THE COMPLEXITY OF READING COMPREHENSION PROCESSES: A REVIEW FROM READER, TEXT, AND COGNITIVE PROCESS PERSPECTIVES

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ABSTRACT

This is a review of reading comprehension theories from published articles. This theoretical review differs its content by showing reading complexities which is viewed from the perspective of its readers, text's, and cognitive process. Readers individual differences are highly affect reading comprehension process as it can be also the source of its complexity by the factors of attitude, habit, and linguistics proficiency (Cassanave: 1988, Mcmaster: K.L., Espin, C.A., Van den Broek: 2014). On the other side, texts as the mediator of reader and writer interaction in reading process as also play an important factor in turning reading to be complex process, genre, content, format, and degree of difficulty are sub-factors that affect the complexity of reading in readers mind (Mcmaster, K.L., Espin, C.S., Van den broek; 2014). However, as the motor of reading process, cognitive activities are also play its important role started from decoding, translation, schemata, questioning, and metacognition process are closely affect reading comprehension process. As mainly composed from published article, this review focus to articles which are published on the year of 2000 and above but for a better result of reviews this theoretical review is taken Cassanave research result which was published on 1988 and Van den Broek research result which was published on 1999.

Keywords: Reading, Complexity

INTRODUCTION

In relation to its nature, questioning the real process in reader's mind during reading is difficult to be answered satisfactorily; either linguistically or cognitively (M. Marpaung; 2011, Ngabut M.N: 2015, P. Kendeou: 2014), as it interrelates factors of text complexity, reader individual differences, and their interaction to the nature of cognitive process (Cassanave: 1988). What are there in readers while reading and how are they interrelated one to another in the process of reading are the further questions after what is happening in reader's mind during reading. Theories in researches findings are delivered in several decades as experts in its field have tried to capture the mysterious things of reading in many models of process which is conceptually various as cognitive (Gough: 1972, Goodman: 1980, Rumelhart: 1988, Smith; 1973, in Ngabut M.N; 2015) and Constructivist (Van Den Sandford and Garrod: 1981 and 1998). Various model of reading processes are introduced such as the approaches of bottom-up, top-down, and interactive, then the second generation of reading researches had introduced Landscape theory and Construction-integration, and finally the later current reading researches had introduced the situation model, event-indexing, scenario mapping, and immersed experience framework.

The complexity of reading process is not only derived from the perspective of thinking processes, as a learned language skill began from the early age, reading is also impacted by reader's environmental factors and his individual characteristics (Cassanave: 1988, Mcmaster: K.L., Espin, C.A., Van den Broek: 2014). These two factors are directly impacted the cognitive process of reading comprehension. It is even harder for the English as a Foreign Language learners (EFL), as it was reported that reading attitude of EFL learners in private college are various due to the environmental factors of major/ study program, parents' education level, either their financial income rate (Marpaung, M: 2020a). It was also reported various due to EFL learners gender. Next, similar to the previous report, reading habit is also reported various in EFL learners due to its factors of reading attitude, first language reading habit, and second language reading proficiency. The report said that second language reading habit is highly been impacted by second language reading proficiency rather than reader's L1 reading habit and reading attitude (Marpaung, M: 2020b). Both of reading attitude and reading habit are parts of the reader's environmental factors (Mcmaster, KL., Espin, C.S., Van den Broek: 2014).

