Original Paper

L2 Expository Text Reading Instruction:

A Graphic Organiser-Based Methodology

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Abstract

A mixed method research design was employed to investigate the effects of using graphic organizers (GOs) to facilitate expository text comprehension in a college EFL reading context. Participants were two intact groups (n = 21, n = 31) of 1st year Japanese engineering undergraduates. Over a six-week study period, treatment group practiced using teacher-generated mapping templates when reading. Control group completed text-based comprehension questions. Treatment effects were examined by pre-and post-testing, to examine if using GOs transferred into quantitative improvements in learner comprehension. Treatment group also completed a survey on the efficacy of GO-based reading in improving reading confidence, understanding of rhetorical structure/organization, motivation and interest. Results showed there was high variability in both group's scores on both tests. Although control group scored significantly higher on both (p < .05) tests, relative gains in the treatment group were significantly higher in non-parametric analysis. Survey responses indicated that using GOs had a positive effect in several areas.

Keywords

graphic organizer, cognitive strategy, metacognitive strategy, compensation strategy, EFL reading comprehension

1. Introduction

Reading is widely regarded as the most important aspect of EFL literacy for college students. The spread of English as a *lingua franca* has given impetus to this view and in many countries, college students are assigned large amounts of reading work in other languages. In Japan also, undergraduate EFL programs - especially programs designed for students in specialized fields such as engineering and medicine - tend to emphasize reading skill; for these students, most reading assignments are based on EL expository texts.

In many contexts, college instructors assume that undergraduates will be able to negotiate highly challenging EFL reading tasks. As Browne suggests, this assumption may be based on the knowledge that at high school, Japanese students invariably focus on developing receptive language skills (Browne, 1996). Nevertheless, the literature contains reports suggesting that, in fact, most Japanese college students have poor L2 reading skills - claims which are consistent with the researcher's 10 years of experience of teaching EFL reading in Japan, much of it with entry/false beginner level (~ CEFR A1) students.

In the context of the present study beginner-level students taking a general reading/listening course often experience difficulties with the set text (*Thoughts and Notions)* due to a lack of lexical and grammatical knowledge, and an inability to understand text organisation. As such many rely on supplementary translations or, in some cases, use text-reader applications on their 'smart' phones. Researchers at other Japanese colleges (e.g., Kitao & Kitao; 1995; Laufer & Yano; 2001; and Okumura & Miyamoto; 2010) have reported similar findings. In Laufer and Yano's study (2001), participants struggled to read EFL expository texts due to inadequate vocabulary. The participants in Miyamoto and Okumura's study (2010) also reported difficulties with the lexis, as well as grammar, coherence and text organisation.

In part, these difficulties may be due to the nature of the texts. As Armbruster (1984) and Reutzel and Cooter (2007; cited in Iwai, 2008) report, readers encounter difficulties with EL expository text because it is often structurally complex, information dense and based on unfamiliar topics. Moreover, it may contain elaborate combinations of text structure types, including description, sequence, compare-contrast, and cause-effect (Armbruster, 1984; Meyer & Freedle, 1984; Meyer et al., 2002). Finally, Williams et al. (1984) state that expository text can be difficult to comprehend because many of the conceptual relationships it contains are implicit and must be inferred by the reader. In order to fully understand such texts, a reader will often need a whole range of literal and inferential comprehension skills.

For Japanese college students the problems may be amplified by their approaches and attitudes to EFL reading, which to a large extent are conditioned by prior language learning experiences. At high school, EFL classes typically focus on preparing students for the English component of the *senta shikken* - the standardised university entrance examination for high school graduates who hope to enter national universities - and the *nyugakku shikken* - tests that many universities use as an additional way of vetting candidates. In both tests, knowledge of English grammar is tested through multiple-choice questions, while English reading ability is tested by questions based on reading passages that, according to one source, "are native speaker level in terms of complexity" (Porcaro, 2005).

To prepare students for the tests, high school EFL teachers often structure their classes around activities in which students translate English passages into Japanese (*yakudoku*) and then analyse the related grammar (Hino, 1988; Gorsuch, 1998; Mantero & Iwai, 2005; Takase, 2007; Underwood, 2012). According to Takase, at most high schools "students are required to read difficult English texts while translating word-for-word, reordering the translated words to fit Japanese word order" (Takase, 2007, p. 97).

One reported shortcoming of *yakudoku*-type activities is that Japanese students learn to translate English text in the literal sense, i.e., "by replacing all English words with Japanese words one by one"

(Kitao & Kitao, 1995 *online*) but often fail to understand its inherent message (Mantero & Iwai, 2005). Furthermore, most develop the notion that "the reading process is little more than obtaining meaning from the words on the page" (ibid). So, in spite of many hours spent reading English and considerable exposure to English print, Japanese undergraduates usually demonstrate comparatively poor English reading ability (Browne, 1996; Iino, 2002; Laufer & Yano; 2001; Robb & Susser, 1989; Torikai, 2003). Another consequence of the *yakudoku*-based methodology is that students lack motivation to read (Kimura et al., 2001; John, 2013, Norris-Holt, 2002; Okumura & Miyamoto, 2010). As John (2013) reports, because in Japan L2 reading at high school typically involves doing uninteresting things with texts they are not interested in reading, "students leave school with little interest either in reading or in English in general" (John, 2013, p. 6).

In summary, high-school EFL reading classes in Japan continue to favour an approach that does little to develop L2 reading skills and strategies or encourage interest in L2 reading. The outcome is that Japanese university students often struggle to read the English expository texts they are assigned. Their problems stem from poor lexical and grammatical knowledge, the inherent nature of English expository text, and the reading practices that they have acquired. These circumstances mean that alternate or complimentary approaches that can be used by EFL reading instructors in Japan to foster better expository text reading skills should be investigated. In particular, approaches that improve performance in reading tests and reading self-confidence, and that encourage students who feel "demotivated" by previous L2 reading experiences.

