

A Narrative Review of Research Syntheses on Graphic Organizers in Facilitating Reading Comprehension in Content Areas

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Ock-Ryeo Kang. A Narrative Review of Research Syntheses on Graphic Organizers in Facilitating Reading Comprehension in Content Areas. 『언어청각장애연구』, 2002, 제7권, 제3호, 273-297. The present study was to narratively review research syntheses on GOs in fostering reading comprehension in an effort to provide directions for future research. Three meta-analyses and six research reviews were synthesized and analyzed. For students with LD, GO as a pre- and post-reading strategy or a substitute for text facilitated reading comprehension or vocabulary learning in content areas. However, GO research has the following issues to solve: Theoretical issues, instructional features (substitution for text, length of treatment, degree of student's involvement in constructing GOs, experimenter's excellence), GO features (type, number, length), participant's feature (reading ability, prior knowledge), materials (length, the degree of difficulty, text structure), appropriate measurement, transfer, and research quality. Directions for future research were suggested.

Key Words: Graphic Organizer, Reading Comprehension

I . Introduction

A pervasive and important educational issue for students with learning disabilities (LD) is how to help them acquire information efficiently when reading in content areas. Reading comprehension is one of the most important aspects in the content areas. The main factors that influence reading comprehension in content areas are text structure, knowledge forms of the text, the teacher's organization of information, and the student's skill. These factors clearly point to the need for more suitable methods and strategies for presenting information to students in content areas. Specifically, interventions that focus on developing and strengthening skills that minimize the deficient characteristics of students with LD are warranted (DiCecco, 1992).

In general many students with LD have reading problems and poor study skills. Thus, they experience difficulty in selecting and attending to the relevant information during instruction (Darch & Carnine, 1986). In addition, they are not adept at abstracting and categorizing incoming information to form logical schema relationships in their existing knowledge banks (Kameenui & Simmons, 1990; Torgesen, 1985). According to Armburster (1984), moreover, the problems of students with LD are confounded by a host of “inconsiderate” features apparent in many textbooks.

The study skill deficits of students with LD and the confounding textual difficulties result in significant problems in content area reading. Lovitt and Horton (1994) maintained therefore students with LD and other low-achieving students need techniques to adapt textbooks to help their learning. Unlike good readers, they strongly require mediational strategies to manage the large number of facts and ideas presented in texts and to improve categorizing skills for comprehension. Graphic organizers (GOs) are one such technique.

GOs, which play an important role in the design and presentation of instructional materials, refer to visual and verbal representation of linkage among ideas or content information. The logical assumption underlying the use of GOs is that if all important information is analyzed and organized and students can see how the information is organized through visual and verbal representations, then they will be able to understand the material better. The reason is that a visual representation like the GO identifies the salient features of a passage into a meaningful whole and eliminates the extraneous information or insignificant details to which students with LD often attend (Williams, 1991). Thus, Novak and Gowin (1984) stated that a GO is a powerful pedagogical tool because it allows students to visualize concepts and the hierarchical relationships between them. DiCecco (1992) also mentioned that GOs provide another meaningful avenue for structuring text materials.

Information that is stored in an orderly, systematic, and meaningful way can be more easily retrieved later. Successful retrieval depends on good encoding (Baddley, 1996). GO attempts to provide cues for well-organized encoding. In terms of memory, Bean et al. (1986) stated that GOs have several advantages because they force the learner to transform linear prose into a nonlinear hierarchical representation and they are generally easier to retain and retrieve than linear structure. In particular, developing a GO entails deep processing in order to reorganize the material and depict interrelationships among ideas.

The use of techniques like GOs is consistent with research showing that students with LD have strength in nonverbal modes of functioning (Sinatra, Berg & Dunn, 1985). Many students with LD are proficient in the use of a nonverbal thinking style, and thus may profit from visuospatial strategies for mental organization. In addition, systematic instruction like GOs is most beneficial for students with special needs (Bean et al., 1986). Thus, Tyree, Fiore, and Cook (1994) stated that GOs are thought to be especially helpful for students who have difficulty selecting, implementing, and monitoring effective learning strategies spontaneously.

So far, many studies have been conducted to examine the effectiveness of GOs in minimizing the comprehension barriers faced by students using content area texts and thereby improving their comprehension. However, there was little information about the use and the effects of GO instructions on reading comprehension of students with LD. Moreover, even though some studies have demonstrated the effectiveness of GO, the research findings for the effectiveness of GOs are still controversial and ambiguous. Nevertheless, the use of GOs in textbooks recently has increased dramatically. With advances in computer software that facilitates graphic organizations more GO tools are available in classroom. In addition, teachers think positively of the use of GOs (Bergerud, Lovitt & Horton, 1988).

In addition, students without disabilities often learn with little guidance or scaffolds from teachers, but students with LD require adaptive techniques to improve reading comprehension from the texts. Considerable structure must be imposed on the learning process. Despite the vast literature on GOs in the students without disabilities, there was little important information available. Very few studies have specifically considered which teaching GO strategies work best for students with LD.

As a knowledge base for future research foundation, therefore, the author would like to review research syntheses on GOs as an aid in facilitating reading comprehension in content areas. In order to identify what we know and what we need to find out in GO research, this paper was to examine meta-analyses and narrative research reviews/critiques that have been conducted on GO until now. In this review, first, the theoretical basis that led to the research was examined. Second, the characteristics of students with LD were offered. Third, meta-analyses and narrative reviews/critiques as conducted in the research literature for the last 30 years were examined. Finally, some conclusions and directions for future GO research with research issues raised as a result of the review were presented.

II. Theories Supporting the Use of GOs

According to research reviews, at least three theoretical underpinnings are related to the use of GOs. The basic perspective falls under the general rubric of encoding specificity principle, schema theory, and text structure.

1. Encoding Specificity Principle

The basic purpose underlying the use of GOs is to facilitate students' learning and retention including reading comprehension in content area reading. GOs attempt to provide cues for well-organized encoding (Dunston, 1992). In information processing, information comes in from the environment through a parallel series of brief sensory memory stores. After this, information goes into a common short-term and long-term store. Before all information is stored in the short-term or long-term memory, it must be encoded through an encoding procedure.

