原文書閱讀：從首句到大意

張慧

國立宜蘭技術學院 應用外語系副教授

摘　要

時下英文原文書普遍在世界各大學中使用，過去研究多指出，以原文書為教材交授英文，不但能幫助學生原文書閱讀的了解，亦能有效增進其英文能力。本文中，作者先敘述目前國內學生原文書閱讀困難情形，並提出就學生閱讀中，從首句推測全段大意過程研究之大綱。本研究中，學生將閱讀其原文書中之連續十二段落，並說明各段落首句是否能代表該段之大意。研究結果顯示，段落大意為名詞片語者，困難度較低；首句如果包含兩個子句，則其困難度較高。另學生甚至有將附屬子句誤以為主要子句，而誤解段落大意者。最後文內就研究結果之教學上之涵義進行討論，並提出未來在學生代表性與文章種類、數量方面，進行未來研究之建議。

關鍵詞：專業閱讀、原文書、主旨、大意、主旨句、科技英文

English Content Textbook Reading: Relating the First Sentence to the Main Idea

Hui Olivia Chang
Associate Professor, Department of Applied Foreign Languages
National Ilan Institute of Technology

Abstract

Previous research in content textbook reading by EFL students has depicted a picture of students struggling through content textbooks reading. Chang (2001b) found that students tend to be distracted by problems at sentential level. As a step towards text-level comprehension, this study investigates how students can be led to relate the first sentence to the main idea of a paragraph. A twelve-paragraph text from a content textbook was given to 22 electronic engineering students. They were asked to explain if the first sentences represented the summaries of the paragraphs. At $P < 0.1$, single factor ANOVA suggested that three paragraph characteristics cause difficulty: if a paragraph is about a noun phrase, if the first sentence carries the main idea, and if the first sentence has two clauses. Pedagogical implications of the results are discussed. At the end of the paper, we call for more comprehensive research in other subtypes of texts.

Key Words：Content reading, main idea, topic sentence, textbook, EST, ESP

Introduction

In this section, we talk about the situation of how some low EFL readers fail to go beyond sentence level in content reading. We discuss the roles main ideas and first sentences play in the teaching of reading. Then, as a step towards language teaching using a content textbook, we propose to study how students relate the first sentence to the main idea of a paragraph.

The use of English content textbooks at universities is not entirely uncontroversial. It may present a reading situation quite unlike that by native readers. First of all, students' reading of English content textbooks is often affected by their English reading ability in almost all areas. Students have reported meaning abstraction to be their major area of difficulty (Yang et al., 1994). You et al. (2000) and Huang (2001) estimated the average vocabulary size of Taiwanese technological university students to be about 1,000 and 2,000 respectively, well below the threshold of 5,000. As a result, many students feel that they "partially understand or distort the meaning of their text" (Huang, 2001, p. 442). Ward (2001) noted that students compensate for their failure to read extended text by working on examples instead. To many students, constant guessing has to take place in order to move on and comprehension of the text and acquisition of content knowledge do not necessarily come about as a result.

Secondly, unlike in a typical reading situation, the content textbooks usually play a supplementary role in students' comprehension and acquisition of content knowledge. They tend to count on classroom lectures and notes in their native language. They may use reference books on similar topics in their native language and may even use a translated version of the English textbook (H. Chang, 2001a). It is common for students who don't read the content textbook regularly to perform satisfactorily for the class. Reading of the textbook in the sense of reading the textual material may play only a marginal role in their content learning. Ward (2001) showed that when asked to rank the most useful among parts of a content textbook, 74% of the subjects ranked examples to be the most useful, while only 15% chose the textual part. In addition, although 20% of the subjects claimed that they read the textual material in detail, 76% of them admitted reading it only superficially. In the case when students did read the text, H. Chang (2001b) noted that the questions raised by students were almost exclusively at sentential level.

These findings depict a picture of students engaged in reading in ways

unexpected by the content teacher and the textbook writer. Sadly but true, because the language is quite above their reading capability and the textbook is not an indispensable instrument for passing tests, many of them don't find reading the text really helpful and may resort to evading reading altogether (Ward, 2001). Not being able to read the text prevents the students from understanding the background knowledge in the content field. Students become professionally disadvantaged in career advancement. It is the purpose of this paper to find a way to encourage students to persist on reading despite their inadequate reading ability.