A highly active field of reading research has examined reading strategies and strategy-based reading pedagogy. Evidence from this research has led many experts to conclude that reading instruction should focus on developing strategic readers, who are in active control of their own comprehension processes (Alfassi, 2004). In this study, a strategy-based instructional approach based on text visualization via graphic organisers (GOs) was investigated. To date a large corpus of research has been conducted on GOs in L1 contexts (e.g., Blachowicz & Ogle, 2001; Dymock, 1999; McKenna & Robinson, 1997; Vacca & Vacca, 1999) providing evidence that GOs are effective in improving comprehension abilities, particularly among low-proficiency readers. This research-based evidence has in turn encouraged widespread adoption of GOs in L1 reading instruction, most frequently in helping students to comprehend expository text. The successes reported by L1 researchers have prompted calls in the literature for more GO research in L2 reading classrooms (e.g., Grabe & Stoller, 2002). Although a small number of studies have pointed to some positive effects in this respect, to date few associated reports have appeared in the literature. According to Jiang and Grabe, "a serious remaining concern is the lack of GO research with L2 students" (Jiang & Grabe, 2007, p. 46). To address this gap in the research, the present study examined the ability of GOs to support college student's L2 reading needs. The general research question arising from this general focus is whether or not using GOs for L2 expository text reading is effective with college students at Kochi University of Technology.

1.1 Aims of the Study

The aim of this study was to investigate the efficacy of using GOs for expository text reading in order to inform the development of more effective L2 pedagogy. The efficacy is analysed in three ways: through comprehension tests; through questionnaires distributed to participants that encompass attitudes to GO-based strategy instruction; and through classroom observation. In this way comprehension gains due to GO strategy use, student's perceptions of the usefulness of GOs for reading, and their observed behaviours during GO reading tasks, are examined.

2. Review of the Literature

The following review surveys reports in the literature related to strategy-based instructional approaches to reading EL expository texts. Particular emphasis is placed on studies with Japanese EFL students. There are two parts: Part 1 examines the metacognitive view of reading, which emphasises the control that readers exercise on the reading process, and the use of reading strategies. Part II examines graphic organisers; their theoretical basis, associated pedagogical claims, uses, and related research in both L1 and L2 contexts. The review shows that research into using GOs as an L2 reading instructional strategy, as addressed in this study, has been underrepresented in the literature to date.

2.1 Metacognition

The concept of metacognition - "knowledge and cognition about cognitive phenomena" (Flavell, 1979, p. 906) - was introduced in the 1970s. Since then, it has attracted much attention from educational researchers and influenced the development of strategy-based reading pedagogy. In the metacognitive view, both perceptual processes and understanding processes are essential for comprehension; however, the reading "mechanism" also depends on metacognitive awareness, monitoring, and regulatory processes, in order for comprehension to occur. In an idealized conception of reading, these processes operate together at several levels as the reader works to construct meaning from the text and towards the goal of comprehension (Aerbersold & Field, 2000).

2.2 Reading Strategies

One way that readers use metacognitive awareness to exercise executive control over reading is by using strategies. Research in both L1 contexts (e.g., Pressley et al., 1992; Pressley et al., 1998) and in L2 contexts (e.g., Carrell et al., 1998; Takeuchi, 2003) has shown that proficient readers have a well-developed awareness of their thinking processes and their reading abilities and make conscious decisions to use different cognitive strategies as they read, including strategies that may be employed to "fill-in" any gaps in comprehension (Baker & Brown, 1984). A fully "proficient" reader has unlimited access to and control over these resources and processes, enabling him/her to read text at a fast pace. Table 1 summarises the strategies that Grabe and Stoller propose are used by such "skilled" readers.

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Table 1. Grabe's *Taxonomy of Common Strategies Used by Skilled Readers* (Grabe & Stoller, 2002)

• Specifying a purpose for reading	• Rereading
• Planning what to do/what steps to take	• Guessing the meaning of a new word from context
• Previewing the text	
• Predicting the contents of the text or section of text	• Using discourse markers to see relationships
• Checking predictions	• Checking comprehension
• Posing questions about the text	• Identifying difficulties
• Finding answers to posed questions	• Taking steps to repair faulty comprehension
• Connecting text to background knowledge	• Critiquing the author
• Summarising information	• Critiquing the text
• Making inferences	• Judging how well objectives were met
• Connecting one part of the text to another	• Reflecting on what has been learned from the text
• Paying attention to text structure	

Knowledge of and control over strategy use therefore seems to be a key factor in reading comprehension. On the other hand, research done with beginner readers in both L1 contexts (e.g., Bereiter & Bird, 1985; Palincsar & Brown, 1984) and L2 contexts (e.g., Alderson, 1984; Carrell, 1985; Carrell, Pharis, & Liberto, 1989; Cotterall, 1990) indicates that beginner readers do not use strategies to exercise control over the reading process, or mainly engage in "bottom-up" reading strategies.

2.3 Reading Strategy Instruction

For many teachers, the pedagogical implication is that reading development can be promoted by encouraging readers to gain awareness of their reading abilities and the strategies they can use to compensate as they build reading proficiency. Although studies with L2 learners (e.g., Barnett, 1988; Carrell, 1998; Li & Wang, 2011; Song, 1998; Shang, 2010; Ikeda & Takeuchi, 2003; Takeuchi & Wakamoto, 2001) have provided evidence that such instructional approaches can be effective in building both reading proficiency and confidence, they are seldom used in L2 reading classrooms. With regard to the present context, several researchers (e.g., Anderson, 1999; Numrich, 1989) have reported that L2 reading strategies are seldom taught or practiced in Japanese high schools. Rather than teaching processing skills, EFL curricula tend to emphasise the production of comprehension via the grammar translation approach. When used in isolation this approach is ineffective, inefficient, and demotivating.

2.4 Graphic Organisers

A strategy used with considerable success with L1 readers is based on "organising" text visually using graphic organisers (GOs). The following section provides an outline of how GOs are generally used in reading, the theoretical basis for GO strategy use, the different types of GOs that have been developed, and finally a review of research into the effectiveness of GO based instruction in both L1 and L2 contexts.

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Gallaudet University (2021), a US based provider of specialist education, describes GOs (which they refer to as mapping) as,

> "The process of reorganising and rearranging (moving) the most important ideas and information from your reading or textbook and converting it into a diagram with your own words to help you understand and remember what you read" (Gallaudet University, 2021, online).

While Carrell (1988) states that:

> "Mapping involves selecting key content (from an expository passage) and representing it in some sort of visual display (boxes, circles, connecting lines, tree diagrams...) in which the relationships among the key ideas are made explicit" (Carrell, 1988, p. 249).

Although there are many types of GOs, including semantic maps, concept maps, knowledge maps, outline grids, tree diagrams, and hierarchical summaries, they serve the same purpose - to graphically depict information in a text and thus show visually how information is structured. In this way, it is claimed, graphic organisers can act as a scaffolder for reading.

