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Enrich College English Teacher's Knowledge of Summarizing Strategies Instruction and Expository Text Comprehension with Kintsch's Reading Model

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ABSTRACT

College English teachers' knowledge of summarizing strategies instruction with expository text can be enhanced by their understanding of Kintsch's Construction-Integration (CI) model. The argument is based on the exploration of how Kintsch's CI model, being a reading model, could serve as a theoretical base to explain the comprehension process of expository text, and the functioning process of summarization. Rooted in cognitive theories, Kintsch's reading model consists of two reading phases (i.e., a construction phase and an integration phase) that make it suitable to explain readers' text comprehension process when they come across unfamiliar reading material, which is exactly the case when post-secondary students read to learn from content area textbooks mostly written in the genre of expository text. Moreover, the generation of three levels of text representation (i.e., surface structure, textbase and situation model) conveyed in this model reveal what reading strategies can be derived from this model and how one type of the reading strategies, namely, macrostructure strategies, is closely related to summarization. This relatedness is supported by researchers' studies on and educators' practice of summarization instruction to college students. Kintsch's CI model is, thus, an appropriate reading model for college English teachers to add to their knowledge base to facilitate their teaching of summarizing strategies with expository text at the tertiary level.

Keywords: Teacher Knowledge, Expository text, Summarization, Summarizing strategies instruction, Kintsch's CI model.

INTRODUCTION

The difficulty of reading comprehension for both native English speakers and particularly non-English speakers demands effective reading instruction at various educational contexts. To accomplish each sort of doing, people should have a specific knowledge base to support that kind of accomplishment. Teachers then should possess a great deal of knowledge in order to complete their doing - teaching effectively. National Center for Research on Teacher Education in the United States used the term "knowledge base" to refer to the repertoire of knowledge, skills, and dispositions that teachers require to effectively carry out classroom practices 0]. This definition actually concurs with Shulman's conception of a knowledge base for teaching. Shulman conceived the knowledge base for teaching as an amalgam of knowledge, skills, and dispositions that underlies a teacher's capacity to teach successfully, and considered a solid knowledge base as a precondition to effective teaching 0. At the tertiary level, each week college students are required to read hundreds of pages of content area textbooks mostly written in the genre of expository text, and to understand, summarize, and remember the most important ideas conveyed in the reading materials. Thus, to facilitate college students' academic reading and writing, college English teachers should teach them how to comprehend and summarize expository text, which is a complex teaching endeavor

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requiring much knowledge about the subject matter of reading strategies instruction and expository text comprehension.

Many researchers have conducted research on what professional knowledge teachers should generally acquire, of which Shuman's typology is widely known and greatly adopted. Shuman's typology characterizes the knowledge base for teaching into seven types, namely, subject matter knowledge, general pedagogical knowledge, curricular knowledge, pedagogical content knowledge, knowledge of learners and their characteristics, knowledge of educational contexts, and knowledge of educational ends, purposes, values, and their philosophical and historical grounds0. According to Shulman, subject matter knowledge refers to "[f]actual and conceptual subject matter information, the structures of subject matter, the principles of conceptual organization, and the principles of inquiry" 0. This explanation indicates that in order to accomplish specific teaching tasks effectively, teachers need to know the content in ways that differ from what is typically taught and learned in university courses, that is, differ from what learners should know.

This article argues for the enrichment of college English teachers' knowledge of expository text comprehension and summarizing strategies instruction with a reading model, i.e., Kintsch's Construction-Integration (CI) model. Following an introduction of Kintsch's CI model, the focuses of the article are on why Kintsch's CI model is appropriate for such enrichment, how the reading model is related to summarization and how it contributes to the comprehension of expository text.

WHAT ARE THE COMPONENTS OF KINTSCH'S CI MODEL?

As a reading model, Kintsch's CI model first of all provides an explanation of the process of comprehension that the reader experiences. Kintsch called this model the outcome of comprehension, which ends up with a mental representation of a text 0. The mental representation is built up sequentially and in cycles along three levels from the lowest to the highest: surface level, textbase level, and situation model. Kintsch's CI model has thus produced and analyzed these three hierarchical levels of mental representations, which act as a unitary whole in the model of text comprehension. Moreover, a dynamic and strategic system should be required to generate these multi-level representations, and to accomplish the engaged multi-level processes of producing them. Kintsch, carrying on his previous research with the cooperation of van Dijk 0, described all strategies comprising such a system in his CI model. The major constituents of Kinstch's CI model, namely, the reading process, the hierarchically-organized text representations, and the involved strategies, are then to be reviewed in more detail as follows.

Comprehension Processes

Kintsch's CI model considers comprehension as a paradigm for cognition, ranging from perception to analytic thinking or problem solving. In this view, comprehension is thought to proceed from automatic perceiving to conscious planning and strategy use when normal reading breaks down. Thus, Kintsch's CI model is rooted in cognitive theories, which involves the aspects of both perception and analytic thinking. When perceiving, a person must figure out meanings from various sensory inputs in a most efficient way. Kintsch said this is a kind of constraint satisfactory process, "such as solving a puzzle in which the pieces could be assembled in several different ways; the best way is the one that violates the least number of constraints" 0. Analytic thinking is a matter of "planning, generating search spaces and using means-end strategies to find a solution path" 0. Sharing aspects with both, reading comprehension, thus, involves both automatic comprehension without elaboration, and conscious problem-solving with great efforts when normal reading breaks down.