In this article, the review is mainly focus to (1) review the complexity of reading comprehension process and supporting it by showing the records of cognitive models of reading started from the latest to the current researches, (2) review the reader's environmental factors and their related researches which is impacted the complexity of reading process, and (3) review the individual differences of readers and how related researches show the impacts to the complexity of reading process. This article expected fits the questions of how the process of reading comprehension can be very complex as its complexity often become obstacles for the EFL learners reading activities and how this reality also often confused teacher and researchers of reading and linguistics field of study. As it is in the question of what makes reading become a complex process? And the following are three parts of reading process which is believed as the source of its complexities; (1) reader perspective, (2) text perspective, and (3) the cognitive process perspective.
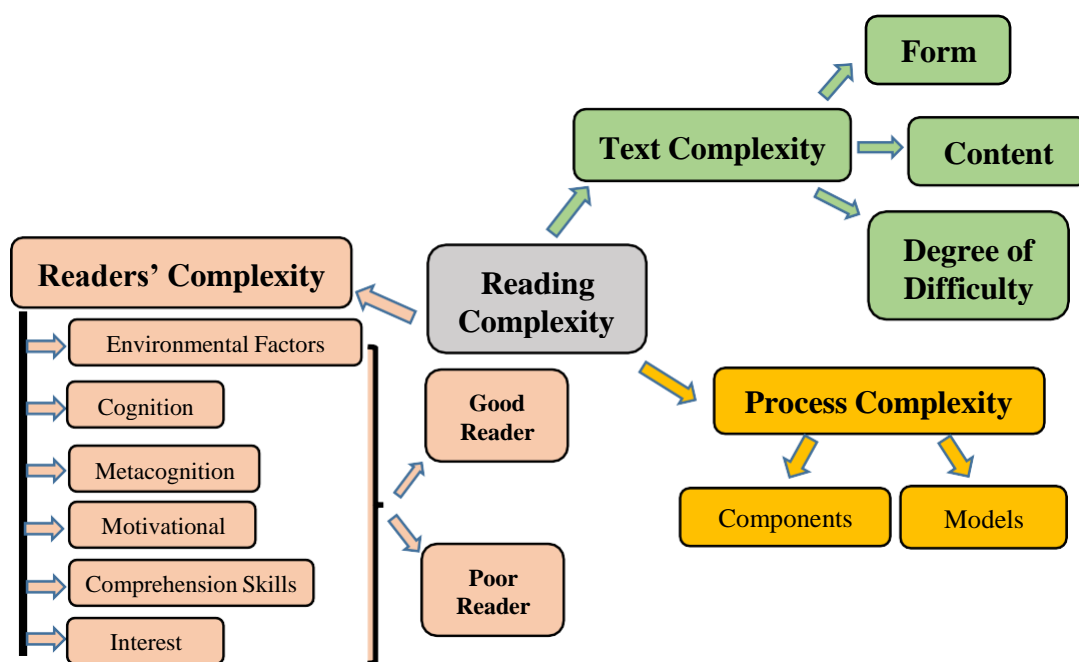

Figure 1. An Introduction to Reading Complexity

THEORIES OVERVIEW

A. The complexity of reading process from readers perspective

The first orientation to define the complexities of reading process is reader side. There are many researches proved reader's has their own characteristics which are individually different one to another. In building the a coherent mental representation, a reader is affected by two factors (1) environmental factors and (2) psychological factors (Pecjak, S., Podlesek, A., Pirc T ; 2011). Environmental factors also can be defined as a nurturing factors as it is picturing treatments accepted in the early ages of a reader which can be divided into two big condition of (1) family environment and (2) school environment. These two environment are believed contributed highly in reader's reading ability in the mature age as it is contributed in school such as the way the teacher instructed reading and writing activities, how the teacher proceed idea in the classroom, and how the teacher make persuasion in reading activities, either family environments are also contributed highly such as how parents accompany children in their reading activities, the availability of books or even mini libraries at home, how often parents let children accepting books as a gift, and how often did children saw their parents do reading activity. Next, psychologically, readers are defined by their degree of ability in cognitive, metacognition, motivational, and emotional. Cognitive is defined as the center processor of the thinking process in reading, as it is also defined as the working memory capacity which is classified into high working memory capacity and low working memory capacity (Bohn-Gettler & Kendeou: 2014). Metacognition is defined as an assessor of thinking process (Cassanave: 1988), it is the center of evaluation of thinking process; a part which is thinking the think in reader's mind. Motivation defined as a desire and as a satisfaction in an experience that support someone's effort in learning, doing, and

striving something (Nezhad, A.Z. et al: 2015), and emotional is defined as a feeling which conduct reader's perception in reading; accepting or rejecting the process.