2.5 Pedagogical Claims for Graphic Organisers

Several specific claims are made regarding GOs use in reading pedagogy. The first claim is that GOs help to reveal how topics or ideas in a text are interrelated. Jones, Pierce, and Hunter, for example, argue that "a good graphic organiser can show the key parts of a whole and their relations, thereby allowing a holistic understanding that words along cannot convey" (Jones et al., 1988, p. 21). They also say that "reading with a good graphic organiser in mind can help students select important ideas as well as detect missing information and unexplained relations" (ibid). Tang argues the same point, stating that GOs "communicate the shape of knowledge and make visible the knowledge structure they represent, and in this way provide a schema which can be accessed again and again, thus facilitating comprehension" (Tang, 1991, p. 37). Another claim is that the process of actually creating or completing graphic representations of the topics and main ideas in a text, i.e., reconstructing messages in the text results in both improved comprehension and recall. Finally, it has also been argued that graphic organisers are an effective means for reducing working memory load.

2.6 Theoretical Basis for Graphic Organisers

According to Ellis (2004) the main theoretical basis for GOs lies in the general theories of learning proposed by Ausubel, by Pavio, and by Sweller. The notion that GOs facilitate the process of linking new information with existing knowledge and the construction of the schema required for successful understanding of new concepts is linked to the Cognitive Theory of Meaningful Verbal Learning developed by psychologist David Ausubel (1963). According to this theory, learning and retention of unfamiliar materials occurs when newly acquired information is assimilated into the extant cognitive structure that makes up an individual's knowledge base (Ausubel, cited in Novak & Cañas, 2006). Ausubel also proposed that for *meaningful* learning, as opposed to rote learning, to occur, input must be presented in a way that allows it to be easily linked with existing schema, as information that fits into existing schema is much more easily comprehended and stored within the hierarchy. In accordance

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with his theory, Ausubel developed the "advance organiser", the function of which is to activate prior knowledge and relate new material to existing information, so that the information is more familiar and meaningful (ibid). Ausubel's "advance organiser" is considered to be the conceptual model for GOs.

2.6.1 Dual Coding Theory

Dual coding Theory (Paivio) centres on the idea that readers "encode" information according to two separate but interrelated information processing systems via which they process both non-verbal imagery and language. These systems are independently controlled, but they are closely interconnected, thereby allowing for "dual coding" of information. Imagery is processed and stored as "imagems" whereas linguistic information is processed and stored as "logogens". Readers hold both logogens and imagems in short-term memory in parallel forms. Thus, "memory for text information and the retrieval of that information are facilitated by verbal-non-verbal dual coding" (Paivio, 2001, pp. 112-113). The reasoning is that GOs present information in a way that makes it possible to codify the information both verbally and visually, so the information is more memorable.

2.6.2 Cognitive Load Theory

Lastly, the claim that graphic organisers can reduce working memory load is based on cognitive load theory (Sweller, 1988). According to Sweller short term memory has a limited capacity in terms of the number of elements that can be held at any one moment. For schema acquisition to occur, instructional approaches that reduce working memory load are most effective in order to facilitate the changes in long-term memory associated with schema acquisition.

2.7 L1 Graphic Organiser-based Research

To date, most of the empirical research into GO based reading instruction has been done with L1 learners, particularly with beginner readers and those who have reading difficulties. This research has variously focused on; the effectiveness of graphic organiser instruction in facilitating comprehension, recall, and transfer of information (e.g., Guri-Rosenblit, 1989; Alvermann & Boothby, 1986; Griffin et al., 1995); on comprehension of specific text structures (Snyder, 2012); on the relative merits of GO instruction against other types of instruction (Armbruster et al., 1991); on the relative merits of using teacher-generated versus student-generated graphic organisers (Stull et al., 2007); the relative merits of different types of graphic organisers (Robinson et al., 1995), GOs against frames; and other variables such as differing proficiency (Armbruster et al., 1987). Summary evidence from these and dozens of other studies has supported recommendations in the literature to use GOs as part of reading instruction. Currently, graphic organisers are widely used in L1 reading instructional curricula designed for learner readers, and are frequently included in L1 reading textbooks (Jiang & Grabe, 2007)

2.8 L2 Graphic Organiser-based Research

However, while "the recommendations to use GOs as part of reading instruction are commonly found in the first language (L1) reading literature", they are "generally less common in second language (L2) contexts" (Jiang & Grabe, 2007). Moreover, on the basis of the "strong claims for GO effectiveness"

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outlined above, "an important goal would be to generalise the results of GO use to the L2 student population" (Jiang & Grabe, 2007, p. 34).

As yet, few studies on GO-strategy use in L2 reading contexts have been reported. Carrell et al. (1989) examined the combined effects of cognitive and metacognitive strategy instruction on reading comprehension with a group of adult ESL students of varied native language. The students were trained either in semantic mapping or the experience-text-relationship (ETR) method and also received training in metacognitive awareness and regulation of the two strategies. Results showed that the combined effects of metacognitive and cognitive strategy instruction were effective in enhancing reading comprehension. Early and Tang (1992) reported on an experiment with a group of ESL learners in Canada that investigated the effect of using a type of GO they termed 'key visuals' for comprehending expository texts. They found that using key visuals had a positive effect in enhancing reading comprehension. Hao and Siu also investigated the effects of using graphic organisers on EFL students' expository reading comprehension. Their study compared the effects of two types of computer-based GOs - concept maps and graphic organisers representing text structure. Although both types of GOs training were effective in facilitating students' reading comprehension, the graphic organisers that represented text structures were more effective in promoting understanding of whole-text semantic meaning and text structure.

In another comparative study, Sarabi (2012) investigated the effects of GO-based and marginal glossing training on the reading comprehension of ESP students in an Iranian context. The graphic organiser group performed significantly better in a reading comprehension post-test. Chularut and DeBacker's (2004) study examined the influence of using concept maps on ESL student's ability to learn from text, and self-efficacy. Their findings were that concept maps had a positive effect in both respects. Both Akgül (2010) and Jiang (2012) investigated the effectiveness of discourse structure-based graphic organisers (DSGOs). Akgül's (2010) study with intermediate level Turkish EFL students examined their effects as against post-reading discussion-based activities on reading comprehension. The study also explored student's attitudes towards this approach to reading instruction. Students who completed DSGOs as a post-reading activity performed significantly better in post-test summaries but had mixed attitudes towards the utilization of DSGOs in reading instruction. Jiang's (2012) study with 340 college-level Chinese EFL students investigated the effects of reading instruction with DSGOs in the development of English reading comprehension. There was significant improvement in general reading ability in the immediate posttest, but the effect did not persist in the delayed posttest. Finally, in the only reported Japan-based study, Evans (2003) investigated the effects of graphic organisers for Japanese readers on EFL expository text. The researcher reported that student-generated graphic organisers helped accommodate different learning styles, promoted meaningful learning and also enhanced reading comprehension.