The encoding specificity principle was introduced by Tulving and Thomson (1973). They asserted that "only that can be retrieved that has been stored, and that how it can be retrieved depends on how it was stored" (p. 359). In more elaborate terms, "specific encoding operations performed on what is perceived determine what retrieval cues are effective in providing access to what is stored" (p. 369). In the same vein, Craik (1983) has suggested that encoding processes are essentially those involved in the perception and comprehension of external events and that retrieval processes represent an attempt to recapitulate these initial processes. Evidence from neuropsychology and neuroscience also suggests that the pathways involved in retrieval overlap substantially with those involved in perception and storage of the same type of information. Baddeley (1996) concisely stated that successful retrieval depends on good encoding.

As regards the encoding specificity principle, there are several implications. First, encoding is a much more important process than retrieval, though retrieval completes the act of remembering that begins with encoding of information about an event in the memory store. Second, the essence of encoding depends on the nature of the cues at the time of retrieval and the conditions under which the target information is encoded. Third, when the method

of retrieval depends on how the material is encoded during learning, it implies that the process and method of organization are crucial (Tulving & Thompson, 1973). It seems that information should be stored in an orderly, systematic, and meaningful way so that it can be accessible at the appropriate time. Although the fact is that there is no one perfect way to store or organize information, GOs as cues for good encoding may provide information in meaningful patterns.

2. Schema Theory

An essential key to learning and memory is organization. Not surprisingly, considerable research has focused on the organization of knowledge and the underlying processes in learning (Jitendra, 1991; Prawat, 1989). The reason is that organization is only one aspect that helps students remember important information. Like encoding specificity principle, importance of organization has been also supported by advances in schema theory (Rumelhart, 1980).

A fundamental tenet of schema theory is that written or oral messages do not in themselves carry meaning. The written or spoken information provides learners with cues as to how they should construct meaning using their own, previously acquired knowledge. A schema refers to how are organized and stored in memory (Dunston, 1992; Pehrsson & Denner, 1989). This previously acquired knowledge is called a schema; learners use a schema as a frame of reference for placing and synthesizing incoming information. Thus, the schema theory is frequently used as a theoretical base for GO research (Darch & Carnine, 1986; Dunston, 1992; Sinatra, Berg & Dunn, 1985).

Schemata are knowledge structures and functions that hold and operate on meaning within the memory system. Schemata process the information of experiences and the meanings in memories. Schemata enable learners to obtain, organize, and generalize information about an event or topic. Schemata are a dynamic means by which the individuals process, construct, and store meanings. However, these functions are determined by the personal knowledge structure (Pehrsson & Denner, 1989).

Information contained within the schema is known as prior knowledge. Schemata enable people to transform information into meaning. In doing so, however, they select and structure

the information in ways that fit into their schemata. At this point, schema theory is linked to encoding specificity principle. Once information is encoded, the information is processed according to the individual's prior knowledge (i.e., schema). Thus, if the information is familiar and meaningful, and well organized, the information can be stored, retrieved and used to construct other meanings.

When a reader receives and rehearses the new information and connects it with the background knowledge, processes or strategies needed to foster solutions of the problems are accessed (Anderson, 1976; Jitendra, 1991). For example, the readers' ability to understand and remember through reading is to a great extent dependent on the schemata she brings to it—how she organizes the prior knowledge as well as her vocabulary knowledge, expectation, and cultural background. Even though prior knowledge is rarely brought to a conscious level, the schemata provide a framework so that new information can be linked with existing knowledge.

By reading, the reader's schema can be enriched and expanded. The reader connects the new information to the old by comparing and reasoning the two sets of information. If the link between the new and the old can be found, the new information can be incorporated into the existing schema. However, if there is no link, then a new schema may be created. Prior knowledge is important for building functional, useful bridges or connections from the familiar to the unknown or new learning situation (Smith, 1991; Snider & Tarver, 1987).

Although the connection between schema theory and GOs is often not explicitly mentioned in the research, the implication is that key terms or concepts from a text that is graphically displayed can activate prior knowledge more immediately and completely than written text to encourage students thinking about materials in the text. In addition, GOs provide an organizational structure for the presentation of information in the text (Smith, 1991).

3. Text structures

Information is structured in a particular way. A great deal of research has been focused on text structures as an organizing framework of written materials. GO research has also focused on text structures. Text structures signify organizational patterns of text written to

convey a purpose (Dickson, Simmons & Kameenui, 1998; Englert & Thomas, 1987) and establish the interrelation between ideas through well-organized patterns. Hence, if students have limited knowledge of text structures, they may experience difficulties in comprehending text. Moreover, text structures have an impact on how students reorganize, remember, and retell materials presented in the text. According to Meyer, Brandt, and Bluth (1980), students who are aware of text structure tend to chunk the text as they read. Chunks retold by good readers show the text structures used to organize the text.

There are two general types of text structure: Narrative and expository. Narrative refers to the structure of a story. Narrative text, sometimes called story grammar, depicts events, actions, emotions, or situations. The components story grammars are commonly used to aid reading comprehension (Idol, 1987; Gurney et al., 1990; Dickson, Simmons & Kameenui, 1998). In contrast, expository texts are designed to inform the reader (Weaver & Kintsch, 1991). Researchers divide expository text structures into approximately five or six types. However, in integrating their classifications, their categorizations were similar, and thus their organizational patterns of expository text can be summarized into six types: (a) problem-solution or cause-effect, (b) comparison or contrast, (c) sequence, (d) explanation, (e) description, and (f) persuasive (Calfée & Curley, 1984; Dickson, Simmons & Kameenui, 1998; Grossen & Carmine, 1992; Meyer, Brandt & Bluth, 1980; Weaver & Kintsch, 1991). However, most expository text is descriptive.

In a review of research, Dickson, Simmons & Kameenui (1998) examined the relation between text organization and comprehension. The convergent evidence that emerged from this literature review is that awareness of text structure is highly related to reading comprehension. Hence explicit instruction regarding text structure enhances reading comprehension. Seidenberg (1989) also indicated that student awareness of text structures facilitated recall of text information and main ideas. Consequently, well-written and organized expository text structures would facilitate reading comprehension and recall of information from written text. Furthermore, students may develop a distinct schema for text structures.

As Dickson, Simmons & Kameenui (1998) indicated, the ability to discern key relationships and concepts in texts and interrelations between relevant information is essential for reading comprehension. Text structures may be useful for this purpose. They also can help students form an important network of knowledge for reading comprehension. Knowledge of

text structure gives students a way to predict forthcoming information and the text order. In this way, Tinzman, Jones, and Pierce (1992) stated that GOs reflect the structure of information, making the relations among the ideas and concepts clearer, thus making information more meaningful and memorable.