While reading, how readers progress from automatic perceiving to conscious planning and strategy use depends on the comprehension demands of a text. The automatic-to-conscious process has considerable educational implications when reading instruction aims at helping students learn from text, that is, when reading teachers push their students to move forward during their reading from what they already know to what they need to know. This known-to-unknown process usually requires active and resource-demanding efforts that are usually difficult to maintain and direct.

To understand what they read during this comprehension process, readers try to build a mental representation of a text. This mental-representation-building process then involves the type of evolvement in the way from early elementary and loosely structured perceptions to late quite orderly and conscious stages until the establishment of a coherent mental model of the text. Thus, this sort of comprehension process is "quite sensitive to context and flexibly adjust(ing) to shifts in the environment" 0. As said earlier, the comprehension process first goes through a construction process that is only weakly controlled and proceeds largely in an associative, bottom-up manner, and then continues to "a constraint satisfaction process in the form of a spreading activation mechanism," which ends up with "the coherent order that we experience" 0. This model is thus named the Construction-Integration (CI) model[1].

As said, the construction-integration comprehension process results in a mental representation of a text. The forming of a mental text representation during reading is the key part in Kintsch's construction-integration theory. The following section elaborates the three levels of mental representations derived directly from text comprehension.

Three Levels of Text Representation

The mental representation of a text produced in Kintsch's CI model is hierarchically organized, starting from a text's surface structures to its propositional representations that consist of textbase and situation model. The three-level representation of a text or a discourse in one's memory is firstly explored by van Dijk and Kintsch 0, and then carried onto Kintsch's CI model. Each level is then explained in more detail in the following.

Surface Structure

First of all, texts are written in words, which are then organized into sentences, paragraphs, and finally into higher-order discourse units such as sections or chapters. When comprehending a text by building a mental model, the reader begins with understanding the meaning of words, and ends with getting the meaning of a text.

Information is represented by the exact words and phrases in the text at the surface level. When reading, sometimes readers need to remember the exact wording, such as in a poem, a joke, or an argument. Such memory for the actual words and phrases of a text is often called the *surface-level* memory. To match this level of mental representation a reader forms, van Dijk and Kintsch 0 used the term "surface structure," which is typically short-lived during the process of comprehension.

For most people, the purposes of reading is not to memorize the exact words and sentences, but to catch and keep the meaning of the words, sentences, paragraphs, and eventually the

[1] The process model was first described in Kintsch0. It continues and extends the earlier 1978 model of Kintsch and van Dijk0. Kintsch and van Dijk 0 provided the basic process model of text comprehension in 1978, but did not deal with knowledge use in comprehension. Later, Kintsch added this feature and created the construction-integration model 0.

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whole text. To achieve this purpose, Kintsch's CI model supposes that the reader forms a higher level of mental representations of a text, which are propositional representations consisting of two levels – text base and situation model.

The Text base

Before the discussion of textbase and situation model, the basic but essential concept "proposition" needs to be discussed first.

Propositions

Most of the time, especially for instructional texts, which are generally organized and constrained by meaning, implied in narrative/expositive content, what matters most is not the exact wording but the message, or in van Dijk and Kintsch's term, semantic contents, conveyed in and extracted from the texts 0. More than one word is combined in schematic forms to form idea units. These idea units are termed as "propositions," which are ways of specifying what constitutes an idea in a text. This semantic level of text representation is thus called the *propositional level* of representation. For example, *Peter watched the film with his iPhone* is a conceptual unit that relates, by means of the predicate *watches*, an agent, an object, and an instrument in a meaningful, conventional way.

This semantic level of text representation can be further elaborated from atomic propositions and complex propositions. Kintsch defined an *atomic proposition* as "a linguistic unit consisting of a relational term (a predicate) and one or more arguments (which may be concepts or other propositions)" 0.

Take the following sentence as an example:
Housewives cook meals (COOK, HOUSEWIVES, MEALS).
Here, COOK is the predicator, and HOUSEWIVES and MEALS are the arguments of the proposition.
A *complex proposition* is defined as a network of atomic propositions corresponding to a (simple) sentence. Propositions are linked in a network either because they are related referentially, as in

The beautiful girl made tea [MAKE, GIRL, TEA] – [BEAUTIFUL, GIRL],
or because of propositional embedding, that is, one proposition may be embedded in another by serving as an argument of it, as in

If Jane loves David, she is a tomfool (IF, [LOVE, JANE, DAVID], [TOMFOOL, JANE]),

or because of other-than-referential overlap among propositions, for example, on the basis of a causal relationship, as in

The beautiful girl was tired from cooking meals ([TIRED, GIRL], [BEAUTIFUL GIRL], [COOK, GIRL, MEALS]).