2.9 Summary

Previous studies support the claim that L2 students can comprehend texts better when they have some kind of visual representation of how information and ideas in the texts are organised. However, both Jiang and Grabe (2007) and Howard and Ellis (2011), conclude that there is a "gap" in our knowledge about GO based L2 reading instruction which needs filling. In Japan, there is a large population of college-level EFL readers for whom reading expository texts is necessary but also problematic, who have poor motivation to read in English, and little confidence in their overall reading ability. In order to examine the efficacy of GO-based reading instruction for addressing the L2 reading needs of such students, the following research questions were addressed:

3. Methodology

3.1 Research Design

The present study used a mixed-method design, based on both quantitative and qualitative data collection and analysis techniques. The experimental component of the study was based on a pre-program-post-program non-equivalent group design (N-O-X-O). This element was to determine if the treatment resulted in increased L2 reading comprehension. In addition, student's attitudes regarding the effectiveness of mapping activities for enhancing their EFL reading skills, reading motivation, reading confidence, and knowledge of text organisation and text structures were recorded. Groups were observed during the treatment and a record made of significant events/trends/patterns of behaviour. The purpose of including a qualitative component was to validate the quantitative data and explain the meaning of the comparisons that were made.

3.2 Background to Research Context

The study was conducted at Kochi University of Technology (KUT), a Japanese engineering college. The KUT English Department offers a range of elective English courses for 1st and 4th year undergraduates. First year courses are part of the general core studies program; however, although students are required to gain credits within this program, the range of courses is limited, and currently most 1st year students take English. The two 1st year courses offered are the aforementioned "Reading and Listening 1/2", and "Science Lab/Science English", a "semi-ESP" course teaching basic scientific content. Each course runs for one semester, over 30 sixty-minute sessions. A student in the 1st year EFL program will therefore have a total of 60 hours of English teaching over the academic year.

3.3 Participants

Participants for this study were recruited from among two intact groups of 18-year-old freshmen students. During orientation participants were assessed by placement test and achieved scores that placed them in the lowest achieving 1/3 of the population. They were subsequently assigned to 'C' level classes according to their academic discipline (with "A" being the highest of the three levels). At the time of the study, participants were taking "R/L 2". Experience has demonstrated that motivation levels among students taking this course are low, and many commit only the minimum effort to

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studying. This lack of motivation may be the product of prior L2 learning experiences, lack of interest in the textbook and the fact that students receive only a single credit for completing the course, while other 1ˢᵗ year courses are double-weighted. It was reasoned that conducting the study among these students would help to reduce the possibility of "skewing" the results, which could result if research were conducted with the (more motivated) students in elective classes.

3.4 Groups

The treatment group consisted of Information Systems Engineering majors (n = 31), and the control group Environmental Systems Engineering majors (n = 21). During the 1ˢᵗ quarter of the semester, participants studied four expository texts from the course textbook and achieved an average grade of 72% (treatment group) and 74% (control group). This grade is based on the sum of combined scores from four listening cloze tests, four video-based listening quizzes and textbook-based vocabulary and reading comprehension exercises.

3.5 Variables

a) *Independent variable*: Instruction and guided practice in using graphic organizers.

b) *Dependent variables*: Score on **c**omprehension test

c) *Controlled variables*: Classroom reading time

3.6 Data Collection Instruments

In this research both qualitative and quantitative data collection instruments were used. Use of these instruments together allowed for corroboration of data and hence, contributed to data triangulation. All instrumentation (tests, questionnaires, and surveys) was prepared by the researcher, with reference to the literature, assistance from teaching colleagues and professional translators.

•   18-item pre-/post comprehension tests

•   Post-treatment mapping questionnaire.

•   Classroom observation protocol

3.6.1 Qualitative Measures

a) 18-item pre/post comprehension tests

These were prepared by the author, and professionally translated into Japanese, and then checked by a native Japanese-speaking academic. The items were designed to test literal, inferential comprehension of the text.

b) Mapping questionnaire

Next, a 9-item questionnaire was written in order to gather data regarding the treatment. The questionnaire asked participants to rate their impressions of text mapping activities on a 5-point Likert-type scale. Items elicited responses on the effectiveness of the treatment in improving knowledge of rhetorical organization, discourse organization, sentence structure, and reading motivation and levels of engagement in text. The mapping questionnaire had a reliability of .888, as measured by Cronbach's alpha.

c) Classroom observation protocol

Because only a limited amount of quantitative data could be collected during the 6-week research period, a systematic program of classroom observation was also planned. In advance, three principle areas of focus were identified and a classroom observation protocol was drafted.

•   Levels of participation/motivation in regard to the assigned tasks between the two groups.

•   Levels of interaction among participants in the process of completing assigned tasks.

•   Time taken to complete and ability to complete the assigned tasks.

3.6.2 Reading Texts

The researcher wrote six original texts for the study to ensure consistency and thus minimise the influence of text variables. Engineering themed topics were selected, in an effort to promote engagement. Each text is organised according to same rhetorical pattern – Situation, Problem and Solution - and each of the four paragraphs in the text has a principle textual genre. To estimate readability, the texts were processed in Word using the Flesch-Kincaid Readability Index.

The following criteria were used in preparing the texts;

•   300-350 words in length (i.e., Same as the course textbook)

•   Readability level within the range of 7.0 – 9.0, as measured by the Flesch-Kincaid Readability Index (i.e., Same as the course textbook)

•   Similar rhetorical patterning (SPS) and inclusive of the basic text structures characteristic of expository texts (i.e., cause-effect, description, sequence, compare-contrast)

3.6.3 Mapping Templates

The mapping templates used in the study (see Appendix for an example) were constructed by the researcher using the Google Docs drawing tools, on the basis of studies in L1 contexts indicating that teacher-generated frames are more successful than either purely teacher-generated maps or purely student-generated maps.

The maps attempt to assimilate the principles of several text visualisation approaches in order to represent both the rhetorical organisation and the language structures in the accompanying texts. In general, the maps follow the concept mapping principles of Novak and Cañas (2006) by focusing on drawing reader's attention to main ideas, on showing how these ideas are connected and also on displaying the rhetorical framework of the text. In addition, the maps follow Novakian principles of spatial arrangement by having a hierarchical concept array, in which general information is at the head and more specific information below.