Another sources mention reader's characteristics into 5 (five), they are (1) decoding, (2) Comprehension skills, (3) motivation, (4) interest, and (5) goals for reading (Mcmaster, K.L., Espin, C.S., Van den broek: 2014). Further, reader's characteristics are also explained into (1) ability functioning perception and cognitive skills, (2) knowledge of the language used, (3) Prior knowledge or experience, and (4) motivation, purpose, interest (Cassanave: 1988). Decoding is the initial eye working of analyzing printed words which is aimed deriving meaning from it (Cassanave: 1988). Decoding is also defined as a process after perception by the eyes (Aryadous V: 2015). Comprehension skills is defined as readers' language proficiency in reading. Reading proficiency is defined into skills and strategies in reading, text types ability and knowledge of the language, metacognitive working, and level of vocabulary (Marpaung M: 2020b). Interest is defined as the emotional to the activity of reading. Interest is a part of habit which is mainly structured into frequency and preference(interest) in reading (Marpaung M: 2020b). The last, Goals for reading is noted important in the students success in reading. A source mentioned it as a purpose of reading (Ngabut, M.N: 2015) as she reviewed reading purposes into four those are skimming, scanning, intensive, and critical reading (Clarke & Silberstein, 1979; Greenwood 1981; Grellet 1987).

Moreover, the complexity of reading comprehension processes which is oriented to the readers classified readers into two; good readers and poor readers; by the following characteristics of a good reader such as (1) directed by a purpose, (2) easily to be concentrated, (3) comprehend the content of the text, (4) remember what has been read, (5) has a sufficient vocabulary,

(6) read rapidly (Berg 1971; Hosenfeld 1984 in Cassanave 1988), and poor reader such as (1) lack of practice, (2) insufficient vocabulary, (3) unable to concentrate, (4) and reading slowly (it can be fast but will miss some important detail information), (5) a poor reader also comes from a bad habit of reading (Berg 1971; Swan 1975 in Cassanave 1988). Thus, reader's characteristics clearly contributed to the complexity of reading processes as it impacted the process by two main characteristics of environmental and psychological factors, and by other source mention five reader's characteristics such as decoding, comprehension skills, motivation, interest, and goals of reading. These characteristics is classified reader into two of good reader and poor reader with their each different characteristics. The following table is another form of explanation of reading processes complexity viewed from reader's characteristics.

No	Reader's Characteristics	Good Reader	Poor Reader
1	Environmental Factors (1) School Environment (2) Family Environment (Pecjak, S et al: 2011)	A good reader comes from: 1. Good teacher's instruction in reading and writing activities 2. High persuasion in reading and writing activities 3. Clear idea delivery in reading class activity. 4. Good parental guidance in reading activity at home 5. Good availability of book/ reading facility at home 6. Good parents performance in reading activity	A poor reader comes from: 1. Poor teacher's instruction in reading and writing activities in class. 2. Low persuasion in reading and writing activities. 3. Ambiguous idea delivery in reading class activity 4. Lack of parental guidance in reading activity at home 4. Lack of availability of book and other reading facility at home 5. Poor parents performance in reading activity.
2	Cognition/ Decoding (Pecjak S, et al; 2011, Mcmaster K.L et al 2014)	Higher level process: 1. Focus on connecting written unit to a coherent comprehension 2. Demonstrating: a. Inference Making (connecting parts of text to the background knowledge) b. Executive Function (interrelating working memory capacity to organize the reading process) c. Attention-Allocation Ability (monitoring and giving attention on selection parts of text) (Van den Broek 1997; Cain, Oakhill & Bryant 2004; Sesma, Mahone, Levine, Eason & Cutting 2009; Hartt	Lower level process: 1. Focus on translating the written code into meaning 2. Depends on: a. Decoding process b. Reading Fluency c. Vocabulary (Perfetti 1985; Fuchs, Hops, & Jenkins 2001; Nagy, Herman, & Anelson1985 in Kendeou P; 2014)

		& Samols 2005 in Kendeou P; 2014)	
3	Metacognition (Pecjak, S 2011)	Top-down Approach: Metacognition is highly interrelated monitoring the process started the beginning. (Pecjak S, et al: 2011)	Bottom-up Approach: Metacognition is the a product accumulated from the linguistic clues processes. (Pecjak S, et al: 2011)
4	Motivational (Pecjak S 2011)	High motivated reader: 1. Reading by goals 2. Spend more time in reading 3. Showing concrete effort in reading (member of reading club, often go to the library, etc) (Nezhad-A.Z. et al: 2015)	Low motivated reader: 1. Just reading 2. Spend a little time in reading 3. Showing low effort in reading (just read to complete an assignment, etc) (Nezhad-A.Z et al: 2015)
5	Comprehension Skills (Mcmaster K.L et al; 2014)	Activating: -Background knowledge -Schemata -metacognition as center of monitoring system -textual ability (Pecjak, S et al: 2011)	Activating: -linguistic clues -decoding -depends on vocabulary -depends on fluency (Pecjak S, et al: 2011)
6	Interest, emotional/ Goals of Reading (Pecjak S, et al; 2011, Mcmaster K.L et al 2014)	-have a big interest for various reading material -have positive perception about reading activity -reading with purpose (Noor, NM: 2011)	-have a low interest in reading -have a negative or neutral perception about reading -just reading (with no purpose) (Noor, NM: 2011)