This form of propositional representation makes it possible to count idea units in a text. Kintsch points out that "What makes reading difficult is determined not only by sentence length and the familiarity of the words used but also by the number of ideas expressed, their coherence, and their structure" 0. Nevertheless, reading teachers need to remember that propositional analysis is only a valuable research tool, but not a teaching tool to teach students idea units.

Examples cited above only show propositions at sentence level. Propositions can also be combined to form representations of a whole text. Syntactic information in a sentence is essential in determining the structure of propositional network at the sentential level. Besides the sentence syntax, more structures exist in a discourse, which is organized globally, usually according to certain conventional rhetorical formats. For example, a simplest story is often organized in the form of setting-complication-resolution, while an expository text may use such structures as a compare-and-contrast schema, a generalization-plus-examples schema, or other kinds of schemas.

van Dijk and Kintsch used the terms *microstructure* and *macrostructure* to differentiate the sentence-level structure from the discourse-level structure 0. According to them, microstructures and macrostructures together form the *textbase* of a text, which is the second level of mental representations for the text in Kintsch's CI model. The *textbase* is the semantic underpinning of a text. In the following analyses of the *textbase*, propositional structures provide convenient and workable tools to represent the meaning of a text.

Microstructure and Macrostructure

The microstructure of a text is the sentence-level structure, which can be represented by an atomic proposition or a complex proposition. This sentence-by-sentence information, or, the network of propositions, is the local structure of the text that represents the meaning conveyed in the text.

The term *macrostructure* is used to mean the global structure of the text which is derived from the microstructure and is a hierarchically ordered set of propositions 0. Macrostructure, the discourse-level structure, is thus the global organization of ideas into higher-order units, often according to conventional rhetoric formats. For example, a story may have many propositions, linked in a complex network. It has been mentioned above that the simplest stories at the macrostructure level are of the form of setting-complication-resolution. Nevertheless, a writer may tell his story in different ways, such as, in the form of a flashback, starting with the resolution and then filling in the setting and complication. This approach results in a very different macrostructure, but the microstructure may remain unchanged. Readers sometimes find the macrostructure directly signaled in a text, but often they must infer it from the text 0.

Thus, the textbase, composed by the microstructures and macrostructures, is "obtained from semantic analysis of a text and its rhetorical structure, as the author of the text intended it" 0. Briefly, the textbase is the semantic content of a text that is represented in memory.

The Situation Model

The textbase of a text is constituted by the propositions directly derived from a text. However, seldom readers understand a text purely depending on its textbase; usually they must supplement the information conveyed in a text "from their knowledge and experience (long-term memory) to achieve a personal interpretation of the text that is related to other information held in long-term memory" 0. Thus, the *situation model*, the third level of text representation in memory, is not the text itself that is represented, but the situation described in the text. Like the textbase, the situation model consists of its own microstructures and macrostructures, which are not necessarily the same as the micro- and macrostructures of the textbase because readers may integrate both locally and globally their own knowledge and beliefs with the information expressed in the text.

The construction of situation model greatly depends on readers' goals in reading a text, their interests, and available background knowledge, so situation models formed by different

readers may be widely different. Moreover, though texts are verbal and textbases are propositional structures, Kintsch believed that "situation models are not necessarily verbal" 0, because sometimes readers often turn to imagery to model the situation described by a text, such as the mental images of maps, diagrams, and pictures. However, at present researchers do not have good understanding of the integration of mental images with verbal information, and the consideration of individual preferences makes this understanding even harder.

In short, the situation model is a deeper level of comprehension. When a reader has deactivated irrelevant and inconsistent information and has absorbed important knowledge elements, a kind of situation model is got from the integrated textbase 0. Figure 1 is an example cited by Kintschto show how a person's prior knowledge elaborated information provided in a text, and integrated it in a situation model 0.

In Figure 1, two sentences taken from a text on heart disease are analyzed with their textbase and situation model. The textbase consists of three propositions (the NOT-GETRID proposition includes two modifiers) linked by sentence connectives. It is natural that not every reader will construct exactly the same textbase: Some reader might, for instance, neglect the modifier ENOUGH.

A situation model here is shown in the form of a graph. Most of the graph is based on the reader's knowledge about the circulatory system, rather than on the text directly. What is derived from the text itself is only the fact that there is a gap in the septal wall so that purple blood gets mixed with the red blood. Once again, different readers do not necessarily construct the same situation model, especially considering that the (correct) model is rather complex and requires a good understanding of the circulatory system that not every reader possesses.