Although it may seem common sense that the main idea of a text is the most important part of the text, the concept of the main idea and how it can be extracted can be rather elusive. Braddock (1974) equated main idea to topic sentence. Ashton, O'Hear and Pherson (1985) defined the main idea to be "that sentence which is general enough to include all of the information provided in a paragraph, but not so general as to be useless" (p. 65). Similarly, Popken (1991) takes the view that the topic sentence is an explicit part of the text that is at the topic level in semantic hierarchy of a paragraph. For this study, I would take as my working definition that the main idea is something that most of the paragraph can be related to. This definition allows the main idea to be either a general topic such as *cowboys*, or a specific topic such as *cowboys have many jobs* (Williams, 1995, p. 25). Ashton et al. (1985) state that "Main ideas . . . must contain a subject and a controlling idea" (p. 61). We would like, however, to adopt a broader definition for our work. Take a look at the following text taken directly from the content textbook (P4 in the test):

> An example of a second-order difference equation is
>
> $$y[n]+y[n-1]+\tfrac{1}{4}y[n-2]=x[n]+2x[n-1] \qquad (2.30)$$
>
> This difference equation might represent the relationship between the input and output signals for a system that processes data in a computer. In this example the order is N = 2 because the difference equation involves $y[n-2]$, implying a maximum memory in the system output of 2. Memory in a discrete-time system is analogous to energy storage in a continuous-time system. (Haykin and Veen, 1999, p. 109)

This paragraph is about how Eq. (2.30) is an example of a second-order difference equation. Having no vigorous training in reading, students tend to take the ubiquitous view that the noun phrase (a subject) *a second-order difference equation* is the main idea of the sentence. We think that a student is able to relate the first

sentence to the main idea of this paragraph if he says, "This paragraph is about ‘a second-order difference equation’" or "The main idea of the paragraph is ‘a second-order difference equation.’"

Researchers have suggested ways that the main idea can be derived or constructed from a paragraph in different ways. Braddock (1974) equated topic sentence of a paragraph to the main idea and stated that it can be constructed from the paragraph in four ways: by having a simple topic sentence (an explicit first sentence serving as the topic sentence), delayed-completion (the first sentence to be completed by later sentences in the paragraph), assembled (to be assembled from various sentences), and implicit (to be inferred from or missing in the paragraph). In this study, we would only look at the situation when the main idea (topic sentence for Braddock) is provided in a sentence explicitly stated in the paragraph, more specifically, the sentence at the first position of a paragraph.

It has long been noted that the first sentence of a paragraph stands out as one most likely to carry the main idea. Although statistics vary by type of articles, the first position in a paragraph is usually the most likely position where the main idea can be found. It was reported that, in introductory sociology textbooks, 95% of the paragraphs contain topic sentences and that 52.9% of the main ideas showed up in the first positions (Popken, 1991; Ashton et al., 1985). In fact, readers often expect the first sentence to help them orient themselves. Thus we think that studying students’ ability to relate the first sentence to the main idea of a paragraph can lead us to better understand their reading behavior and to be able to help resolve their reading problems eventually.

In this section, we have described how students' reading ability is below the threshold level necessary for content reading at university level and how students sometimes evade reading or fail to comprehend what they read. By drawing results from reading research, we pointed out that, as the first step towards extracting the main idea of a paragraph, students should learn to pay attention to its first sentence. It is therefore the purpose of this paper to study how students relate the first sentence to the main idea of a paragraph in actual content reading. We will ask students to read a piece a text, decide if the first sentence represents the main idea of the paragraph and explain why. By comparing their answers and analyzing their mistakes, we hope to identify textual characteristics that contribute to the difficulty in determining the main idea of a paragraph. This design leads students to focus on getting the main idea

of a paragraph and to pay special attention on the role the first sentence plays. By achieving paragraph level comprehension can students move to section- or text-level comprehension. This is an important first step towards reading beyond the sentence level.

Literature Review

A study on how students relate the first sentence to the main idea by EFL students in reading English content textbooks necessarily involves research in many areas. In this section, we divide our review of literature into the use of English content textbooks in the Taiwanese and other EFL/ESL contexts, textbook analysis and the identification of topic sentence and main idea. Research in these areas contributes to and affects our understanding of the content reading of our students.