Each template contains four hierarchically arranged "sub-maps" or structural arrays, representing the four paragraphs in the text. The paragraphs are arranged according to an SPS pattern and are labeled accordingly. Within this main visual framework, there are a series of boxes, or nodes. In contrast to Novakian maps nodes are not linked through linking words, phrases or labels but by means of graphic symbols indicating the nature of the relationship – comparative, causative, explanatory, and sequential. Explanatory (descriptive) structures are shown as broken lines, classification by solid lines, sequences

by smaller arrows and causative relationships by larger arrows. Another difference is that sequential structures are arrayed horizontally. In addition to these purely symbolic clues, discourse markers, phrases and sentences are used in some instances to orientate the reader to the task.

3.6.4 Pilot Study

After developing the instruments, the first comprehension test was piloted with a group of 1st year Management majors who were also currently taking the R/L course. All aspects of the pilot procedure (location, duration, length of reading time) were the same, in order to replicate the actual test conditions. Some problems with the Japanese phrasing in one of the survey items were thereby revealed so it was duly revised.

3.6.5 Data Collection Conditions, Schedule and Procedures

The study ran over a 7-week period in the second quarter of the 1st semester at KUT. For pragmatic reasons, the study was organised as a supplement to the regular "Reading and Listening" syllabus. Therefore, during this period, in addition to the reading tasks assigned as part of the present study, participants studied 4 units from the course textbook. The study was conducted in a regular classroom setting. The following section describes the three main phases of the study.

3.6.6 Pre-treatment Phase

Pre-treatment testing was conducted during a 60-minutes classroom session using the *The Pacific Railroad* text. Participants were allowed 40 minutes to read the text, using whatever strategies they would normally employ during reading. Following the reading, participants completed an 18-item comprehension test.

3.6.7 Interim (Treatment) Phase

Over the following six weeks participants spent twelve minutes sessions at the end of regular 60-minute reading classes studying in series four of the expository texts described above. In the first session, the GO group were introduced to the general principles of mapping and the application of mapping to L2 reading. They were also shown examples of completed maps and provided with a guide explaining the meaning of the graphic symbols. In the following sessions the GO group read and practiced completing the associated mapping templates; meanwhile, the control group answered general comprehension questions written on the whiteboard by the researcher. Throughout this period, the researcher kept a systematic record of observations regarding classroom conditions and activities.

3.6.8 Post-treatment Phase

At the end of the study period, participants completed a comprehension test based on a text on the topic of *Kansai International Airport*. The procedure was the same as for the pretest. In the final session of the study period, participants in the treatment group were asked to complete the mapping questionnaire (see Table 3 in the results section).

3.7 Methods of Processing

3.7.1 Self-rated Comprehension Survey

Responses to the self-rated comprehension questionnaires were coded on a scale of 1 – 8 (with 1 being the lowest) and collated in Microsoft Excel for Mac 2010™ prior to processing.

3.7.2 Mapping Questionnaire

Responses to the mapping questionnaire were coded on a scale of 1 – 5 (with 1 corresponding to "Strongly Disagree") and tabulated in Microsoft Excel for Mac 2010™. Data was examined to identify the number of responses in each of the five categories, and then converted into a percentage. The median response was also identified for each item.

3.7.3 Methods of Analysis

Next, the quantitative data was analyzed using SPSS for Mac™ software. Laerd Statistics (Note 1) and Professor Ian Isemonger at Kumamoto University, Kyushu, provided statistical guidance. The following describes the procedures for analysing the collected data.

3.7.4 Reliability Testing

Reliability tests for the mapping questionnaire were performed using Cronbach's Alpha in SPSS™.

3.7.5 Analysis of Comprehension Test Scores

a) Assumptions testing

Next, an exploratory analysis of pre- and posttest comprehension test scores was conducted. The analysis indicated a difference in the mean scores on both the pre- and post-test; furthermore, the post-test scores for the control group were not normally distributed, as assessed by the Shapiro-Wilks procedure, with a negative skew attributable to a single outlying score (Case 1:4). Because removing the outlier would have increased the numerical imbalance (i.e., Control n=20, Treatment n=31), the outlier was retained and an attempt was made to transform the test data in SPSS. However, transformations are frequently problematic, as they do not deal with outliers, can reduce power, and make interpretation difficult. In this case, transformation had the effect of reducing the Shapiro-Wilks normality rating for the Treatment Group.

b) Non-parametric analysis of comprehension test scores

To assess the significance of the difference in mean comprehension scores between groups while minimising the potential for Type I errors, the untransformed data was analysed using the Mann-Whitney test and the Mann-Whitney U-test. Both tests are considered "robust" where there is an imbalance in sample size and where data is not normally distributed and retain 95% of the statistical power of a parametric test (Siegel, 1957).

Analysis of mean scores revealed that the baseline scores for the control group were significantly higher (p < .05). Therefore, an analysis of gain scores was conducted. Individual gains scores were calculated in Microsoft Excel. Scores were then imported into SPSS.

3.7.6 Analysis of Qualitative (Questionnaire) Data

Record of classroom observations was analyzed to examine if any significant patterns in behavior had been recorded.

3.8 Limitations

The data analysis techniques described have several limitations. In this study, comparison between groups was complicated by the imbalance in group numbers and the higher baseline reading comprehension scores among the control group. This factor (and other factors reported in the methodology) prompted the use of gain score analysis. While the Analysis of Co-Variance procedure is sometimes used in such cases, Ercez-Hurn and Mirosevich (2008) suggest that analysts should use ANCOVA only for randomized trials, only for tests of main effects and, even then, only if groups are *equivalent at baseline*. Additionally, in this study, testing of assumptions for the ANCOVA procedure revealed heteroscedascity in the data. Because the assumptions of homogeneity and normality made for the ANCOVA could be met, the non-parametric Mann-Whitney U-test was used for analysis of differences in gains.

Among statisticians the importance of homogeneity and normality has been a contentious issue. Kerlinger suggests that it is "overrated" (Kerlinger, 1973, p. 287) based on evidence from large-scale studies by Norton and Boneau (Norton & Boneau, 1960; reported in Kerlinger, 1973, p. 287). However, other experts have questioned how robust parametric tests are to violations of assumptions of normality (Wilcox, 1998; reported in Erceg-Hurn & Mirosevich, p. 594), and shown how the process of testing the assumptions for these "classic" statistical tests is prone to error. The Mann-Whitney test however, also, has major limitations, including proneness to Type 1 errors. Although more robust methods of statistical analysis have been developed that are an alternative to the ANCOVA, including the ANCOVA Type-Statistic, they are neither well known, nor available to researchers through SPSS.