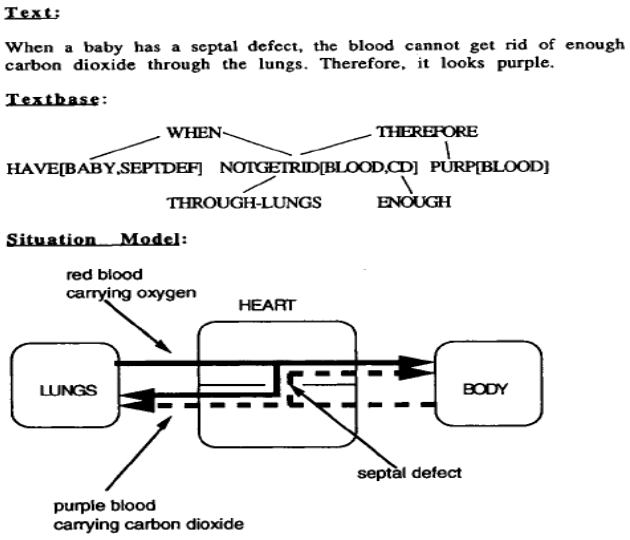


Figure 1: A two-sentence text fragment with its textbase and situation model.
Note. From "Text comprehension, memory, and learning," by W. Kintsch, 1994, *American Psychologist, 49*, P. 295.

An important characteristic of the situation model is that integrating a new situation model with the reader's prior knowledge is a prerequisite for the reader's capability of making knowledge acquired from texts usable in novel situations. Failing to link a new situation model with other relevant portions of readers' prior knowledge will result in encapsulated knowledge that is only available via specific episodic text memory, but is not part of their generally available knowledge base to be retrieved in new situations when the episodic retrieval cues are lacking. For example, if a EFL reader, who had read a dining scene in Hemingway's novel, *A Moveable Feast*, and also had been taught how to order dishes served at

a French restaurant, still felt at a loss when he/she did dine at a French restaurant for the first time, and were unable to order his/her meal because he/she did not see the same kinds of dishes learnt at his/her EFL class, then we can judge that the learner only held encapsulated knowledge about dining at a western-style restaurant. Therefore, the transfer of knowledge learned from texts to novel situations must depend on how active this new situation model is linked to semantic retrieval cues. If the menu at the French restaurant included the same dishes as described in Hemingway's *A Moveable Feast*, these semantic cues would help the EFL reader to retrieve what he/she had learned from his/her EFL class. This retrieval then would help him/her to order the same dishes successfully. This transfer of knowledge is not an automatic process, but requires the learner's strategic action and effort.

From the above discussion, we can see that surface structure, textbase, and situation model are the three levels of mental representations which play important roles in the reader's reading process, and which the reading teacher should consider while conducting reading comprehension instruction. Figure 2 demonstrates the relationships of these three levels of text representations. Figure 2 shows that texts are represented at different levels. The first level is surface structure, which represents the actual words and phrases of the text. The second is textbase, and the third is situation model, both of which are the propositional levels of text representations, and both of which are comprised by their own microstructures and macrostructures. The situation model is different from the textbase in that it is built when the information provided by a text is integrated into whatever prior knowledge there is available in readers' long-term memory until the mental representation of the whole text can be stored in their memory for later retrieval and application. Therefore, in instruction, what situation models students form concern reading teachers greatly when considering whether the students understand a text correctly and whether they are able to integrate the textual information with their own prior knowledge for future use.

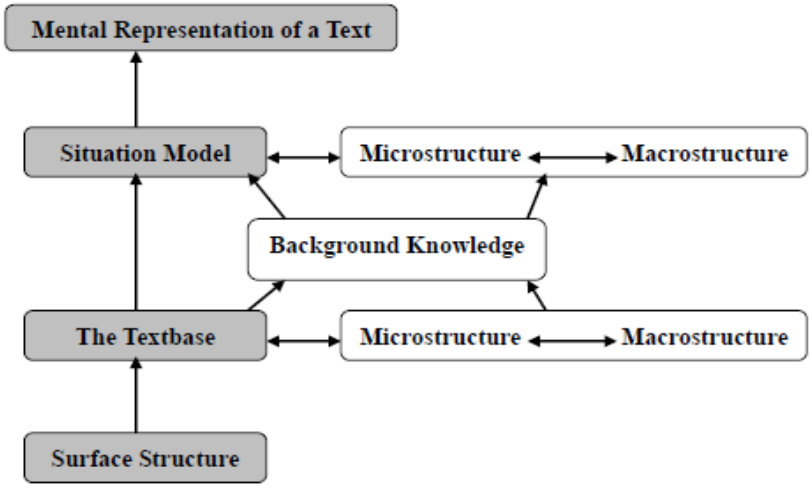


Figure 2: Relationship of the Three Levels of Mental Representations of a Text

To sum up, Kintsch's CI model of text comprehension describes a complete reading process from recognizing words and syntactic parsing of sentences in a text to understanding the underlying meaning and incorporating the meaning of the text in other present knowledge about the same topic until constructing a mental representation of the meaning conveyed in the text. Therefore, the CI model assumes that during their comprehension processes, readers build three different levels representations of a text: a surface structure that is a verbatim representation of the text, a textbase that involves semantic representations describing the meaning of the text, and a situation model that indicates the mental representation of a situation to which the text refers.