In an earlier research, M. Chang (1991) interviewed teachers and students in a junior college and suggested offering EST courses to help English content reading. Yang et al. (1994) studied students' reading difficulty level, attitude and motivation and reported that meaning abstraction was the leading cause of difficulty. H. Chang et al. (1996) reported that content teachers tend to project their experience in the use of English content textbook and do not perceive the use as difficult as the students do. Kong (1996) reported widespread use of content textbooks among teachers in two schools and found a big gap between teachers' expectation and students' performance. In a comparative study, Chen (1998) concluded that ESP students in a content-based class outperformed those in non-content-based class. By testing students on physics texts in English, Lin and Kong (2000) concluded that the language is far beyond students' capacity. In a case study, H. Chang (2001a) reported that the content of the textbook was too easy for the students yet the language too difficult. She also suggested that content teachers make reference to the content textbooks when in the class. H. Chang (2001b) reported English teaching by answering questions that students asked based on the content textbook. She argued that the approach meets the short term need of resolving students' reading problems and the long term need of teaching topics deemed important by the ESP teacher.

The study on the use of English content textbook is also quite widespread elsewhere around the world. Reporting a series of studies on content text reading in different disciplines, Cohen et al. (1988) noted that students had difficulty with heavy noun phrases, cohesion and nontechnical vocabulary in content texts. They concluded by suggesting that, instead of asking what the problematic areas are, it may be more

fruitful to ask how students go about solving problems in reading. Flowerdew (1993) documented how a content-based language instruction program evolved at a Gulf university where English is the medium of instruction. After two years of implementation, the reading texts were simplified to contain fewer pages, more reader-friendly layout, better paragraph and text organization, and simplified syntax. Using tests based on General Service List and the University World List, Nurweni and Read (1999) reported Indonesian university students' vocabulary size to be around 1,200, far below the threshold level. They also suggested ways to improve vocabulary knowledge. Recently, Ward (2001) studied Thai students' attitude towards the use of a Chemistry textbook. He noticed that the texts were too difficult because students were below certain threshold. Students were not reading the text as they are supposed to and many used the text to "confirm what they already know from the lectures" (p. 147). He suggests that EFL students' reading problems "are primarily linguistic" (p. 147). These findings are in agreement with those reported locally in H. Chang (2001a) and Huang (2001).

Besides students, the textbook is the other player in the reading situation. Staver and Lumpe (1993) examine twenty-nine chemistry texts to study the ways of presenting the mole concept in introductory chemistry texts. They discuss how well the presentation connects to previously developed concepts in chemistry. Their results are more related to science teaching than to language teaching. Love (1991) examines two introductory geology textbooks and found the concept of process-product to be prevalent throughout the books. She points out that such kind of analysis may help ESP teachers improve student literacy in new areas of study. Henderson (2000) comments on two studies on metaphorical analysis (of words like *equity, cash flow, currency,* etc) of economics textbooks and how they may help students understand the content knowledge. Results from these two works may help set up the appropriate content/subject schema necessary for successful content reading (Love 1991).

Previous works in reading have offered abundant insights that may help teachers navigate through the maze of teaching content reading at an EFL environment. Of particular relevance to this paper are works on the identification of topic sentence and main ideas. Dishner and Readence (1973) proposed an eight-step procedure to help students identify main ideas. The procedure calls for identifying the key words or topic of a sentence and then moves up to recognizing and inferring the main idea of a

paragraph. Specifically students read first and then write at different levels so as to eventually converge at the main idea of the paragraph. They admit that students would "have to be 'walked through their procedure'" (p. 10) in order to master the skill. A fool-proof procedure to identify main ideas has yet to be found. Braddock (1974) adopted the view that a topic sentence may be implicit and may need to be delayed-completed, assembled or inferred. His found that topic sentences do not occur as often as many researchers had believed nor do they show up in the presumed place as often. He felt, however, that the writing of many of essays would have been clearer to read if the authors had used more explicit topic sentences at the more favorite (paragraph-initial) position. Similarly, Popken (1991) reported that topic sentences were not used in his corpus of nonacademic context as often as those found in other types (academic, journalistic, scientific and technical) of writing. In addition, he found topic sentence frequency to be related to genre type and paragraph length. Ashton et al. (1985) equated the main idea of a paragraph with the sentence that carries it and studied how clues suggested by reading texts work in three sociology textbooks. They found that 52.9% of the time the main idea appears in the first sentence of a paragraph. They reported that paragraphs without stated main ideas seldom contain important material. Although the statistics vary among different text types, the first position of a paragraph is more likely to contain the main idea or the topic sentence of a paragraph than any other positions.