B. The complexity of reading process oriented to text

The complexity of reading processes also can be viewed from the perspective of the text. It can be ignored that text structure is also a complex material that must be taught seriously in several subjects (e.g. basic reading, analytical reading, textual reading, and critical reading). The complexity of the text is structured by genre, content, format, and degree of difficulty (Mcmaster, K.L., Espin, C.S., Van den broek; 2014). Text, as a reading material, is classified into two literary and factual text (Paltridge, B 1996 in Marpaung, M 2019). Literary text types (genre) such as narrative, poems, autobiography, literary recount are easier to be understood by a reader than the factual text types such as factual descriptive, discussion, expository, etc. The text types themselves structured by three important parts social function, generic structures, and linguistics features (Marpaung, M 2019), these three structures in any text impacted the reading process itself. Next, content of the text is affect the process of reading as it is stated that the length of a text is highly contributed to the reader's comprehension; a beginner reader is difficult to build a comprehension from a short text, a research report stated that long text can easily build a coherent comprehension for a reader even it is objected a top-down reading process (Shrum and Gilian, 1994 in Ngabut M.N 2014). The format and degree of difficulty of a text is also highly contributed to the readers reading understanding, as it is implemented in the vocabulary in the text. It was reported that text clued context that helped readers to define the meaning of a

difficult words, this situation named context clues (Marpaung, M: 2019b). Readers in building comprehension will often defined meaning by context and this situation let readers highly affect by contextual factors of richness, local-global, partial, and clear-ambiguous factors, and it is reported that rich-local factor is the highest factor impacted readers in defining the difficult words in a reading process (Marpaung, M; 2019b).

In conclusion, text which is mediated the complex process of reading should be learned intensively for its complexities. Some of the review of literature confirmed that this reading material could also be the source of complexities that led to a difficulties of building a coherent comprehension. Reader should anticipated themselves by the genre, content, format, and degree of difficulty of the text by learning it.

C. The complexity of reading process from the process perspective

In relation to the process of reading comprehension, records of defining the complexity of reading comprehension processes has been recorded for several decades. Reading has been defined as a process of interaction between readers and writers stimulated by reading material (text/passage) that requires readers' complex skills to combine accurate reading strategies in bounding connection to the main message of the writer in the reading material (Nezhad, A.Z., et al, 2015). Psychologically, reading was defined as cognitive processes, a complex cognitive process (Goodman 1967; Marpaung, M. 2011) as it mainly persisted on the discussion of mental representation (comprehension) and memory representation (Broek, 1999). Bounding connection to the message written in reading material by readers is the main problem tried to overcome in any reading researches history; the problem of how is the process of building the mental representation (comprehension) in reading activity.

Cognitively, the complex processes of reading in building comprehension has been tried to be mapped/ modeled in several ways and concepts (goodman; 1967, stanovich; 1986, rumelhurt; 1977, kintsch; 1988, Mckenna & stahl; 2009). Moreover, Urguhart and Weir (1998) defined that cognitive model of reading comprehension is classified into two (1) process models and (2) componential models. While the process models of reading comprehension are defined into (1) top-down, (2) bottom-up, (3) interactive, and (4) situation model, the componential model of reading comprehension is defined into (1) two-components approach and (2) three-component approach.

In this review from the process perspective, the complexity of the process will be reviewed in three main ideas (1) research generation, (2) basic concept, and (3) components interrelated.