Pearson and Fielding (1991) synthesized a series of 13 studies focused on teaching students to create visual representations of key ideas in text. Visual representations of text have been found to be more effective for low-performing students than for high-performing students. According to their interpretation, high-performing students develop their own strategies, whereas low-performing students benefits from GOs from teachers or authors.

Based on the evidence on text structure, GOs can be used to give structures to the numerous pieces of information contained in a text. They have great potential for being structured in a number of ways such as problem and solution maps or comparative and contrastive maps according to the relationships of ideas. Thus, they can provide a framework for focusing on the essential points of text by emphasizing important relationships and reducing the number of words and irrelevant information and visually structuring the main ideas.

III. Characteristics of Students with LD in Reading

Many students with LD are not adept at abstracting and categorizing incoming information to form logical schema relationships with their existing knowledge (Torgesen, 1985). Even if a schema exists, instead of modifying the old information with new information, students with LD tend to use the old information to distort the new (Weisberg, 1988). This further inhibits and confuses their learning (Smith, 1991).

Usually, poor readers have difficulty in recalling content, organizing information, identifying main ideas, and discriminating between relevant and irrelevant information (Dickson, Simmons & Kameenui, 1998). Kameenui and Simmons (1990) indicated that students with LD commonly have difficulties in making inferences, understanding relationships and connections, selecting the main idea, and understanding the main point of a passage. In addition, the

problems of students with LD are confounded by a host of inconsiderate features apparent in many textbooks, including esoteric vocabularies, complex syntactical structures, dense concentration of novel concepts, and heavy information loads (Armbruster, 1984).

Although some students with LD use strategies efficiently, many of them appear to use inefficient strategies or no strategies at all (Gerber, 1987). Their inefficient strategies are related to inadequately focused and sustained attention, weak visual and holistic information processing and analytic/sequential strategies, or cognitive styles (e.g., dealing with too much details instead of important concepts). Such inefficient learners' strategies interfere with all aspects of comprehending, remembering, and communicating knowledge (Smith, 1991). Consequently, the information overloads the students ability immediately or they may waste their time in focusing on unimportant information or details in a text. In considering inefficiency of students with LD to encode incoming information for storage and recall, strategies designed to enhance students ability to categorize information need to be provided and taught.

With regard to memory, students with LD generally are far less mature in their repertoire of memory strategies, and in their awareness and use of memory strategies. Often, they do not organize information, use memory cues, or use spontaneous verbal rehearsal efficiently. They also do not monitor their understanding level on incoming information. Of course, the texts can contain details to memorize. However, frequently, students with LD do not know how the text's organization could help them learn (Dickson, Simmons & Kameenui, 1998) and they do not activate their prior knowledge to make the information more meaningful (Smith, 1991). If comprehension falters, then they need to know how to compensate in some manner, but they do not.

Research indicates that students with LD demonstrate deficits in text structure awareness. Consequently they experience difficulties in utilizing them as aids in comprehending text (Dickson, Simmons & Kameenui, 1998; Englert & Thomas, 1987). Furthermore, they have difficulties in following main ideas, recognizing main topics and their interrelations, and recognizing that main topics are supported by superordinate and subordinate ideas or examples (Seidenberg, 1989). Actually, Englert and Thomas (1987) demonstrated that students with LD are not able to distinguish between essential and nonessential material and have difficulties formulating reasonable hypotheses based on what they read or about upcoming details based on interrelationships presented by text. In addition, students with reading prob-

lems often tend to select important information based on their personal interest (cited in Dickson, Simmons & Kameenui, 1998) and they demonstrate difficulty integrating separate idea units into larger units and organizing their reading input in a meaningful way (Casteel, 1990).

IV. Previous Meta-Analyses and Research Reviews on GO Studies for Students With or Without LD

Several research reviews have sought to sort out the accumulated evidence of GO effects on learning. Three meta-analyses (Kang, 2002; Moore & Readence, 1980, 1984) and six narrative research reviews on GOs (Alvermann & Swafford, 1989; Dunston, 1992; Griffin & Tulbert, 1995; Rice, 1994; Robinson, 1998; Smith, 1978) have appeared in the literature. Most research reviews included GO studies that used students without LD as participants. Although some research reviews or critiques included several GO studies for students with LD to synthesize research findings, only one research synthesis examined and analyzed the effects of GOs for improving reading comprehension for students with LD by using meta-analytic procedures.

1. Previous Meta-Analyses

Moore and Readence (1980, 1984) used meta-analytic procedures in order to integrate research evidence on GOs for students without LD. In the first meta-analysis, Moore and Readence (1980) included 16 GO studies. They examined the effect of GOs on learning from text. As variables, they used the type of treatment subjects received, the length of treatment, the time of post-test, test content, and the type of knowledge measured. Measures were calculated by two methods. First, t and F ratios were converted to point biserial (r_{pb}) and eta (η) values, respectively. Second, d values (effect sizes) were calculated according to Glass (1976) (cited in Moor & Readence, 1980). These d s were transformed to r_{pb} values and Cohen's (1977) conventional definitions were used: small ($\eta = .10$); medium ($\eta = .24$); and large ($\eta = .37$). As a result, overall findings of this study revealed generally small effects ($M =$

.15) for GOs on learning from text. However, medium but significant effects were obtained when students constructed GOs as a post-reading activity ($M = .39$) and also when vocabulary knowledge was the dependent variable ($M = .26$).

To complement the earlier meta-analysis, Moore and Readence (1984) conducted a second meta-analysis of GO research. This time, 23 studies were included along with 9 variables. The variables were any of the earlier ones included. The variables were divided into two characteristics: substantive (e.g., treatment, measure, response format, grade level, time, instructional focus) and nonsubstantive (e.g., instructor). On the second meta-analysis, Moore and Readence used a more contemporary approach. To calculate effect sizes, the mean difference between the experimental group and the control group was divided by the standard deviation of the control group. In this study, the values presented by Cohen (1977) were used to characterize small ($\Delta = .2$), medium ($\Delta = .5$), and large ($\Delta = .8$) effects. One hundred and sixty-one effect sizes were computed and the average effect size was .22. However, the effect sizes varied according to examined variables. For substantive characteristics, for example, when comparing treatment conditions (e.g., pre-GO, GO as study guides, and post-GO), the post-GO showed the largest effect size of .57. Moreover, GOs produced a moderately large effect size ($\Delta = .68$) when the dependent variable was vocabulary and a small effect size ($\Delta = .29$) when the dependent variable was comprehension. In general, when the instructional focus was expository reading passages rather than overall course content, the effect size was .36.