In this section, we reviewed literature on the use of English content textbooks, textbook analysis, and the identification of topic sentence (main idea) and the unique role the first sentence plays in carrying the main idea. Despite the fact that reading research is a well-established area, relatively few have dealt directly with how EFL students actually interact with their English content text. In this study, we have endeavored to incorporate the student, the text and the reading, with the hope to address content reading directly. In the next section, we will show our methodology.

Methodology

In this study, subjects are asked to take a test that asks them if the beginning of a paragraph summarizes the paragraph or if it is the main idea of it. Students are also required to explain their answers.

Participants

Twenty-two electronic engineering students took part in this study. They were

enrolled in an EST class offered by this author as an adjunct class to the content course Signals and Systems. The author-teacher, who has background in general science, also served as the grader for the test.

Instrumentation

The test consists of an example and 10 questions that refer to the beginning 12 paragraphs from a section in students' content textbook (see Introduction and Discussions sections for some paragraphs). For each question, students are asked to decide if the first sentence of the paragraph summarizes or gives the main idea of it. P1 (Paragraph 1) was used as an example in the test and P7 was excluded from the test because it is a two-sentence introduction to a subsection[1].

Procedure

During the test, students were asked to refer to the first 12 consecutive paragraphs of a section in their content textbook, decide whether the first sentence summarizes the paragraph or it is the main idea of the paragraph (the yes/no part of the question), and explain their answers by referring to the paragraphs in the book. The test was open-book (dictionary and notes included) and students could discuss in pairs or threes. There was no time limit. Referencing and discussion were allowed so as to emulate actual reading situation.

After the test, the researcher consulted the content teacher and graded the tests, assigning marks ranging from 0 to 1 depending on how well the explanation matches against the yes/no part of the question and the associated paragraph. When the main idea of a paragraph includes a predicate and its arguments, a half point is taken off for missing the predicate. A small fraction of a point is usually awarded for writing down some relevant expressions but falling to relate them to the question. Since explanations of why a sentence is or is not a summary of a paragraph may vary greatly, marks were assigned based on how a student's explanation compared to those of other students. (See Appendix for a sample of students' answers to for P11.) Thus the marks served as an indicator of how well a student relates the first sentence to the main idea of a paragraph and how his explanation compared to other students' when his explanation is somewhat flawed.

[1] Ashton et al. (1985) excluded chapter summaries from their study of finding main idea clues because "summaries, by their very nature, tend to be one sentence paragraphs or to contain a wide range of sentences with little unification (p.61)." P-7 happens to be a two-sentence summary paragraph.

Results

Students' marks are summarized in Table 1. A total of 10 paragraphs (questions) were used in the test, each worth 1 point. The total mark column shows students' total marks out of a maximum of 10 points. The student rank column shows their ranks, ranging from 1 to 22. The average mark row shows the average mark for each paragraph and the paragraph rank row shows their difficulty level in the test, ranging from 1 to 10. The highest and lowest total marks are 5.7 and 0.4 (all marks rounded), earned by student 3 and student 9. Raw marks were not rounded while averages were. P6 and P12 are the most difficult paragraphs (average mark = 0.08) while P4 is the easiest. The standard deviation for the marks is 1.48 (not shown).

Table 2 summarizes correlation between the average mark and a number of readability factors. The correlation is low across the board. There is little correlation between the average mark and the number of lines, the number of words, the number of sentences and the number of finite clauses for the paragraph. Correlation is also low between the average mark and the number of words of the first paragraph.

Table 1 Students' marks

	Paragraph										Total	Student
Student	2	3	4	5	6	8	9	10	11	12	mark	rank
1	0	0.8	1	0	0.1	0	0	0.9	0.9	0	3.7	9
2	0	0.8	0.9	0	0.1	0	0	0.9	0.9	0	3.6	10
3	1	0.9	0.7	0	0.1	1	0.9	0.9	0.2	0	5.7	1
4	0.9	0.95	0.2	0.5	0.1	1	0.95	0.9	0.2	0	5.7	2
5	1	0	1	0.8	0.05	0.3	0	0	0	0	3.2	13
6	0.4	0	0	0.6	0.1	0.9	0.8	0	0	1	3.8	8
7	1	0	0.2	0.5	0.15	0	0.1	0	0	0	2.0	17
8	0	0.9	0.5	0.5	0.1	1	0.1	0	0.1	0	3.2	12
9	0	0	0.2	0	0.1	0	0.1	0	0	0	0.4	22
10	0	0.1	0.2	0	0.1	0	0.1	0	0	0	0.5	21
11	0	0.1	1	0	0.1	1	0	0.5	0.75	0	3.5	11
12	0	0.1	1	0	0.1	1	0.1	0.9	0.75	0	4.0	7
13	1	0.85	0	0	0	0	0	0	0	0	1.9	18
14	0.9	0.85	1	0	0	0	0	0	0	0	2.8	15