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WHY IS KINTSCH'S CI MODEL AN APPROPRIATE THEORETICAL BASE FOR READING INSTRUCTION AT THE TERTIARY LEVEL?

Comprehension is considered as a paradigm for cognition in Kintsch's CI model of text comprehension, which puts forward that the reader's comprehension process involves creating a mental representation of information conveyed in a text within two major phases: a construction phase and an integration phase. This CI model shows the process of how disorderly mental representations constructed at an early stage are integrated into well-ordered ones at a later stage 0. For example, the CI model generates several plausible meanings of *grade* in *The grade was too steep* in parallel and only later, when a rich context is available, sorts out the right *slope* meaning of *grade*. Thus, according to Kintsch, understanding something starts from the construction phase, which activates much information, relevant and irrelevant, orderly and disorderly, consistent and contradictory in memory independent of indicated situations in a text. Then the reader's comprehension process proceeds to the integration phase, which de-activates the irrelevant, disorderly, and contradictory information and yields a context-specific and well-structured mental representation of the text through the use of one's knowledge of ideas or concepts mentioned in the text 0.

This bottom-up process is inconsistent with the top-down view of schema theory, according to which, a schema filters out incorrect interpretations at the very beginning. For the previous example, supporters of schema theory would claim that readers know that they are talking about a hill, and then assign the right *slope* meaning to *grade* 0. That is to say, the rules of a schema-based theory would choose the right construction from the beginning, while the production rules in the CI model are weak and do not prevent the wrong constructions from being formed. The construction stage in the CI model yields both irrelevant and relevant meanings of a word or inferences via weak production rules. Only the integration process of the CI model generates the construction of contextually correct meanings, and thus quickly deactivates contextually incorrect constructions. The bidirectional reading process implied in this CI model makes it suitable for researchers to explain readers' comprehension process when they come across unfamiliar reading materials, for which they do not have appropriate knowledge base to assist their reading, and, thus, are not equipped with relevant schema to help choose the right construction from the stump. This explains why the CI model is considered as more suitable than schema theory for researchers to explain readers' comprehension process when they come across unfamiliar reading materials. It is exactly the situation when post-secondary students read to learn from their content area textbooks for various academic courses. Most content area textbooks are written in the genre of expository text. Researchers now agree that generally students are less familiar with expository text than with narrative text, and most students take more efforts to comprehend expository text.

Thus, Kinstch's CI model would be a good resource for reading teachers to turn to when they try to understand their students' difficulties in comprehending expository text, and then to come up with ways to ease their struggles with expository text comprehension. In fact, in collaboration with van Dijk, Kintsch has been activating his research on models of text comprehension in the area of comprehension of non-narrative text [0-0, 0-00. Moreover, since the proposal of this CI model, it has been greatly rooted in as well as applied to studies and experiments of non-narrative text comprehension. The above arguments, thus, provide detailed supports to the suitability and reasonability for reading teachers to base their understanding of expository text comprehension on Kintsch's CI model.

Moreover, the reading process analyzed in Kintsch's CI model shows readers' application of all top-down and bottom-up reading strategies to understand a text, attaining the main ideas of the text to be stored in their long-term memory as knowledge and information for later retrieval. The process of using all reading strategies to get the main ideas of a text is actually a condensing process. This condensing process is analogous to a summarizing process when readers use summarizing strategies to get the brief of a text. Therefore, if reading teachers have Kintsch's CI model in their knowledge base to support their understanding of summarizing processes and their decision-making on summarizing instructions, their teaching would be not only theoretically based, but also systematically effective.

Last but not least, Kintsch' CI model is a particular research program and theory of text comprehension that is based on data from proficient readers, for whom comprehension is fluent, automatic, and easy as long as they read familiar materials. This model thus should be a proper theoretic base for comprehension instruction at the tertiary level since post-secondary students are expected to become mature readers.

Clearly, the views presented above indicate that it is reasonable and appropriate to adopt Kintsch's CI model to explain mature readers' expository text comprehension, and to be a theoretical anchor for summarizing strategies instruction. Therefore, it would be beneficial for college reading teachers to integrate Kintsch's CI model into their knowledge base of teaching summarizing strategies with expository text at the tertiary level.

HOW IS KINTSCH'S CI MODEL RELATED TO SUMMARIZATION?

The three levels of representation of a text proposed by Kintsch are essential for reading teachers to predict how a text is comprehended and remembered. To comprehend a text effectively and successfully by building a mental representation of the text in their memory, readers need to apply various reading comprehension strategies during the process of comprehension. Therefore, in addition to the analyses of the hierarchically organized mental representations of a text, Kintsch's CI model has also surveyed the major comprehension strategies involved in helping the readers build text representations.

What Are the Important Reading Strategies Derived from Kintsch's CI Model?