In contrast, for nonsubstantive characteristics, when the instructor was the variable, there were only trivial differences ($\Delta = .13$) between the experimenter and the classroom teacher. Moore and Readence (1984) also analyzed the 23 studies qualitatively by examining discussions of results and conclusions. Teachers who presented content through GOs reported feelings more confident and competent while leading students through content materials. They also perceived themselves as being better organized, more in control of the learning activity, and more sensitive to the learning task.

Most recently, Kang (2002) systematically synthesized GO intervention studies conducted for students with LD by using a meta-analytic procedure. This study was designed to determine whether GOs affect performance of students with LD in improving reading comprehension in content area reading. Studies eligible for the research synthesis consisted of research sources published from 1971 to 2000. Fourteen studies that used GOs as an

intervention for students (K-12th grade) with LD were analyzed. Effect sizes (Cohen's *d*) were calculated by dividing the differences between the means of the treatment and comparison groups by the pooled standard deviation. Also, in each aggregation of effect sizes, weighted mean effect sizes were calculated by giving weight according to sample size. Instructional features, GO features, length of intervention, instructional group size, instructional materials, dependent variables, measures, and methodological features were examined.

The overall findings of this meta-analysis revealed moderately large effects (weighted mean effect size = .76) of GOs on learning from text materials. In terms of instructional features, the results clearly indicated the following: (a) GOs used as pre- and post-reading facilitated initial and subsequent learning of students with LD in content areas, (b) GO interventions produced very large effects (weighted mean effect size = 1.39) when used as substitutes for text materials, and (c) the use of teacher-constructed GOs for students with LD was effective in enhancing their learning in content learning areas.

Regardless of grade, these results suggest that large instructional group size (e.g., above 10) yields larger effects for students with LD than small instructional group sizes. This finding is counterintuitive because most researchers and practitioners in special field support small group instruction over larger group instruction. Based on length of intervention, this study found that there was no statistically significant differences between interventions.

GOs with the hierarchical and central format with or without pictures resulted in very large effects. Consistent with findings of Alverman and Swafford (1989), this study found no specific trend in subject matter. In addition, all but one GO interventions focused on expository text. The weighted mean effect size for studies that used materials matched to students' reading ability was larger than that of the studies that used materials matched with their grade level. When reading comprehension, vocabulary learning, or strategy knowledge as a dependent variable were used, studies produced large effect sizes.

The large effect size of GOs was associated with the higher grade level; for example, the effect size of the school level studies was very high and was twice as large as upper elementary and middle school. However, though the effects of GOs are dependent on the participants' prior knowledge and reading ability, how these factors affected GO outcomes was not revealed.

Only five studies measured maintenance of performance. Students in GO conditions

outperformed students in comparison conditions on maintenance tests. The weighted mean effect size of GO instruction on tests of maintenance was .60. However, GO instruction appeared to have no significant transfer effects.

2. Narrative Reviews and/or Critiques

Six narrative literature reviews and/or critiques on GOs have been published. Except for Smiths (1978) review and Alverman and Swaffords (1989) review, many studies (e.g., Dunston, 1992; Griffin & Tulbert, 1995; Rice, 1994; Robinson, 1998) used in the reviews overlapped with those analyzed in the Moore and Readence (1984) meta-analysis.

In a narrative review of six investigations, Smith (1978) examined the value of using GOs within content areas and the relative effectiveness using several types of GOs as a pre-reading strategy. Smith reported that the GO as a pre-reading strategy did not improve scores significantly on the standardized tests nor did it increase retention over time. However, Smith concluded that GOs may be more appropriate for some types of material than for others and may help a teacher in determining instructional objectives. In addition, instructional situations which provide some means of pre-learning are generally more effective than single presentations of materials. However, use of two or three GOs may result in a decrease of learning by interrupting continuity and by overloading the reader with conceptual information (Smith, 1978). Smith only reviewed studies that used teacher-constructed GOs as pre-reading strategies. Moreover, Smith indicated that some studies reviewed had several methodological flaws and inappropriate measures (e.g., true/false) which did not correspond to the GOs. Smith concluded that research examining the effectiveness of the GOs was limited, and the conclusions were necessarily tentative.

A decade later, Alvermann and Swafford (1989) conducted a narrative research review of studies involving secondary students. In their review, they examined what reading strategies were recommended by professional journals and whether content-area reading texts utilized reading strategies that were supported by an empirical research base. Subsequently, they examined how effective the reading strategies were in terms of the grade level, the reading ability of the students, and the type of text. Initially, 6 reading methods texts (see Alvermann & Swafford, 1989) were examined to identify recommended comprehension and

vocabulary strategies, and then a list of the comprehension and vocabulary strategies was created. Analysis of the 6 reading method textbooks revealed 54 different comprehension and vocabulary strategies. One of the seven receiving the most research attention (e.g., advance organizer, GO, self questioning, question placement, structured overview, three level guide, and use of text structure) was the GO. The literature review was conducted for studies containing the recommended strategy. Overall, more of the studies found the strategies to be effective than ineffective. In detail, in the literature on content-area reading strategies for students in grades 7-12, eight studies reviewed evaluated the effectiveness of GOs. However, Alvermann and Swafford (1989) indicated that there was no pattern in grade level, subject matter, or reading ability.

Dunston (1992) reviewed the existing literature that examined the use of GOs in content area reading. The findings of this review were consistent with those of Moore and Readence (1980, 1984). Moreover, GOs tend to produce greater effects when (a) accompanied by lengthy instruction and training in organizer use, (b) constructed by students, (c) used with more capable students, and (d) used with descriptive text. However, so far studies have neglected to measure students' prior knowledge of text structure. In addition, these studies provided no instruction, training, or activation of prior knowledge concerning the purpose and use of text structure. Under the basic principle of schema theory, the objective of GOs is to activate prior knowledge of concepts that are related to information to be learned. However, teacher-constructed GOs may not be consistent with those of the students. Thus, these GOs may not activate the schemata in students even though the GOs are well developed. Theoretically, to be certain that the appropriate schema is being activated, GOs would need to contain vocabulary terms or concepts with which students are familiar and have established schemata.