15	1	0.8	1	0	0.05	0.9	0.1	0	0.1	0.2	4.2	5
16	0	0.95	1	1	0.05	1	0.1	0	0.25	0.2	4.6	3
17	1	0.1	1	0.8	0.05	0.2	0.1	0.9	0.1	0	4.3	4
18	1	0.65	1	0.2	0.1	0.85	0	0	0.1	0.1	4.0	6
19	0.8	0	0	0	0	0.9	0.1	0	0	0	1.8	19
20	0	0	0.5	0	0.2	0	0.1	0	0	0	0.8	20
21	0	0	0.9	0.2	0.1	0.8	0	0	0	0	2.0	16
22	0	0	0.9	0.2	0	1	0.1	0	0.5	0.2	2.9	14
Average	0.46	0.40	0.65	0.24	0.08	0.54	0.17	0.27	0.22	0.08	3.10	NA*
Rank	3	4	1	6	10	2	8	5	7	9	NA	NA

NA*: Not applicable

Table 2 Correlation between average mark and basic textual factors

Paragraph number	2	3	4	5	6	8	9	10	11	12	Correlation
Difficulty rank	3	4	1	6	10	2	8	5	7	9	NA
Average mark	0.455	0.40	0.65	0.24	0.08	0.54	0.17	0.27	0.22	0.08	NA
Lines / paragraph	8	8	7	14	12	12	6	7	6	3	0.16
Words / paragraph	98	100	66	141	158	148	70	72	57	37	0.10
Sentences /paragraph	6	6	4	11	8	7	4	5	3	2	0.06
Finite clauses /paragraph	11	9	6	10	12	13	7	9	5	5	0.20
Words / f-sentence	23	14	9	24	18	37	12	14	20	20	0.12

Since the correlation was low, we turned to other causes that might have caused the difficulty. Closer examination of students' written explanation suggested that they tend to make more mistakes when the first sentence or the paragraph is of certain characteristics. To investigate the effects of these characteristics, we used *yes/no* to classify if the paragraph is about a noun phrase, if the first sentence carries the main

idea, and if the first sentence has two clauses (Table 3). We then ran single factor ANOVA on the three factors and obtained Tables 4-6. In the three cases, we found P values to be low enough (< 0.1) to suggest that the difference in student performance was significant.

Table 3 Some characteristics of first sentence and paragraph

Paragraph number	2	3	4	5	6	8	9	10	11	12
Paragraph about NP	YES	NO	YES	NO	NO	YES	NO	NO	NO	NO
F-sentence carries main idea	YES	YES	YES	YES	YES	YES	NO	NO	YES	YES
Two clauses in f-sentence	YES	NO	NO	NO	YES	NO	YES	NO	YES	YES

Table 4 ANOVA on whether the paragraph is about a noun phrase or not

Source	DF	Sum of Squares	Mean Square	F Value	P Value
Model	1	2.63	2.63	17.90	< .0001
Error	218	32.02	0.15		
Corrected Total	219	34.65			

Table 5 ANOVA on whether the first sentence carries the main idea or not

Source	DF	Sum of Squares	Mean Square	F Value	P Value
Model	1	0.45	0.45	2.87	< .0917
Error	218	34.20	0.17		
Corrected Total	219	34.65			

Table 6 ANOVA on whether the first sentence with or without two clauses or not

Source	DF	Sum of Squares	Mean Square	F Value	P Value
Model	1	5.27	5.27	39.12	< .0001
Error	218	29.38	0.13		
Corrected Total	219	34.65			

Number of observations: 220

Discussions

In the previous section, we presented descriptive statistics of students' marks, correlation between marks and some readability factors, and ANOVA results on marks and some factors suggested by students' written explanation. The average

total mark was 3.098 out of 10 and the lowest 3 total marks were less than 1. Although it was a known fact that the difficulty level was quite above students' reading ability and that the text was not their major source of content knowledge, that students performed as poorly as they did in a language test concerning main ideas still came as a disappointment. The low marks here probably should not be taken as a reflection of students' content ability but rather as a reminder that a lot more research and teaching needs to be done in this area. In this section, we will discuss causes behind our results and suggest pedagogical implications in the classroom, drawing freely evidence from the tables, explanations given by the students in their test papers and other relevant information about them.