Kintsch's CI model is a hierarchically structured model of text comprehension, which describes how top-down processes guide comprehension and how bottom-up processes constrain it. Therefore, the interplay of both top-down and bottom-up processes determines the nature of mental representations at each level of analysis – from basic linguistic processing to knowledge integration. The processes distinguished by this model belong to two major categories –microstructural processes, *low* in hierarchy, and macrostructural processes, *high* in hierarchy. These multi-level representations and multi-level processes surely require a "flexible", "dynamic", "multilevel", and "strategic" system to accomplish. Van Dijk and Kintsch discussed all "strategies that are used at the various levels of discourse processing, starting with the construction of a propositional representation for a text, and ending with its macrostructure" 0.

Propositional strategies and *local coherence strategies* represent types of strategies for lower processes. With propositional strategies, readers are assumed to build up a propositional level of text representation. For this purpose, they have to decode the meaning of words, to disambiguate word meanings within a sentence context, and to combine word meanings into elementary propositions. *Local coherence strategies* associate elementary propositions to the secondary level of propositional representation – the textbase via simple mechanisms such as argument overlap or coreferentiality of expressions. While these processes mainly rely on

basic linguistic knowledge, the higher level of strategies mentioned in the following make a stronger use of world knowledge.

Macropropositional strategies generate macropropositions that are representations of the main statements or topic sentences of a text, by deletion, generalization, or construction. The efficiency of macropropositional strategies heavily depends on the availability of domain specific knowledge. Moreover, van Dijk and Kintsch also discussed about *schematic strategies* and *rhetorical strategies* as strategies high in hierarchy 0. *Schematic strategies* make use of super structures, that is, knowledge about typical structural properties of certain kinds of texts (for example, letters, expository texts, or fairy tales), while *rhetorical strategies* in general refer to pragmatically relevant knowledge, such as knowledge about the author, his or her intentions, and the discourse context.

All these strategies used in the complex discourse comprehension process actually aim at reducing the complexity of meaning-making, starting from comprehending a text word by word and sentence by sentence to forming a mental representation of the text so that the meaning of the text as a whole is to be made and the gist of its meaning is to be stored in one's working memory first and then long-term memory for later retrieval. The whole process of using all strategies in text comprehension is in fact a process of condensing. The condensing procedure is like peeling off layers and layers of onion until the core is reached if the onion has a core. This process of condensing is analogous to the process of summarizing. At this, it is now obvious that reading teachers' knowledge of summarizing and summarizing instruction can be enriched with their understanding of Kintsch's CI model of text comprehension.

In fact, some pioneering research on summarizing strategies, such as Brown and Day's studies 0, has originated from *macrostructure strategies* that generate the macrostructures as defined in Kintsch's CI model. Macrostructure is a term used by van Dijk 0 and elaborated in van Dijk and Kintsch 0. Kintsch defined it as "a hierarchically ordered set of propositions representing the global structure of the text that is derived from the microstructure" 0. Thus, macrostructures are represented by macropropositions, obtained by applying macrostructure strategies, namely, the above stated macropropositional strategies. Kintsch even affirmed that "an ideal summary is (or should be) a text expressing the macrostructure" 0. Then how are the macrostructure strategies in Kintsch's CI model related to summarization?

How Are the Macrostructure Strategies in Kintsch's CI Model Related to Summarization?

As said, Kintsch's CI model, modeling how text representations are constructed and integrated with the reader's knowledge, is actually a complete account of the reading process that implies and specifies what strategy is applied and how it interacts with input from both the text and other prior knowledge that the reader may have about the topic. As an important part of the reading process in Kintsch's CI model, the macrostructural process, namely, the use of macrostructural strategies to produce the macrostructures of a text is the key part that is closely related to the reading strategies commonly known as summarizing strategies. The following explores the nature of macrostructural strategies and their products—macrostructures, and their relations to summarizing strategies that reading teachers could include into their knowledge base for summarizing strategies instruction.

Macrostructures and Summary Statements

The macrostructures produced during the macrostructural processes of comprehending a text are mental representations of the text at a global level. When macrostructures simply mirror

the structures of a text from which they were derived, they are considered as the textbase of the text, and when they reflect readers' own prior knowledge structures to varying degrees, they carry the nature of a situation model. Kintsch pointed out that "macropropositions put into words are summary statements at different levels of generality" 0. Macropropostions are generated via macroprocessing predicted on the basis of microprocessing. The formation of a memory representation of the gist of a text is then based on the redundancy of proposition occurrence, and the subsequent overlap of arguments. Thus, salient and structurally important propositions are more likely to be recalled because the comprehension process tends to be more concerned with them than with structurally unimportant propositions 0. Then, the macropropositions, or summary statements of different sections of a text, reflect the important propositions in the text.

Summarizing is thus closely related to and implied in Kintsch's macrostructure strategies applied to the formation of macrostructures – abstract semantic descriptions of the global content of a discourse. Summarizing here is then considered as a kind of comprehension process achieved via the application of a set of macrostructure strategies, which is generalized as summarizing strategies in the later part of this article.
As said previously, macrostructures are semantic units that must consist of propositions, namely, *macropropositions* 00.

A macroproposition is derived bottom-up from the sententially expressed propositions of a discourse. Therefore, the definition of macrostructures need to be based on the meanings of the sentences of a discourse, which are summary statements either presented directly in a text or generated by readers according to their own understanding.