Table 2. Link to Research Questions

1. Does using graphic organizers improve actual comprehension of expository texts among Japanese engineering students? 2. Can anything be inferred from: a) Learner's attitudes to classroom mapping activities.	• Absolute and relative gain scores • Post-treatment survey • Post-treatment survey
b) Observations of learner activities during classroom mapping activities.	• Record of classroom observations

4. Results

In this study, both quantitative and qualitative measures were used to answer the main research questions. The data obtained is reviewed in the following section.
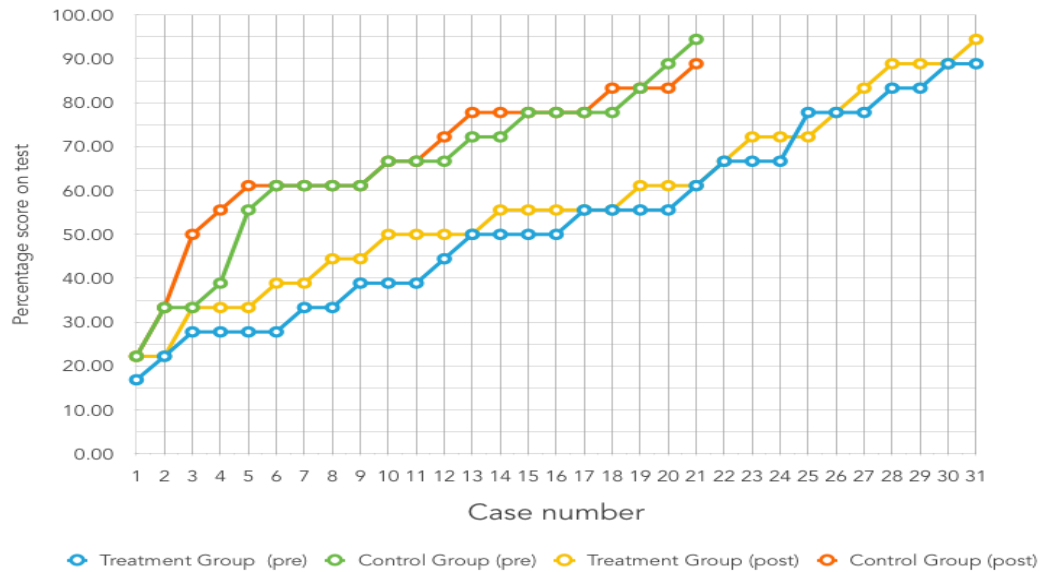
4.1 Descriptive Statistics for Actual Comprehension Tests

Figure 1. Pre/Post-test Scores

4.1.1 Summary of Pre-test Results

On the pre-test the Treatment group had a mean score of 9.5161 or 52.87% (s.d = 3.77599) and the Control group had a mean score of 11.5714 or 64.29% (s.d = 3.414260). For the control group scores of 7, 12, and 14 represented the 1st, 2nd and 3rd quartiles, respectively. For the treatment group scores of 6, 9, and 12 represented the 1st, 2nd and 3rd quartiles, respectively. Pre-test scores were normally distributed for Treatment Group with a skewness of -0.161 (SE = 0.421) and kurtosis of -1.022 (SE = 0. .821) and for Control Group with a skewness of -0. 735 (SE = 0. 501) and kurtosis of -0.068 (SE = 0.972). Test I scores were normally distributed for both Treatment and Control groups, as assessed by Shapiro-Wilk's test (p > .05).

4.1.2 Summary of Post-test Results

On the post-test the Treatment group had a mean score of 10.3226 or 52.87% (s.d = 3.55328). Mean/Median for Control Group was 12.00 or 64.29% (s.d. = 3.01662). For the control group scores of 11, 12, and 14 represented the 1st, 2nd and 3rd quartiles, respectively. For the treatment group scores of 8, 10, and 13 represented the 1st, 2nd and 3rd quartiles, respectively. Post-test scores were normally distributed for Treatment Group with a skewness of -0. 164 (SE = 0. 421) and kurtosis of -0.646 (SE = 0.821) and for Control Group with a skewness of -1.172 (SE = 0.501) and kurtosis of -1.445 (SE = 0.972). As assessed by Shapiro-Wilk's test (p < .05), test scores were normally distributed for the Treatment Group (p=.409) but not the Control Group (p=.025).

4.2 Descriptive Statistics for Mapping Activities Questionnaire

a) Responses to the native language mapping survey

Table 3. Mapping Questionnaire Data

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Median
Q1. I could understand the information maps that were provided by the teacher	2.9%	***68.6%***	22.9%	5.7%	0	4
Q2. I could understand the texts that were provided by the teacher.	5.7%	***60%***	25.7%	2.7%	0	4
Q3. Using information maps improved my knowledge of text organization	11.4%	***48.6%***	34.3%	2.7%	0	4
Q.4 Using information maps improved my knowledge of sentence structures	5.7%	40%	***48.6%***	5.7%	0	3
Q.5 Overall, using information maps improved my English reading skills	8.6%	***51.5%***	28.7%	5.7%	0	4
Q.6 Using information maps encouraged me to interact more closely with the texts	8.6%	34.3%	**40%**	17.2%	0	3
Q.7 Using information maps improved my reading confidence	5.7%	31.4%	***48.6%***	11.4%	0	3
Q.8 Using information maps encouraged my interest in reading English	5.7%	40%	***48.6%***	2.7%	0	3
Q.9 Overall, information mapping was a useful activity for me	5.7%	***71.5%***	17.2%	2.7%	0	4

4.3 Inferential Statistics

4.3.1 Actual Comprehension

a) Pre-test comparative statistics

An independent samples Mann-Whitney U-test showed a marginally significant difference ($p < 0.05$) in pre-test scores between the two groups, U(df) = 431.5, Z = 1.98, p = 0.047

b) Post-test comparative statistics

An independent samples Mann-Whitney U-test showed a marginally significant difference ($p < 0.05$) in post-test scores between the two groups, U(df) = 430.5, Z = 1.96 , p = 0.049

c) Gain score statistics

An independent samples Wilcoxon-Mann-Whitney test showed that the two groups differed significantly in terms of gain U(df) = 438, z = -2.2573, p = 0.012

Control n = 21   Mean rank = 21.1429

Treatment n = 31 Mean rank = 30.129

A post-hoc independent samples Mann-Whitney U-test showed that the two groups differed significantly in terms of gain, p = 0.0186.