In Table 4, we tried to determine the effect of when the main idea of the paragraph is about a noun phrase (paragraphs 2, 4, and 8 as seen in Table 3), versus when it is a statement about a noun phrase. ANOVA results showed this difference to be significant in determining student marks. Students performed better when the main idea of the paragraph is about a noun phrase. We mentioned in Introduction that we would allow the main idea of a paragraph to be just about a noun phrase because the situation is not uncommon in scientific texts. We used P4 as an example of a paragraph being about a noun phrase. Here we show P11, of which the main idea is a predication, not a noun phrase:

> The form of the natural response changes slightly when the characteristic function described by Eq. (2.32) or Eq. (2.34) has repeated roots. If a root r_j is repeated p times, then we include p distinct terms in the solutions Eqs. (2.31) and (2.33) associated with r_j. They involve the p functions
>
> $$e^{r_j t}, t e^{r_j t}, \ldots, t^{p-1} e^{r_j t}$$
>
> and
>
> $$r_j^n, n r_j^n, \ldots, n^{p-1} r_j^n$$
>
> respectively. (Haykin and Veen, 1999, p. 114)

This paragraph and its first sentence are about a predication, a relationship between the predicate and its argument: how natural response changes when an equation has repeated roots. It is not about repeated roots. Of the 22 students, 9 mentioned the relationship, 7 thought the paragraph is about repeated roots, 1 thought it is about another noun phrase, and the remaining 5 were either non-answers or no-answers. The tendency to favor a noun phrase becomes more obvious with P12 below:

> The nature of each term in the natural response depends on whether the roots r_i are real, imaginary, or complex. Real roots lead to real exponentials, imaginary roots to sinusoids, and complex roots to exponentially damped sinusoids. (Haykin and Veen, 1999, p. 114)

The average mark for P12 was 0.08, the lowest (most difficult) of all paragraphs. P12 and its first sentence are about how "the nature of each term" varies depending on certain condition. It's about how different roots lead to terms of different forms. Only 1 student was able to recognize the predication, 4 marginally touched it, while 15 quoted the 3 kinds of roots (noun phrases) as the main idea. In contrast, P4 and its first sentence are about a noun phrase, and it is the one question that students scored the highest in the test. Paragraphs 2, 4, and 8 are all about noun phrases and their associated marks were higher than the other paragraphs that are about predicating. Students had more difficulty when a paragraph is about predication and less difficulty when it is about a noun phrase. They seem to favor to use a noun phrase as the main idea.

When analyzing the test papers, we noticed that students performed better when the first sentence summarized or predicted what was in the paragraph. In other words, students had more difficulty when the first sentence does not carry the main idea of the paragraph. Note that marks were assigned based on their answers to the *yes/no* part of the questions and their explanation as well. Lower marks, 0.17, 0.268 respectively, were found for the only two paragraphs for which the answer is *no*, P9 and P10. The first sentences of these two paragraphs provide a condition that is to be used later to derive the particular solution with the initial conditions given. They help make the transition. But they do not summarize the paragraph or give the main idea. Students' performance declined when they have to recognize and explain why the first sentence did not summarize or predict the rest of the paragraph. Thus in Table 5, when we tried to determine if student performance would differ if the first sentence summarizes the paragraph or gives the main idea of the paragraph, we found the P value to be smaller than 0.0917, rejecting the null hypothesis. This situation in part reflects what some researchers have pointed out that the first position is the preferred position to carry the main idea. It also suggests that students should be forewarned of the possibility when the first sentence does not carry the main idea of the paragraph.

Closer examination of students' explanation and mistakes seemed to also suggest

another cause for explanation of the marks. Thus, in Table 6, we tried to decide, if the first sentence is grammatically more complex (indicated by the number of clauses), would the students have more difficulty deciding if it summarizes and/or predicts the content of the paragraph. ANOVA results showed the P value to be smaller than 0.0001, rejecting the null hypothesis. It seems that the more clauses the first sentence contains, the more difficult it becomes to decide if it summarizes or carries the main idea.