Furthermore, Dunston indicated that the questions surrounding organizers need to focus on the reason why they operate successfully for some students and not for others. Although the connection between schema theory and GOs is not explicitly stated in the existing research, it is thought that GOs activate prior knowledge more quickly and completely. Text structures are also thought to provide a framework for learning and remembering by organizing information in a particular way for a certain type of text. Students develop specific schemata for certain text structures with the help of GOs by seeing visually how the in-

formation is organized. Text structure is important in facilitating the construction of GOs. Dunston thought that text structure offered a more satisfactory explanation of how GOs work than schema theory.

Nonetheless, Dunston also suggested the encoding specificity principle (Tulving & Thomson, 1973) as an alternative theory to explain why GOs work. To better remember information is an important educational goal. Likewise, the basic purpose of GOs is to facilitate the learning and retention of information from text. For information to be learned, it should be encoded, processed, and retrieved. If learning and retaining information is the purpose of GO instruction, then GOs must serve as cues for encoding. The encoding specificity principle suggests that in order to retrieve target information from memory, cues must be present during the encoding or learning process. The way in which information is organized during inputting determines the ease with which it can be accessed and retrieved later. As a result, future GO research should focus on how GOs function during the encoding process and how they cue retrieval during testing.

Rice (1994), who examined the research related to graphic representation, focused on the quality of GO research. Rice indicated that GO research is, in general, weak and lacks a systematic analysis. Rice contends that this results in a lack of explanations for why GOs do or do not work. The primary problem is due to inconsistent operational criteria in studies using GOs. The reason, Rice suggests, is that the focus of the research has been on the GO as a learning strategy without addressing the underlying cognitive constructs that dictate how GOs facilitates readers' organization of conceptual information represented in text. As a result, instructional implications from this research are debatable. In other words, the range of instructional procedures for using GOs is as varied as the number of studies that have used GOs. In addition, a large amount of variability between texts (level, content, length, difficulty, and organization) and the outcome measures (recall, multiple choice, etc.) have impeded any cross-study comparisons. Furthermore, Rice indicated that researchers have neglected the analysis of correspondence between GOs and the texts used. Rice contended that the structure of the GO should parallel the structure of the text from which it is derived and outcome measures should assess the text structures represented.

After reviewing studies on the use of GOs, Griffin and Tulbert (1995) indicated several reasons why we have failed to increase significantly our knowledge base concerning GOs.

First, researchers have not examined the literature base carefully enough before undertaking new GO studies. Second, the experimental design of GO studies have affected our ability to discern its potential facilitative effects because some are quite simple and others are highly complex. Third, there are three kinds of GO instructional processes: (a) a teacher-constructed text adjunct, (b) a student-constructed strategy, and (c) a partially teacher-constructed teaching and learning aid. Thus, we need to examine the effects of GO designs according to instructional processes. Finally, many studies suffer from methodological flaws including the lack of a control group, the manipulation of independent variables, and procedures that favor GO treatment groups.

Recently, Robinson (1998) synthesized 16 studies from 1966 to 1994. This narrative review was restricted to studies where GOs were created by researchers, not students. After reviewing 16 studies that have investigated the effects of GOs as text adjuncts, Robinson indicated several specific limitations of GO research that have made it unsystematic and suggested several guidelines for how future research may address the issue on how GOs should be constructed for use in classroom learning situations. Fourteen of the 16 studies found facilitative effects for GOs when compared to studying text alone. The studies considered a wide variety of topics, including text length, format of GOs, participants, age, and the number of GOs varied. Measurement types were also varied, including facts, idea units, relational knowledge, generalization, and problem solving. Testing occasions ranged from immediate to an 11-day delay. Some studies sought to prove the effectiveness of a GO over text alone, whereas others compared a GO to other adjunct aids.

One apparent conclusion is that researchers have tested the effectiveness of GOs in a wide variety of settings. Unfortunately, Robinson revealed the following limitations of GO studies: (a) unspecified format of the GO, (b) extensive use of facts and limited use of relations as a dependent measure, although GOs purposely assist students understanding of interconceptual relationships from a text, (c) use of short text, (d) use of a single organizer, and (e) use of immediate testing. In order to practically construct and effectively use GOs, Robinson recommends that teachers consider several guidelines: (a) use only specific types of GOs that can be easily constructed by amateurs, (b) use tests that require knowledge of concept relations and that are similar to those that a teacher should use, (c) use texts that are similar in length to what students are required to read and study for a test (at least one

chapter), (d) use multiple GOs according to the structure of the text, and (e) use both immediate testing and delayed testing for long-term learning.

V. Discussions and Directions for Future GO Research for Students with LD

The previous meta-analyses and narrative reviews or critiques suggest some conclusions and directions for future research of students with LD.

First, without addressing the underlying theoretical basis, many studies that dictate why and how GO facilitates learners' organization of conceptual information represented in text have focused on the GO as a mediational strategy so far (Dunston, 1992; Rice, 1994). Thus, in order to explore their efficacy, future investigation needs to find out how GOs function in terms of encoding specificity principle, schema theory, and text structure.

Second, Rice (1994) indicated that GO research is weak and lacks a systematic analysis. Its primary problem may be due to inconsistent operational criteria in studies using GOs. So far, numerous researchers have offered their own definitions and procedural methodology for constructing GOs, and thus, it involves some difficulties to analyze and synthesize the research findings. Thus, we need to clarify terms and methodological principles in constructing GOs.

Third, the general guiding rule for constructing GOs is to simplify information and to emphasize important relationships by reducing the number of words and visually structuring the main ideas. However, there is no single right way to construct GOs. Thus, the effectiveness of GOs may vary according to the experimenter's construction ability. Future studies need to control the experimenter's "excellence" variable in examining the effects of GOs.

Fourth, GOs can be generally classified into one of three instructional positions, that is, pre-, during-, and post-reading. Some studies consecutively used one or two of these instructional positions and some studies used three positions. From this review, Moore and Readence (1980, 1984) reported that GOs as a post strategy produced the largest effect size

in GO instruction positions. Contrary to Moore and Readence (1980, 1984), the post-reading GO in Kang's (2002) study showed a small effect size. That is, GOs as a pre- and post-reading strategy showed large effect sizes. For students with LD, GO instruction as a pre- and post-reading strategy seems to facilitate reading comprehension and learning of students with LD. It seems likely that the effects of pre- and post-GOs are linked to the encoding specificity principle and retrieval strategy. However, we need more evidence in order to generalize this finding.