There were three eras recorded which were characterized by their own basic inquiry. The first is the early era (1928-the mid of 1980) of reading cognitive research which was focus on the reader's memory resulted after reading, the main focus of this first reading cognitive research generation is determining reading features and drawing-recalling memory or conclusion in reading process, at the late of this first generation of reading cognitive research was much influenced by the finding of top-down (Smith; 1973, Goodman; 1988), bottom -up (Gough; 1972), and interactive (Rumelhart; 1977, Stanovich; 1980) reading processes model. The second era (mid of 1980 - mid of 1990) was focus on the real process of reading, this second generation was identified by its willing to describe the real process of reading complex cognitive as they also accomplish it to the process of inference to be discovered. This second generation was much identified by the reading model of construction-integration, minimalist, causal inference, and structure building. The last era (mid of 1990 - present) of reading cognitive research was focus on the online (comprehension process)

and offline (memory representation) aspects of reading cognitive process, this current era believed that mental representation is built by the interaction of online and offline aspect; the interaction of comprehension skills and memory representation. This last era of reading cognitive research is mainly identified by the coming of landscape model of reading cognitive process, including the situation model of reading process (Van den Broek; 1999). The following table is another review of reading process by the research generation based on Van den broek 1999 book chapter.

No	Research Generation	Focus	Approach/ Model
1	Early Generation 1928 - mid of 1980	Memory representation (what do readers remember after reading?)	1. Bottom - Up (Gough 1972) 2. Top - Down (Goodman 1978)
2	Second Generation Mid of 1980 - mid of 1990	1. Modeling the process of reading (focus to the process - what do readers do in reading?) 2. Inference making	1.Interactive Model (Rumelhart 1988) 2.Construction-Integration
3	Third/Late Generation Mid of 1990 - current	1. Online and offline components (Online: memory capacity, background knowledge, schemata. Offline: text component, linguistic clues/ stimuli from new coming information) 2. The interaction between online and offline components of reading	1. Landscape theory 2. Event - indexing 3. Scenario mapping 4. Immersed experience framework

Moreover, there are various basic classification (concept) of the model of reading process. A concept of psycholinguist (cognitive) believe that reading process is a psychological process; depended on the reader's cognitive access (Goodman; 1988, Smith; 1973, Gough; 1972 in Ngabut M.N; 2015); bottom-up and top-down reading model are the product of this concept, then landscape theory came later proposing the same concept of reading process. However, a concept of constructivist (Hejsek, L., Kopecky, K., Kusa, J., Polak, M., & Maresova, H.:2015) believe that reading process is an interactive process and developed by reader's access to the text parts (the content of reading material); interactive reading model and construction-integration are believed as the most appropriate in describing the process of reading in this concept. Furthermore, a concept of connectionist (Vahid Aryadoust:2017) believed that a comprehension in reading process is much built by the readers' ability to see the connection of the text parts, this concept believed that the ideas connected in the text are the source of readers' comprehension; this last concept has many theory of reading model such as (1) situation model: Event indexing (Zwaan; 1995), (2) Scenario Mapping (Sandford & Garrod; 1981 and 1998), and (3) Immersed Experience Framework (Zwaan; 2004).

No	Basic concept	Main idea	Approach/model
1	Psychologist/ Cognitive	Reading as a psychological Process.	1. Data Driven 2. Conceptual Driven 3. Landscape Model
2	Constructivist	Reading as a process of interactive communication between readers' prior knowledge to the passage current information.	1. Interactive Reading Model 2. Construction - Integration Reading Model
3	Connectionist	Reading comprehension as a process of building connection in the text parts, the ability to build the text parts connections believed as a source of comprehension.	1. Situational Model 2. Scenario Mapping 3. Immersed Experience Framework

Due to the comprehension as the main problem in reading is affected by two factors of (1) reader's characteristics and (2) reading material characteristics (Sandford in Cassanave; 1988). Further, reader's characteristics are explained more into (1) ability functioning perception and cognitive skills, (2) knowledge of the language used, (3) Prior knowledge or experience, and (4) motivation, purpose, interest. Moreover, 'interest' as a part of the last reader's characteristics, claimed as an essential component to successful comprehension. It was explained that even the reading material is easy without interest in a reader the comprehension will not be built successfully. Interest to approach the comprehension is essential as it is supported by (1) the content of the reading material and (2) the style of the writing in the reading material. Noor, M.N. (2011) defined individual interest and preferences as parts of reading habit which is various depended on the level of readers' ages, (and reflected by the numbers and types of reading materials being read.

