. Gill (2004) in his intertextuality study demonstrated think aloud using a maths word problem. The use of a mathematics word problem had the effect of not cueing the particular strategies. Gill (2004), followed Hartman's (1995) advise and he trained the subjects using sets similar to the ones in the actual collection of data. The sessions were audiotaped and by playing back the audiotape he was able to indicate to the subjects the cognitive processes that they should focus on, without cueing extraneous processes or information.

- Completeness of the Think aloud protocols.

Ericsson and Simon (1984) assert that think aloud protocols are often incomplete because the subjects do not utter all of their thought processes. To address this problem, Gill (2004) used a retrospective interview to supplement the think aloud procedure. This was done so as to probe into some of the statements made during the

think aloud, thereby improving the reliability of the protocol analysis. The technique of cued retrospective recall uses the audio – recordings of the verbal performances of the subjects, as represented in their think aloud protocols, to serve as cues in eliciting their retrospective reports (Dipardo 1994). The technique rests on the premise that confronting the subjects once again with the task situation by means of the audio recording reactivates traces in short term memory, thus allowing the subjects to report their cognitive processing with an acceptable degree of accuracy (Faerch and Kasper 1987).

According to Gill (2004), combining the think aloud protocols with the retrospective stimulated recall interview data assured the completeness of the subjects' verbalizations. It also allowed for between methods of triangulation of data. Many researchers have encouraged triangulation as a means of enhancing the validity and reliability of verbal data (Ericsson and Simon 1984; Greene and Higgins 1994). In addition, Smagorinsky, 1995 stated that methodological triangulation allows for the construction of a composite picture from both retrospective and concurrent protocols that is likely to yield the corroboration necessary to draw strong conclusion. Furthermore, collecting and cross-referencing data from the think aloud protocol and cued retrospective recall interview allows checking for consistency as well as completeness of these accounts (Greene and Higgins, 1994). Nyhus (1994) in his study, the respondents and the researcher listenened to the recording of the verbal report and the respondents provided a retrospective verbal report by pausing the tape when they wanted to make additional comments about thoughts that had occurred to them while reading the text. According to Nyhus (1994) this provided still more insight on the verbal reports.

In conclusion, think aloud protocols do have their shortcomings, as in all other research methodology but what is important as Smagorinsky (1995) asserts is that when researchers are attentive to the potential problems caused by the procedure and take steps to control and account for them, think aloud collection and analysis is a remarkably illuminating methodology.

Ericsson and Simon (1993) have advocated the collection of concurrent verbalization over other approaches of verbal reports because asking questions only about what was heeded in short-term memory was seen as a means of making such reports more reliable in that there is no strain on the memory to reconstruct past thoughts. Furthermore, Ericsson and Simon (1984) found substantial evidence that the contents of thinking aloud and of immediate retrospective reports are valid, and no empirical evidence that these reports do not correspond to what subjects pay attention to in normal course of problem solving and thinking. Therefore these reporting procedures should yield useful information on the cognitive processes involved in reading and text comprehension.

2.4.5 L2 Reading Research Using Think-aloud Protocol

There have been a plethora of studies that examine the comprehension strategies that second language readers utilize to process a text. However, only a few of these studies have used think aloud protocol as a research tool.

A comprehensive review of think aloud studies in reading by Presseley and Afflerbach (1995) showed the enormous range of strategic activities used by readers

in elementary schools (e.g., Meyers, Lytle, Palladino, Devenpeck,&Green,1990), high school (Olshavsky,1976-1977), and college students and adults (Afflerbach,1990). Readers in think-aloud studies show evidence of planning their reading activities, enacting numerous cognitive and metacognitive strategies, monitoring the efficacy of those strategies, adjusting strategies flexibly, reflecting on and reacting to what was read, and many other processes. Furthermore, Cromley and Azevedo (2004) have stated that think-aloud studies have revealed reading processes of proficient readers (e.g., planning) that had not been identified by other research tools. In addition, to the experimental studies cited above, several think-aloud studies have shown evidence that background knowledge, inference, strategies, vocabulary, and word reading play a role in students' reading comprehension.