Macrostructures and Macrorules
Then, how can we derive the meaning of a text from the lower level of propositions, and relate them to the higher level ones? According van Dijk and Kintsch, as mental representations of text at a global level, macrostructures are defined by means of *macrorules* 0. Macrorules are "semantic mapping rules: they relate proposition sequences at a lower level with proposition sequences at a higher level, and thus derive the global meaning of an episode or a whole discourse from the local, sentential meaning of the discourse" 0. Macrorules are recursive in the sense that they may apply over and over again to derive a still higher level macrostructure(s) given a sequence of macropropositions. Therefore, the notion of macrostructure is relative, that is, the macrostructure of a discourse is a hierarchical structure, consisting of several levels of propositions. When we express the generated macrostructures in sentences, we get summary statements at different levels of generality, which indicate what the different sections of a text are about.

Macrorules, as defined in van Dijk and Kintsch's theory of discourse, consist of deletion, generalization, and construction 0.

The three macrorules are illustrated in the following:
DELETION: Given a sequence of propositions, delete each proposition that is not an interpretation condition (e.g., a presupposition) for another proposition in the sequence.

GENERALIZATION: Given a sequence of propositions, substitute the sequence by a proposition that is entailed by each of the propositions of the sequence.

CONSTRUCTION: Given a sequence of propositions, replace it by a proposition that is entailed by the joint set of propositions of the sequence. 0

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The operation of macrorules helps explain the procedures of generating macropropositions, and thus derives macrostructures. Though Kintsch also stated that, "the macrorules merely help us to explain what can be done, but they are not algorithms or computational procedures that generate macropropositions from a text automatically" 0, these macrorules have become the base for other researchers to design instruction procedures in their experimental research on the reading strategies of summarization. Namely, these macrorules have been generated into summarizing strategies in reading strategies instruction.

Macrostructure Derivation and Summarizing

From the cognitive perspective, the macrostructure of a text is the conceptual global meaning assigned to it. This assignment is based on textually manifested surface meaning structures on the one hand and on various types of knowledge or other purely cognitive structures on the other 0. Summarizing during normal reading is thus related to how language users actually infer macrostructure. Such derivation of macrostructure of a discourse may be approached both contextually and textually depending on the role of prior knowledge in the processing of getting text summarizations. This aspect distinguishes author-based summary from reader-based summary. Author-based summary is more textually-derived, while reader-based summary more contextually-derived. The efficiency of producing both kinds of summary heavily depends on the availability of readers' domain-specific knowledge.

The application of summarizing strategies during students' reading process facilitates the recurrence of important information in a text, and the subsequent assembly of high-importance propositions into macrostructures to represent a gist of the text. Hence, summarizing strategies promote students' processing of high-importance information, and help them memorize and learn from text. Via the operation of such macrorules as deletion, generalization, and construction, Kintsch's CI model has revealed the covert cognitive performance of generative summarizing processes. When the reader applies summarizing strategies, propositions of high importance are recalled from memory more frequently, and are recycled more often as the reading process starts and proceeds. This recalling and recycling process, thus, enhances the probability of developing connections or links between new important information and readers' prior knowledge in memory.

At this, it is now clear that summarizing is an important reading process to assist readers' learning from text, and memorizing important information learned. Here summarizing can also be regarded as a general term for a series of summarizing strategies. Being able to explain summarizing strategies within Kintsch's CI model of text comprehension then should be part of reading teachers' knowledge of teaching those strategies in their classrooms.

HOW DOES KINTSCH'S CI MODEL CONTRIBURE TO THE COMPREHENSION OF EXPOSITORY TEXT?

As previously mentioned, Kintsch's CI model is a particular research program and theory of text comprehension based on data from proficient readers, for whom comprehension is fluent, automatic, and easy as long as they read familiar material. It is thus appropriate for college reading teachers to base their instruction of reading strategies on Kintsch's CI model. Specifically, Kintsch's CI model makes contributions to the comprehension of expository text in the way of providing explanations to the process of students' understanding and learning from expository text, and also to the process of determining important information in a text unfamiliar to them.

Explaining the Process of Students' Understanding and Learning from Expository Text

Most of the readings that post-secondary students have to accomplish for several content area subjects each week are expository texts. As also stated earlier, researchers have agreed upon the fact that expository text is more difficult for most readers because it has different requirements from narrative in terms of reading strategy application and prior knowledge activation. The justification of the idea that Kintsch' CI model is suitable for the explanation of expository text comprehension lies in the understanding of the essential elements that cause the difficulties for post-secondary students to comprehend content area readings, and the key points that might ease the difficulties for them.

Friend pointed out that content area reading is quite different from reading for one's own pleasure because college students have to understand and remember new information in order to learn, and also because what should be learned has been decided by others for each content area 0. This nature and demand of reading for college study has determined the importance of memory for college students. Then what is the best model of memory for post-secondary students to learn from reading? What are the effective ways for them to learn from expository text?