Fifth, in terms of students with LD, this research review seems to suggest that GOs may serve as effective substitutes for text materials in order to learn content of text materials. The effect size obtained when GOs were substituted for text was very large. However, substituting GO of information for text may not help students become literate. Thus, in order to confidently support this finding, future research must address the effects of GOs as a substitute for text in fostering reading comprehension.

Sixth, originally GOs were teacher-constructed. However, in order to address some limitations of GOs as a pre-reading strategy, an alternative strategy was proposed to have students construct their own GOs. According to Dunston (1992), GOs tend to produce greater effects when constructed by students. As evidenced by findings of GO studies with students without disabilities, there can be certain advantages to having students construct GO during learning. However, almost all studies that used students with LD focused on assisting students with text comprehension with teacher-constructed GOs and a large effect size was documented. Only one study examined the effects of student-constructed GOs of students with LD in a group design. The study demonstrated that the group that used student-constructed GOs performed higher on reading comprehension than the group that used teacher-constructed GO or traditional instruction. This study had a moderate effect size (weighted effect size = 0.45). It implies that although teacher-constructed GOs are effective in enhancing learning of students with LD and are well developed, these may not be consistent with the schema of the students. Future research needs to consider the degree of student involvement in constructing GOs.

Seventh, type of GOs includes hierarchical/central, cause and effect, comparative, directional, and representative formats. The type of GO is dependent on the type of information or text structures. Regardless of types of GOs, Smith (1978) reported that GOs did not fa-

facilitate learning of content materials. In contrast, Kang found that using a hierarchical and central format with or without pictures were used most and they produced a very large effect sizes. Yet little if any research has been conducted specifically to assess the effects of types of GOs on the learning of students with LD. Thus, future research needs to examine the effectiveness of the types of GO related to text structures. Moreover, as Robinson (1998) indicated, researchers need to find specific types of GOs that can be easily constructed by amateurs. According to Smith (1978), in addition, use of two or three GOs may result in a decrease of learning continuity. However, there was no way to gauge how number and length of GOs affect the process of students' learning or understanding in content areas. No study attempted to investigate these effects in studies selected (Kang, 2002). Obviously, future research is needed to study interventions that directly address the relative effects of GOs in this feature.

Eighth, Alverman and Swaffold (1989) and Kang (2002) reported that there was no specific trend across subject areas. In terms of types of text structures, Dunston (1992) found that GOs tend to produce greater effects when used with descriptive text. It is inevitable because most of expository texts used in the studies were descriptive. In other words, the use of GO was very limited with text structure, despite the fact that GOs used a variety of text structures. Thus, future research needs to examine the effects of GOs relative to the types of text structure. In Kang's (2002) study, studies that tried to use text materials matched with the participants' reading level produced a larger effect size than that of the studies that used materials matched with their grade level. Thus, future research needs to clearly investigate the relationship between the level of text difficulty and effectiveness of GOs. With regard to the length of text materials, Robinson (1998) indicated the use of short text as a limitation of GO studies. A few studies reported the precise length of reading materials of GO studies, whereas most studies were not clear in terms of length of materials. Robinson indicated that we need to use texts that are similar in length to what students are required to read and study for a test (at least one chapter).

Ninth, in considering participants' features, grade levels, prior knowledge, and reading ability affect GO outcomes. Especially, under the basic principle of schema theory, GOs are to activate prior knowledge of concepts that are related to the information to be learned. Like this, though the effects of GOs are dependent on the participants' prior knowledge of the text

structure (e.g., Dunston, 1992; Kang, 2002), it was impossible to address this issue in this review because studies did not measure students' prior knowledge of text structure. Alverman and Swaffold (1989) reported that there was no pattern in grade level and reading ability. In terms of grade level, however, Kang (2002) that analyzed the effects of GO according to participants' grade level (upper elementary, middle and high school) found that the effect of GO was associated with the higher grade level. Perhaps, based on schema theory, older individuals may have more sophisticated and extensive schemata than younger children and, consequently, may use GOs more efficiently. Moreover, research is needed to clearly investigate the relationship between levels of participants' reading ability.

Tenth, the frequent dependent variables assessed across the various studies were reading comprehension, content learning, vocabulary learning, written summarization, and strategy knowledge. In Moore and Readence's studies (1980, 1984), when vocabulary knowledge was the dependent variable, the effect sizes of GO instruction were moderately large effect size. However, Kang (2002) reported that when reading comprehension, vocabulary learning, or strategy knowledge were used as dependent variable, studies produced large effect sizes. It seems like that GOs enhance reading comprehension, vocabulary learning, and strategy learning.

Eleventh, the adequacy of length of treatment has been considered a major limitation in GO research. Furthermore, the brevity of intervention was indicated as a critical factor for the failure to obtain significantly positive results for intervention and transfer effects. In fact, Dunston (1992) and Moore and Readence (1980, 1984) reported that GOs tend to produce larger effects when accompanied by lengthy instruction and training. However, in Kang's analysis (2002), when the instruction is prolonged, the effect sizes tend to slightly decline, although the effect sizes still keep moderately large levels. This may be a result of lagging fidelity of implementation due to a shift in instructional focus or interest. On the other hand, the most important factor related to students achievement may not be the length of intervention. Rather, other variables (e.g., type of intervention, students served, grouping format, etc.) may be more important (Elbaum et al., 1998).

Twelfth, as Rice (1994) indicated that outcomes measures have impeded any cross-study comparisons, it was not able to answer the effect of GOs related to types of dependent measures. In order to measure students' comprehension or learning for GO instruction, various

response formats (e.g., multiple choice, true/false, short answer, oral free recall, written recall or summarization, relation knowledge) were used (Kang, 2002; Rice, 1994; Robinson, 1998; Smith, 1978). These different types of measures may assess simple facts or main ideas of information taught in the content area. These measures do not appropriately assess relational knowledge represented in the GOs (Smith, 1978; Rice, 1994). Thus, researchers (e.g., DiCecco, 1992; Robinson, 1998; Simmons, Griffin & Kameenui, 1988) suggested that measures need to assess relational knowledge of salient features conveyed and taught by GOs. Rice (1994) also indicated that researchers have neglected the analysis of correspondence between GOs and the text used. Thus, measures should address the structures represented. Future research needs to explore the appropriate use of measures to assess the effects of GO with structure represented.