In addition to the previous explanation, interest which dependant on the reading material and style of writing is closely similar to reading habit which is defined as behaviour of reading frequency, numbers of book being read, and reading preference (Marpaung, M; 2020). Reading habit which is consisted of frequency and preferences in reading is believed handed a great role in students successful academic life. Furthermore, Marpaung, M (2020) found that second language reading habit is mainly dependant on the second language reading proficiency the most than the other factors affected such as first language reading habit and reading attitude. The better the second language reading proficiency of a reader, the better the second language reading habit can be built.

As a complex process, reading was affected by two main factors; (1) readers' various environmental factors such as school environment, teacher's method of teaching reading, parents' persuasion in reading (e.g. books provided, guidance given in reading activities), and (2) psychological factors such as students' competence in cognition, metacognition, students' motivation, and their emotional (attitude) related to reading activity (Pecjak, S., Podlesek, A., Pirc T ; 2011). moreover, due to the second factor, reading cognition is still a relevant and important thing to research since there are no satisfied model of reading process discovered (Davoudi, M., & Moghadam, H.R.H; 2015)

Unlike the first and second explanation of reading process models, this paper

proposing another way of explanation of reading process models. This last explanation defined reading process model into three groups (1) reader-oriented reading process model, and (2) goal of reading oriented models.

No	Era/Generation	Basic Concept	Process Orientation	Components interrelated	Process Approach
1	Early Generation (1928-mid 1980)	A process of psycholinguistic (Cognitivist)	Reader-text Orientation	Minimalist (one component interrelated for each process element)	Bottom-up (Gough; 1972,
2					Top-down
3					Interactive
4	Second Generation (mid 1980-mid 1990)	A process of construction comprehension (Constructivist)	Goal Orientation		Construction-Integration
5	Late Generation (mid 1990-current time)	A Process of Connecting text content to readers mind (Connectionist)		Maximalist (more than one component interrelated for each process element)	Landscape Theory
6					Event Indexing
7					Scenario Mapping
8					Immersed Experience Framework

And the last, the following are lists of reading model and its components overview included what are the reading elements proceed. The following table is listed you models of reading as a cognitive process by showing you the components interrelated and its elements' processes.

No	Reading Model	Components	Process Elements
1	Bottom-up	Linguistics Clues	- Decoding - Syntactic structure - Word association - Interpretation
2	Top-down	- Reader's background knowledge - Prediction/hypothesis	- Activating background knowledge - Checking/confirming prediction/hypothesis
3	Interactive	- Linguistic clues - Reader's background knowledge -Prediction/ hypothesis	- Fasten word's association - supporting confirming/ checking prediction
4	Construction-Integration	- Linguistic clues (text based) - syntactic - semantic association - reader's background knowledge	- Surface information - Microstructure - Macrostructure

5	Landscape Theory	- Linguistic clues - background knowledge - episodic memory - Long-term memory	- text based information - comprehender's semantic memory - activating the previous cycle comprehension - elaborating previous cycle of text comprehension, background knowledge, long-term memory to build comprehension
6	Event-Indexing	- Linguistic clues - Text dimensions - interpretations - comprehension	- textual representation - mental representation
7	Scenario Mapping	- Linguistic clues - text based representation - Background knowledge - long term memory	- Mapping the stimuli from the discourse (text) - Connect the mapping to the scenario exist in long term memory - building comprehension
8	Immersed Experience Framework	- Linguistic clues - Reader's experience - world knowledge - Visual representation (Visuospatial)	- Textual stimuli - Building visual representation - Activated reader's experience - Activating reader's world knowledge - Building knowledge

CONCLUSION

Reading comprehension processes is defined as a process of decoding and perception viewed from language skill perspective and as a complex cognitive process viewed from psycholinguistics perspective (Ngabut, M.N.: 2015). Reading process is an everlasting issue to be questioned and never be really satisfactorily to be explained for its complexity. Reading complexity is sourced from its readers' characteristics, text's variety, and sure cognitive processes which are listed complex elements and components resulted into many researches and models of it. The above theories reviewed showed you how reading is complex in its readers' capacity related to their attitude, habit, and motivation towards reading. In addition to that, reading is also complex is its text form and degree of difficulty. And last reading is also complex viewed from its cognitive elements and components interrelated which are resulted various models to be learned. This article which contains explanation of reading from those three perspectives expected able to overcome the mystery and unsatisfactorily sense of reading complexity.

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