The answers are provided by information processing research 0. Memory for the content area reading is called semantic memory, which is defined by Raynolds, Sinatra, and Jetton 0 as a network of related ideas grouped into interlinked concepts. To strengthen the semantic memory, students need to connect ideas in a text and organize the connections. Each time an idea is used, that idea and the ideas associated with it are alerted, or primed (a term used in information processing). The more an idea is primed, the stronger the memory, and the better an idea can be recalled and applied 0. Thus, when reading, students should put together important ideas in a text, and organize them to get a gist of the text. To organize important information in a text, students actually generate macrostructures, the mental representations of the text, which can then be expressed in summary statements. A summary constructed in this way is author-based, which generally represents what has explained earlier the textbase of a text in Kintsch's CI model.

Moreover, to organize new information in a text, students must also draw on their prior knowledge and pay attention to the nature of relationships among the known and the unknown. Using one's prior knowledge of the topic to organize the new information in a text, students make connections among related concepts. When new information is linked with the network of prior ideas, it will be recalled more easily and used more adaptively later. Such a summary, constructed to link new information with the readers' background knowledge, is considered as a reader-based summary, which is thus related to the previously mentioned situation model of a text in Kintsch's CI model.

A summary, no matter author-based or reader-based, thus requires transforming long detailed passages into concise statements to represent the gist of the information. A clear-cut boundary for author-based and reader-based summaries is too ideal to be expected and to be true. Most summaries must be constructed with the application of the reader's prior knowledge in comprehending a text at various degrees. Thus, summarizing is a deep process of priming concepts that are related to new information, and are activated by one's prior knowledge as well. In this way, summarizing helps post-secondary students with their learning of new knowledge, and improves their recall and application of what they have learned.

Obviously, Kintsch's CI model contributes to the explanation of how post-secondary students may learn from content area reading. These contributions are particularly implied in the

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application of summarizing strategies for students' comprehension of expository text. The above arguments also help justify the idea conveyed in this article that college teachers' understanding and knowledge of summarizing strategies instruction with expository text can be enriched by their understanding of Kintsch's CI model. Next section then continues to explore how Kintsch's CI model provides explanation for the process of determining important information in a text unfamiliar to students.

Explaining the Process of Determining Important Information in a Text Unfamiliar to Students

The reasonability of Kintsch's CI model for the theoretical explanation of expository text comprehension lies in the reading process conveyed in this model. As said, content area information from school study is stored in semantic memory. This semantic memory differs from episodic memory where mostly personal experiences are stored. Semantic and episodic memories have different cues to indicate importance. In semantic memory, the essential cues to text-based importance are *repeated reference* and *generalization* 00, while "novelty, emotion, and drama are cues to importance in episodic memory" 0. Actually, novelty, emotion, and drama are labeled as seductive details for expository text comprehension since they distract students' attention from important ideas that are usually more abstract 0. Therefore, when judging what is important to the author during their reading of content area materials, students depend on the *repeated reference* and *generalization* in a text instead of their personal experiences and idiosyncratic personal values, which are usually more effective for reading narratives. The application of *repeated reference* and *generalization* in reading has been integrated by Friend 0 into her teaching of summarization as a content area reading strategy to college students.

The process of determining the importance during expository text comprehension is analogous to the macropropositional processing proposed in Kintsch's CI model, as discussed in the above sections. Like the macropropositonal processing, this importance determination process is thus quite bottom-up: the prior integration of higher order concepts and their relations (macrostructure) is on the basis of the interpretation of the subordinate, low-importance constituents temporary stored in the reader's working memory. This way of using information of high importance is essential when the text is unfamiliar to readers. Such is the case when expository texts in college content areas are new to most post-secondary students, they cannot readily access that high-importance information. That is to say, when the readers have little in the way of a guiding schema during expository text comprehension, this bottom-up macropropositional processing is more appropriate for them to approach their reading, and to obtain the macrostructures of a text mentally.

Moreover, Kintsch's CI model of text comprehension regards text structure as an essential cue, effective at the macroprocessing level for readers to identify and keep the important information in their summaries and recall. Many researchers 00 have suggested that students' insensitivity to the text structure of expository text is a major contributing factor that causes trouble for them in getting a gist of an expository text 0. At this, the nature of expository text revealed mainly in its text structure is an important factor that influences summarizing instruction.

CONCLUSION

Kintsch's CI model is an appropriate reading model that systematically supports the application of comprehension strategies at higher level of reading process. The CI model has also backed up the explanation of expository text comprehension, which is especially important for us to understand how post-secondary students learn from reading content area

materials, mostly falling into the genre of expository text. Therefore, reading teachers who are expected to teach summarizing strategies and expository text comprehension effectively at the tertiary level could reasonably take Kintsch's CI model as part of the theoretical base for summarizing strategies instruction with expository text. Further research is thus expected to test the effectiveness of Kintsch's CI model in supporting college reading teachers' teaching of summarizing strategies and expository text comprehension at different educational settings.

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