5. Discussion

Previous research has shown that strategy-based approaches are an effective means of helping L2 learner readers to overcome comprehension difficulties. This study was conducted in order to investigate if the use of graphic organisers in the L2 reading classroom transferred into gains in expository text reading comprehension, and also if anything could be inferred from participants views on the effectiveness of GO instruction, and from classroom observations.

In the following, the results of this study are discussed from the perspective of the pre-determined research questions. Firstly, the effects of GO use on participants actual comprehension, as quantified by performance on the post-reading test; second, the effectiveness of GO use, as quantified by responses to the post-treatment survey. In addition, motivation levels and attitude are considered in relation to the questionnaire and the researchers' observation record.

5.1 Research Questions

A. Does using graphic organisers in EFL reading classes enhance actual comprehension of EFL expository texts?

Analysis of data showed that the comprehension gains among the mapping group were significantly higher (p < .05) than among the treatment group. In relation to previous research it is difficult to make comparisons because so few L2-based studies have actually been conducted. However, as Early and Tang (1992), Evans (2003) and Sarabi (2012) also found, there was a facilitative effect for reading comprehension. The results are also consistent with both Akgül (2010) and Jiang (2012), who also used discourse structure based GOs in their studies and found that they promoted reading ability.

One explanation for the higher gains in reading comprehension for the mapping group is the extent to which they were involved in the mapping process. Although the GOs were provided by the researcher, it was up to the reader to complete them. These findings offer support to claims in the literature that enhancements in comprehension result when readers are actively doing something with text. They are also consistent with L1 studies showing that teacher-generated templates (as opposed to purely teacher-generated or student-generated) maps are most effective in promoting comprehension (Jiang & Grabe, 2007).

Other possible explanations for the score gain anomalies are a) maturation b) the on-average higher baseline scores in the control group (explaining the comparatively smaller mean gain scores); and c) subject matter knowledge. The latter has been shown in previous research to influence reading comprehension. In this study the treatment group consisted of Information Systems majors, whose locus of study is computer software and hardware engineering. The control group was Environmental Systems Engineering majors, studying aspects of civil engineering affecting the environment. As the

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post-test topic was *Kansai International Airport*, a civil engineering project, it is possible that topic familiarity (subject matter knowledge) was an intervening factor.

B. What can be inferred from students' responses to the mapping questionnaire?

According to the questionnaire nearly 60% of respondents thought that "using information maps improved my English reading skills". The same percentage of them felt the treatment had improved knowledge text organisation. On the other hand, participants were more indecisive as to whether the mapping activities had improved their knowledge of text structures, reading confidence and levels of interactivity with the text.

These responses suggest that when used over a longer period of time, GOs can help to improve some key aspects of EFL reading self-efficacy. This finding is consistent with Chularut and DeBacker (2004) and is important in regard to the role that self-efficacy can have in motivating EFL students to read. One notes however that when using self-reported analysis research techniques, "a very difficult question for the teacher is knowing how to weigh and interpret information obtained by means of this research approach when it is combined with information obtained by means of other research approaches" (Tarone, 1994, p. 678).

Finally, what inferences can be made from observations of learner behaviours during classroom activities? On the one hand, most students were undecided as to whether the treatment had improved their motivation to read; however, the researcher's observations were that, compared with students in the control condition, participants in the mapping condition were more engaged in the assigned reading tasks during the 6-week treatment period. While some of the participants were able to complete the maps without difficulty, others clearly found the task challenging. However, the researcher observed that even those who were slower to complete the maps tended to remain "on-task" throughout. In addition, participants worked cooperatively. Finally, mapping activities were observed to promote a more interactive (in the sense of interaction between reader and text) approach to reading. For example, many students marked up the text in order to establish to nature of the relationships.

By comparison, over the study period the control group was observably less motivated in reading the texts and in completing the assigned tasks. To illustrate this point, after 10 minutes reading the *Leaning Tower of Pisa* text, only one of the 21 participants had answered more than one question. Most of the others were already distracted; whether in fact this was due to lack of interest in the topic matter, or the fact that the research was conducted in conjunction with other reading activities is not clear. Overall, evidence from the classroom observations leads the researcher to conclude that using graphic organisers encouraged greater engagement in and interaction with the texts, although the participants did not make the same conclusions.

5.2 Additional Observations

Although not part of the main study (and as such not analysed systematically), from a research-based perspective the apparent correlation between participants ability to complete the maps and their performance on the post-test is noteworthy. This correlation was evident in many cases. Finally, from a

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pedagogical perspective it was interesting that whereas participants in the control group were less engaged during the study phase, they made greater efforts for tests. Also, although both groups had been assessed at "C" level in the pre-sessional placement test, the results indicate that proficiency levels among these lower groups varies widely. These findings will prove useful in informing future curriculum development.

5.3 Recommendations for Future Research

This study makes a modest addition to the research that has been conducted into the use of GOs for L2 reading instruction. The findings are important because they indicate that GOs have several practical benefits when used in a college EFL reading classes in a Japanese context. However, further studies are needed before any conclusions can be drawn; future research might legitimately investigate:

a) The long-term effects of using graphic organisers in L2 reading instruction. This is most important, as the length of the training period has been consistently shown to be a critical variable in determining the efficacy of strategy instruction (Alvermann, 1981; Alvermann & Boothby, 1986). Furthermore, observations made over a longer period of time can elicit more revealing data (Grabe & Stoller, 2002).

b) The effects of using graphic organisers as part of a multiple strategy-based approach to reading; i.e. in combination with summarizing.

c) The efficacy of teacher-generated against student-generated maps.

d) The effects of using graphic organisers with other types of texts.

5.4 Limitations

In hindsight, the present study was limited in several respects. Firstly, the sample was relatively small, at n = 52. Second, practicalities of scheduling and time spent preparing the necessary documentation and data-gathering materials in both English and Japanese limited the treatment period to just 6 weeks. The limitations in data analysis have already been discussed. It is hoped that future research in SLA will benefit from the adoption of more powerful analytical tools.

6. Conclusion

For many Japanese college students reading EFL expository text can be highly demanding and many struggle with reading assignments. Research indicates that this is due to difficult reading materials, limited reading proficiency, a low sense of L2 reading self-efficacy, and poor motivation. The problems are compounded by the fact that most continue to rely on grammar-translation strategies when they read and lack awareness of the compensatory strategies they can use when comprehension becomes difficult.