Thirteenth, results on delayed post-tests (i.e., maintenance) showed that effects persisted even after intervention was discontinued. However, from a meta-analysis, Kang (2002) found that GO instruction appeared to have no significant transfer effect. Students with LD may need extensive practice using GOs due to their poor study skills and may need additional strategy instruction. Thus, in order to improve transfer effect, future research need to explore additional ways to improve transfer and focus on how often and how long GO treatment should last for students with LD to benefit.

Finally, several researchers indicated that GO studies reviewed had methodological flaw including the lack of a control group and procedures that favor GO treatment group (Griffin & Tulbert, 1995; Smith, 1978). Keeping high research quality is important in educational research because mistakes, oversights, and biases may occur at any stage of research process. Especially, each study should have comparability between treatment and control groups in terms of contents and instructors. All researchers should improve their research quality.

REFERENCES

- Alverman, D. E. & Swafford, J. (1989). Do content area strategies have a research base? *Journal of Reading*, 32, 388-394.
- Anderson, J. R. (1976). *Language, memory, and thought*. Hillsdale, NJ: Lawrence Erlbaum.

- Armbruster, B. B. (1984). The problem of "inconsiderate text." In G. G. Duffy, L. R. Roehler & J. Mason (Eds.), *Comprehension instruction: Perspective and suggestions*. New York: Longman.
- Baddeley, A. (1996). *Your memory: A user's guide*. London: Prion.
- Bean, T. W., Singer, H., Scortor, J. & Frazee, C. (1986). The effect of metacognitive instruction in outlining and graphic organizer instruction on students' comprehension in a tenth grade history class. *Journal of Reading Behavior, 18*, 153-169.
- Bergerud, D., Lovitt, T. C. & Horton, S. (1988). The effectiveness on sixth-grade students' memory for expository reading. *Reading Research Quarterly, 21*, 161-178.
- Calfee, R. C. & Curley, R. G. (1984). Structures of prose in the content areas. In J. Flood (Ed.), *Understanding reading comprehension*. Newark, DE: International Reading Association.
- Casteel, C. A. (1990). Effects of chunked text material on reading comprehension of high and low ability readers. *Reading Improvement, 27*, 269-275.
- Cohen, J. (1977). *Statistical power analysis for the behavioral sciences*. New York: Academic Press.
- Craik, F. I. M. (1983). On the transfer of information from temporary to permanent memory, *Philosophical Transactions of the Royal Society of London, Series B302*, 341-359.
- Darch, C. & Carnine, D. (1986). Teaching content area material to learning disabled students. *Exceptional Children, 53*, 240-246.
- DiCecco, Y. M. (1992). *Graphic organizers as an aid fostering comprehension of expository text*. Unpublished doctoral dissertation, University of Oregon, Eugene.
- Dickson, S. V., Simmons, D. C. & Kameenui, E. J. (1998). Text organization: Research bases. In D. C. Simmons & E. J. Kameenui (Eds.), *What reading research tells us about children with diverse learning needs: Base and basics*. Hillsdale, NJ: Lawrence Erlbaum.
- Dunston, P. J. (1992). A critique of graphic organizer research. *Reading Research and Instruction, 31(2)*, 57-65.
- Englert, C. S. & Thomas, C. C. (1987). Sensitivity to text structure in reading and writing: A comparison between learning disabled and non-learning disabled students. *Learning Disability Quarterly, 10*, 93-105.
- Elbaum, B., Vaughn, S., Hughes, M. & Schumm, J. S. (1998). *The effect of instructional grouping format on the reading outcomes of students with disabilities: A meta-analytic review* (U.S. Department of Education Grant-H023E5005-96).
- Gerber, M. M. (1987). Application of cognitive-behavioral training methods to teaching basic skills to mildly handicapped elementary school students. In M. C. Wang, M. C. Reynolds & H. J. Walberg (Eds.), *Handbook of special education: Research and practice: Vol. 1. Learner characteristics and adaptive education*. New York: Pergamon.
- Griffin, C. C. & Tulbert, B. I. (1995). The effect of graphic organizers on students' comprehension and recall of expository text: A review of the research and implications for practice. *Reading and Writing Quarterly, 15*, 73-89.

- Grossen, B. & Carnine, D. (1992). Translating research on text structure into classroom practice. *Teaching Exceptional Children, 24*, 48-53.
- Gurney, B., Gersten, R., Dimino, J. & Carnine, D. (1990). Story grammar: Effective literature instruction for high school students with learning disabilities. *Journal of Learning Disabilities, 23*, 335-342.
- Idol, L. (1987). Group story mapping: A comprehension strategy for both skilled and unskilled readers. Journal of adolescents with learning disabilities in content classes. *Learning Disabilities Research & Practice, 8(2)*, 106-126.
- Jitendra, A. K. (1991). *An investigation of third grade students' mathematical word problem solving utilizing dynamic assessment*. Unpublished doctoral dissertation, University of Oregon, Eugene.
- Kameenui, E. J. & Simmons, D. C. (1990). *Designing instructional strategies: The prevention of academic learning problems*. Columbus: Merrill.
- Kang, O. R. (2002). *A meta-analysis of graphic organizer interventions for students with learning disabilities*. Unpublished doctoral dissertation, University of Oregon, Eugene.
- Lovitt, T. C. & Horton, S. V. (1994). Strategies for adapting science textbooks for youth with learning disabilities. *Remedial and Special Education, 15(2)*, 105-116.
- Meyer, B. J. F., Brandt, D. M. & Bluth, G. J. (1980). Use of top-level structure in text: Key for reading comprehension of ninth-grade students. *Reading Research Quarterly, 16*, 72-103.
- Moore, D. W. & Readence, J. E. (1980). A meta-analysis of the effect of graphic organizers on learning from text. In M. L. Kamil & A. J. Moe (Eds.), *Perspectives in reading research and instruction*. Twenty-ninth Yearbook of the National Reading Conference.
- Moore, D. W. & Readence, J. E. (1984). A quantitative and qualitative review of graphic organizer research. *Journal of Educational Research, 78*, 11-17.
- Novak, J. D. & Gowin, D. B. (1984). *Learning how to learn*. New York: Cambridge University Press.
- Pearson, P. D. & Fielding, L. (1991). Comprehension instruction. In R. Barr, M. L. Kamil, P. Mosenthal & P. D. Pearson (Eds.), *Handbook of reading research*. White Plains, NY: Longman.
- Pehresson, R. S. & Denner, P. R. (1989). *Semantic organizers: A study strategy for special needs learners*. Rockville, MD: Aspen Publishers.
- Prawat, R. S. (1989). Promoting access to knowledge, strategy, and disposition in students: A research synthesis. *Review of Educational Research, 59*, 1-41.
- Rice, G. E. (1994). Need for explanations in graphic organizer research. *Reading Psychology, 15*, 39-67.
- Robinson, D. H. (1998). Graphic organizers as aids to text learning. *Reading Research and Instruction, 37(2)*, 85-105.
- Rumelhart, D. E. (1980). Schemata: The building blocks of cognition. In R. J. Spiro, B. C. Bruce & W. F. Brewer (Eds.), *Theoretical issues in reading comprehension*. Hillsdale, NJ: Law-