With regards to background knowledge, Kletzien (1991,1992) studied activation of prior knowledge by high and low 10 and 11 grade readers as they read social studies texts of varying difficulty using think-aloud protocols. His study revealed that there was no difference in vocabulary strategy use between high and low readers on independent or instructional level texts.

While Afflerbach (1990) used think-aloud protocol on 15 skilled reader graduates and high school students from a gifted and talented program – to make predictions while reading three essays and two short stories. With regards to inference, nine think aloud protocol studies with middle and high school students have shown differences in inferencing across either readers groups or text type. Furthermore, Neuman (1986) compared 21 low achieving and 21 high achieving 5th grade students on a think aloud

task with two stories from a children's mystery series. Students' inferences were coded and analyzed; low and high achieving readers did not differ significantly on the types or frequency of strategies, but they did differ on inference errors. Whereas Rogers (1991) used think aloud on 8 ninth grade students at a range of teacher-rated reading levels, reading short stories by William Faulkner. He was able to identify a number of specific strategies used by high school readers. These included summarizing, elaboration, monitoring, hypothesizing, and evaluating.

In another such second language study, Hosenfeld (1978) used think aloud procedure to examine what types of cognitive operations, successful and unsuccessful readers used to process written texts. The subjects were ninth grade students who were learning French. In an oral interview the subjects were asked to read a text and verbalise their thoughts. They were required to say in their first language whatever comes to their mind while processing each sentence in the text.

Block (1992) investigated the comprehension –monitoring process used by first and second language readers of English. The subjects were twenty-five college freshmen and consisted of proficient and non-proficient readers of English. While reading an expository text the subject were asked to think aloud, or specifically to say everything they understood and everything they were thinking as they read each sentence.

On the other hand, Anderson (1991) used think aloud to examine individual differences in strategy use on two types of reading task: standardized reading comprehension tests and academic texts. The subjects were twenty-eight Spanish-speaking adult students enrolled in University-level English as a second language

course. A think aloud protocol was used where the subjects verbalized their reading strategies while the subjects read two passages from the Textbook Reading Profile, which consisted of academic reading passages.

Yet in another study, Young and Oxford (1997) investigated the differences among forty-nine native English speaking men and women while reading two Spanish texts and one English text. The subjects read the passages, rated their familiarity of topic, and then completed a think aloud protocol.

In the studies mentioned above the researchers used think aloud protocols to examine reading strategies of second language learners. Each study revealed important information about the reading process and each investigation contributed to the database on L2 reading strategy use in its own unique way.

In the last few years think-aloud protocol has played a role in a significant number of research studies on language learning strategies. Many insights about learning in particular reading strategies have been obtained from learners as they provided verbal report data before, during, and after performing learning or language tasks. It is important to note that verbal report is not one measure but encompasses a variety of measures intended to provide mentalistic data regarding cognitive processing. In studies where the respondents answered interview questions or completed written questionnaires about their language strategies the self report has been shown to be somewhat removed from the cognitive events being described, this approach may

produce data of questionable validity. On the other hand, questionnaire items are more likely to elicit learners beliefs about what they do, rather then what they actually do (Cohen, 1998). Therefore, think aloud protocols have gained popularity in the last few decades because it provides data on cognitive processes and learner responses that otherwise would have to be investigated only indirectly.

Furthermore, this type of protocol has at times provided access to the reasoning processes underlying cognition, response, and decision making. Presseley and Afflerbach (1995) asserted how the use of verbal report has yielded a thorough description of reading. They also provide a detailed description of what they refer to as before reading, while reading, after reading, monitoring and evaluating strategies, based on a review of 38 primary data studies. Presseley and Afflerbach then went on to say that the think alouds were extremely revealing about the dynamics of comprehension difficulties and how understanding of text shifts in reaction to comprehension difficulties and surprises in text. It is for these reasons that think-aloud protocols were used in this study so as to "provide a more direct access to the learners' processing and knowledge" (Faerch and Kasper, 1987). It for this reason that this study uses the think-aloud protocol as the primary data collection tool.