The results of the present study provide positive evidence as to the effectiveness of GOs as an instructional strategy in L2 reading classrooms. Firstly, they offer support for and add to the findings of previous studies, namely that using GOs help EFL learners to overcome their difficulties in comprehension and to build reading proficiency. Additionally, the positive experiences reported by the participants, and the classroom observations, indicate potential benefits for GO-based reading

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instruction approaches in motivating learners to engage reading activities. Overall, perhaps the clearest indication is that students respond positively to methodologies they have not encountered before in language learning.

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Note 1. Laerd Statistics. https://www.statistics.laerd.com

Appendix A: Sample text and map

Japan's energy choices

Every year, people in Japan use 859,700,000 Mega hours of electricity. Electricity powers many of the things around us. For example, electricity powers home appliances such televisions, refrigerators,

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kettles and microwave ovens. Electricity also powers factory machinery, traffic signals, and streetcars and underground trains.
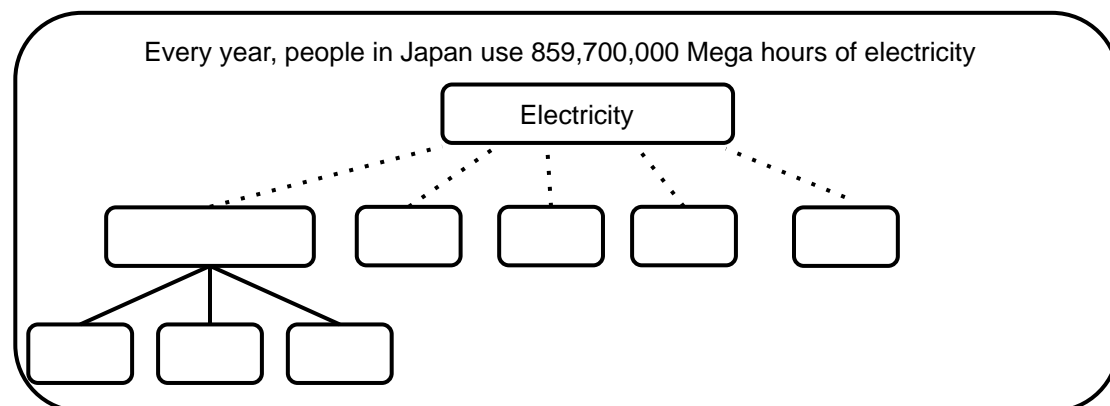
Currently, there are three main methods of generating electricity in Japan. The first method uses fossil fuels including coal, oil and natural gas. The second method uses nuclear fuel.   The third method uses water in lakes and rivers. In Japan, fossil fuel power plants generate about 80% of electricity, nuclear power plants generate 14.0%, and hydroelectric (water) power plants generate about 4%.

However, each of the current methods for generating electricity has some problems. There are two problems with using fossil fuels.   Firstly, Japan has no fossil fuels. So, Japan has to buy fossil fuels from other countries including Russia and Saudi Arabia. However, the world's supplies of fossil fuels will run out by the year 2100. The second problem is that fossil fuel power plants produce CO^2 and SO^2, which cause global warming. The problem with nuclear power plants is they can be dangerous. In Japan, nuclear power plants are next to the sea, because they need lots of seawater for cooling. However, in Japan, building a nuclear power station next to the ocean increases the risk of damage from *tsunamis*. In March 2012, a huge *tsunami* damaged the Fukushima nuclear power plant. As a result, the Japanese government decided to close all nuclear power plants in Japan. Finally, the problem with hydroelectric dams is that they need large areas of land. Also, they don't generate much electricity. Now Japan must find new methods to generate electricity. For Japan, one solution may be to use geothermal energy. Geothermal energy is heat energy from underground. To generate electricity from geothermal energy, first engineers drill a deep hole into the ground. Then, they put a pipe in the hole. Next, water is pumped down the pipe. The water heats up and rises out of the hole as steam. Finally, the steam drives a generator, making electricity. Right now, there are 18 geothermal power plants in Japan. These power plants generate 0.1% of Japan's electricity.
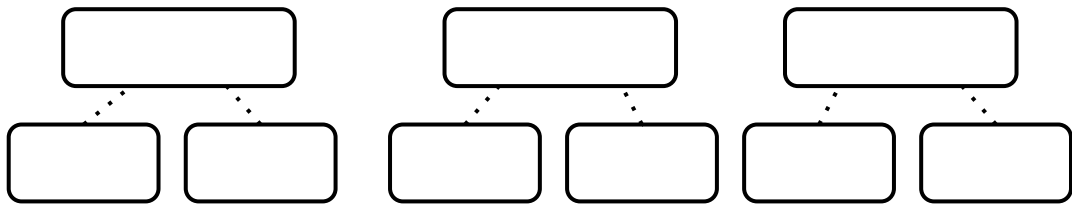
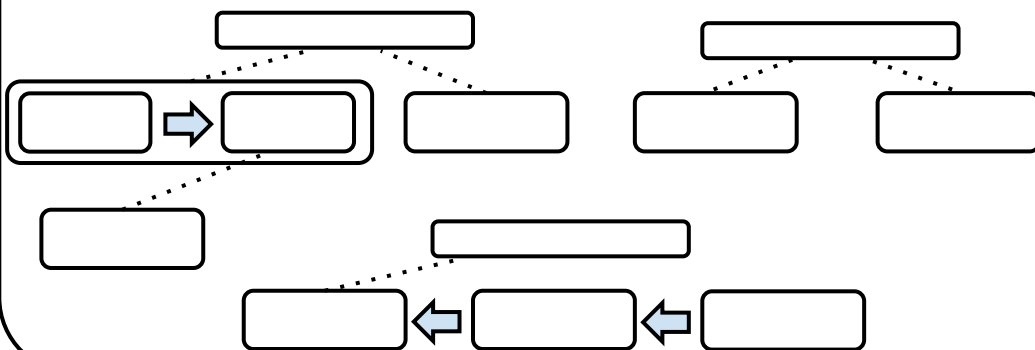| Text 5 *Japan's energy choices*	Word count = 372

Text mapping template (Japan's Energy Choices)

Currently, there are three main methods for producing electricity in Japan.

However, each of the current methods for generating electricity has some problems.

Now Japan must find new ways to produce electricity.