rence Erlbaum.

- Seidenberg, P. L. (1989). Relating text-processing research to reading and writing instruction for learning disabled students. *Learning Disabilities Focus*, 5(1), 4-12.
- Simmons, D. C., Griffin, C. C. & Kameenui, E. J. (1988). Effects of teacher-constructed pre- and post-graphic organizer instruction on sixth grade science students' comprehension and recall. *Journal of Educational Research*, 82, 15-21.
- Sinatra, R. C., Berg, D. & Dunn, R. (1985). Semantic mapping improves reading comprehension of learning disabled students. *Teaching Exceptional Children*, 17, 310-314.
- Smith, A. L. (1978). The structured overview: A pre-reading strategy. In J. L. Vaughan & P. J. Gaus (Eds.), *Research on reading in secondary schools*. Tucson, AZ: University of Arizona, Reading Department.
- Smith, C. R. (1991). *Learning disabilities: The interaction of learner, task, and setting* (2nd ed.). Boston: Allyn & Bacon.
- Snider, V. E. & Tarver, S. G. (1987). The effects of early reading failure on acquisition of knowledge among students with learning disabilities. *Journal of Learning Disabilities*, 20, 351-356.
- Tinzman, M., Jones, B. F. & Pierce, J. (1992). Changing societal needs: Changing how we think about curriculum and instruction. In C. Collins & J. N. Mangieri (Eds.), *Teaching thinking: An agenda for the 21st century*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Torgesen, J. K. (1985). Memory processing in reading disabled children. *Journal of Learning Disabilities*, 18, 350-357.
- Tulving, E. & Thomson, D. M. (1973). Encoding specificity and retrieval processes in episodic memory. *Psychological Review*, 80, 352-373.
- Tyree, R. B., Fiore, T. A. & Cook, R. A. (1994). Instructional materials for diverse learners. *Remedial and Special Education*, 15, 363-377.
- Weaver, C. A. & Kintsch, W. (1991). expository text. In R. Barr, M. L. Kamil, P. Mosenthal & P. D. Pearson (Eds.), *Handbook of reading research*. Chicago: National Reading Conference.
- Weisberg, R. (1988). 1980s: A change in focus of reading comprehension research-A review of reading/learning disabilities research based on an interactive model of reading. *Learning Disability Quarterly*, 11, 149-159.
- Williams, J. R. (1991). The use of schema in research on the problem solving of learning disabled adolescents. In T. E. Scruggs & B. Y. L. Wong (Eds.), *Intervention research in learning disabilities*. New York: Springer-Verlag.

국문초록

읽기 이해를 촉진시키는 그래픽 오거나이저(graphic organizer)에 관한 연구종합들에 대한 문헌연구

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많은 학습장애 아동들은 읽기 이해의 문제를 가지고 있고 학습하는 기술들이 부족하다. 이 아동들의 읽기 이해를 증진시키기 위한 중재 전략들이 필요한데 그래픽 오거나이저가 그런 테크닉 중 한 가지이다. 지금까지 읽기 이해를 촉진하기 위한 그래픽 오거나이저의 사용에 관한 많은 연구가 수행 되어왔지만, 연구결과들은 아직도 논쟁적이고 모호하다. 그럼에도 불구하고 교과서에서 그래픽 오거나이저의 사용은 최근 눈부시게 증가해왔으며, 컴퓨터의 발달과 함께 더 많은 그래픽 오거나이저가 교실에서 가능하게 되었다. 그러나 그래픽 오거나이저의 사용에 관한 정보들이 많이 없는 실정이다. 따라서 본 연구의 목적은 그동안 그래픽 오거나이저에 대하여 수행되어왔던 연구종합들을 검토하여 학습장애 아동을 위한 그래픽 오거나이저의 미래 연구들에 대한 방향들을 제시하는 것이었다. 세 개의 메타분석 연구들과 6개의 서술적인 연구종합 혹은 비평들이 검토되었다. 학습장애 아동에게 그래픽 오거나이저는 읽기 전후로 사용되었을 때 읽기 이해를 촉진시키는 것으로 나타났고, 특히 그래픽 오거나이저가 교과서를 대신 할 때 그 효과가 큰 것으로 나타났다. 그래픽 오거나이저는 단계적 혹은 중앙형태의 그래픽 오거나이저가 그림과 함께 사용될 때 가장 효과적인 것으로 나타났다. 그러나 그래픽 오거나이저에 관한 연구들은 미래연구에서 해결해야 할 많은 문제점들이 남아있다. 즉, 기본 이론들에 대한 철저한 조사, 분명한 용어 정의, 그래픽 오거나이저의 구성 원리, 중재 기간, 그래픽 오거나이저를 구성하는 사람의 탁월성, 교과서를 대체하는 것의 효과를 확신있게 지지하기 위한 연구의 필요, 그래픽 오거나이저의 길이와 수, 자료의 길이와 난이도, 교과구조, 적합한 측정도구, 전이효과, 마지막으로 연구의 질과 관련하여 미래연구들을 위한 방향들이 제시되었다.

핵심어: 그래픽 오거나이저, 학습장애

▶ 게재 신청일: 2002년 9월 30일

▶ 게재 확정일: 2002년 11월 13일

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