One should, however, be reminded that not all clauses contribute equally to the difficulty of meaning abstraction. Table 7 lists all of the first sentences containing more than one clause, the type of their dependent clause, the average mark, and the number of students' references to the dependent clause. Among these five first-sentences, FS2 (first sentences 2) and FS6 contain an adjective clause (that-clause), FS9 and FS11 contain an adverb clause (when-clause) and FS12 contains a noun clause (Azar, 1981). An adjective clause "describes, identifies or gives further information about a noun" (Azar, 1981, p. 209). Since a dependent clause (adjective) serves to provide further information about a noun phrase, its contribution to the main idea of the paragraph is secondary to that of the independent clause. Thus it would be acceptable not to refer to the adjective clause when one tries to figure out the main idea of a paragraph. The rightmost column in Table 7 shows that most students were doing the right thing by not referring to the adjective clause in FS2 and FS6. (The difference in average marks between P2 and P6, however, should probably be attributed to the fact that P2 was about a noun phrase while P6 was about a predication and that its first sentence was descriptive in nature.)

FS9 has an adverbial clause, *when the input is zero*, which is fairly easy to understand for the students and is important in determining if FS9 summarizes or predicts the paragraph. The rest of the paragraph explores the mathematical property of the natural response based on the condition *when the input is zero*. Only 4 students mentioned the adverbial clause, while 19 students made reference to *natural response*. Students had no problem understanding the surface meaning of the clause and yet they failed to see that it is an important precondition for deeper discussion on natural response (in a continuous system) in the later part of the paragraph. Most students skipped something that looked trivial and focused only on a familiar technical term, *natural response*. The term is important in the sense that the entire section, and even the entire chapter, is about it. Saying that *natural response* is what the first sentence is

about and it is the main idea of the paragraph would be saying something so general as to be useless (Ashton et al., 1985). This phenomenon can be looked at two ways. First, students may not be as sensitive to mathematical conditions anyway. They would make similar mistakes with Chinese texts, too. Thus it is a content/math problem. Secondly, students may be insensitive to the functions served by an adverbial clause in English. They might have wanted to turn to something else for the main idea because *when the input is zero* looked too mundane to carry anything important. Failure to see the importance of the adverbial clause resulted in failure to see the main idea of the paragraph. This could be a content/mathematics problem, or it could also be a language use problem.

Table 7 First sentences containing a dependent clause

FS containing a dependent clause (dependent clause in bold)	Dependent clause type	Average mark	Number of references to DC
2. As an example of a differential equation **that describes the behavior of a physical system,** consider the RLC circuit depicted in fig. 2.2(a).	Adjective	0.45	7
6. The initial conditions summarize all the information about the system's past **that is needed to determine future outputs.**	Adjective	0.08	2
9. The natural response is the system output **when the input is zero.**	Adverb	0.17	4
11. The form of the natural response changes slightly **when the characteristic function described by Eq. (2.32) or Eq. (2.34) has repeated roots.**	Adverb	0.22	20
12. The nature of each term in the natural response depends on **whether the roots r_i are real, imaginary, or complex.**	Noun	0.08	20

The rightmost column in Table 7 also shows that 20 students made reference to the dependent clause in FS11 and FS12 respectively, while only 7 and 2 students did the same thing with FS2 and FS6. In FS11 and FS12, students overwhelmingly mistook the dependent clause as the main-idea conveying clause and overlooked the main clause. Little mention was made of the main clause. For example, most

students thought P11 was about repeated roots and P12 was about three types of roots when, in fact, the dependent clauses about different roots only provide the context for discussion about how the form of the natural response changes and how the nature of a certain term changes. Although a dependent clause serve a particular function in a sentence (such as showing time, cause and effect relationships, opposition, condition, as an argument to a predicate, etc. (Azar, 1981)), its importance does not surpass that of the independent clause. Students should direct their focus towards the main clause, while keeping an eye on how the dependent clause can be related to it.

In the section, we analyzed and discussed our results based on Tables 1-7, drawing evidence from students' explanations. We found the following to be important factors in students' ability to relate the first sentence to the main idea of a paragraph: Whether the main idea is a predication or just a noun phrase, the grammatical complexity of the first sentence (number and types of clauses) and whether the first sentence carries the main idea or not. Although detailed sentence level analysis may help, what's more important may be the ability to analyze the first sentence in terms of types of clauses and to see relation among clauses and relation between clauses and the main idea of the paragraph. From a pedagogical point of view, moving students' attention to clause level is a first step towards meaning abstraction at paragraph and section levels.

Limitations

Due to the preliminary nature of this research, our findings are limited by the representation of subjects and the coverage of the text. Since this research is ESP oriented and it is about content reading, the subjects are necessarily those involved in the same content course. I had used all twenty-two students enrolled in the adjunct EST class as subjects. The remaining students in the content class, by choosing not to take the optional EST class, tend to have quite different English characteristics from the subjects. For example, poorer English readers may choose not to take the elective EST class for fear of failing the course. Thus our subject selection excluded this kind of students. A study of these students might reveal performance problems of different kinds.

Another source of limitation of this research originates from our coverage of the text. Since we set out to investigate students' actual reading process, we used the section of text from their content book that was under discussion by the content teacher at the time of the test. It was not a carefully selected text except that we

made sure it was a continuous span of text so as to better represent actual reading situation. Its textual characteristics may be quite different from other parts of the book. For example, mathematical derivation happens to abound in this part of text. Many subjects failed to recognize the importance of a condition embedded in the adverbial clause of the first sentence prior to the derivation and missed the main idea of the paragraph, resulting lower marks. Future research may address the coverage issue by expanding the coverage in two directions. For one, a more thorough sampling of the textbook (or even more textbooks) may provide a better picture of the range of reading problems. The other direction for sampling would be along the line of text type. Textbooks have traditionally been treated as a genre (Swales, 1995; Paltridge, 1996). More focused research along text types such as mathematical derivation, procedure, description, exposition, problem-solution (Paltridge, 1996), may prove to be pedagogically more productive.

Conclusions

We pointed out in the beginning of the paper that English content textbook reading is beyond many EFL students' reading ability. By asking students to determine whether the first sentence is a summary of a paragraph or represents its main idea and to explain their answers, we were able to lead them to read beyond sentence level. After analyzing their responses, we found a number of factors to be affecting the performance: the structure of the first sentence (Is it a one- or two-clause sentence? Is it a predication about a noun phrase?), and the structure of the main idea (a predication or just a noun). We discussed the possible causes and pointed out how teaching can be improved based on these findings. English content textbook reading by EFL students is an extremely complicated and difficult task. Given the fact that students are ill-prepared for this very important task anyway, they should be taught and encouraged to read beyond sentence level. The method presented in this study is only one way of getting them to do it. The findings reported here reflect only the performance of students reading a piece of content text in an EST classroom. More research in a wider range of text types involving more students will help make content textual reading beyond sentence level a reality among EFL content students.

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Appendix

Sample student explanations (from paragraph 11)

Student	Student explanations
1	第一段說明 當特性方程式由 Eq. (2.32) 及 Eq. (2.34) 解題時，產生重根，則自然響應會有些微變化 其後提到 root r_j is repeated p times, then we include p
2	第一段說明 當特性方程式由 Eq. (2.32) or Eq. (2.34) 產生重根，則自然響應會有些微變化。 其後又提到 root r_j is repeated p times, then we include p distinct
3	第一句提到 repeated roots，之後立即提到 r_j is repeated p times
4	第一句提到 repeated roots，之後立即針對 r_j is repeated p times, 的情況做討論
5	第一句提到 characteristic equation，之後也提到
6	把(2.32) 和 (2.34) 和 natural response 的 關係說明完了
7	第一句 The form of the natural response changes slightly 離散與連續時間的公式有關 p functions
8	第一句提到 repeated roots，後面即說明此 root 的寫法
9	NULL
10	NULL
11	第一句說明 the characteristic equation has repeated roots，之後則在介紹如果一個根重複 p 次的情形
12	第一句說明 the characteristic equation has repeated roots，之後則在介紹如果一個根重複 p 次的情形
13	NULL
14	第一句指出，該段的理論基礎來自何處， 而後面的句子也依此發揮。
15	因第一句有提到 (repeated roots)重根，之後馬上提到重根
16	第一句提到 Eq. (2.32)和 Eq. (2.34)有重根，之後便針對此重根特性探

討，例 If a root r_j is repeated p times,....