

## Chapter Four

### Results and Discussion

This chapter presents the results, interprets the findings, and attempts to address the research questions stated in Chapter One. It centers around three issues: (a) the effects of conjunctions on Taiwanese EFL students' comprehension in reading expository texts, (b) students' comprehension difficulties with the four types of conjunctions of logical relations, and (c) students' favoring selections of types of conjunctions.

#### *The Effects of conjunctions on Taiwanese EFL Students' Comprehension in*

#### *Reading Expository Texts*

The first research question to be addressed in present study focused the effects of conjunctions on reading comprehension. Its main concern was whether expository texts with conjunctions facilitated reading comprehension. Students' global and local understanding of the texts as well as their English reading proficiency was further investigated.

**Results.** Table 3 presents the total mean scores and standard deviations of the testing texts with and without conjunctions. A paired *t*-test was employed to indicate the significant difference between them ( $p < .001$ ). Table 4 reports the students' comprehension of main ideas and detailed information of the texts. A paired *t*-test points out that conjunctions also make a significant difference in global and local understanding ( $p < .001$ ).

Table 3

*t*-test Results for the Differences Between Testing Texts With / Without Conjunctions

<i>Conjunctions</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>t-value</i>	<i>Sig.</i>
With	14.2	3.4	67	-5.4	.000***
Without	12.3	3.9	67		

Note. Total scores=20

\*\*\*Significant at  $p < .001$

Table 4

*t*-test Results for the Global and Local Understanding of the Texts With / Without Conjunctions

<i>Conjunctions</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>t-value</i>	<i>Sig.</i>
Main Idea					
With	6.0	2.3	67	-4.5	.000***
Without	4.8	1.7	67		
Details					
With	8.2	2.0	67	-3.8	.000***
Without	7.4	2.7	67		

Note. Scores for each=10

\*\*\*Significant at  $p < .001$

**Discussion.** The results show that conjunctions do make a significant difference in students' reading comprehension in expository texts, no matter in understanding of main ideas or detailed information. The scores of the testing texts with conjunctions are significantly higher than those without, explaining that conjunctions play a facilitating role in reading comprehension. The results of this study are quite consistent with those of Degand et al (1999). In other words, the findings suggest that the students rely on logical conjunctions to discover the meaning of the text when encountering the content with which they are unfamiliar. They also prove the

assumption that text devices that make the relation between concepts explicit are more beneficial to the readers.

However, Table 4 revealed an interesting finding deserved to be explored more deeply. By comparing the mean scores of main idea and detailed information, the former ones are lower than the latter ones. A *t*-test was further applied to examine if there was significant difference between them. The results (as shown in Table 5) illustrate that whether there are conjunctions or not, students' performance in questions for details were significantly better than in questions for main ideas, accounting for the fact that global understanding are significantly more difficult than local understanding for the students when they try to figure out the texts which they could not be easy to make inferential connections based on the activation of generic world knowledge. This situation can be explained by playing a jigsaw puzzle. Students start the game by putting small bits and pieces together, so they may have a chance to see some parts of the picture. However, it takes time and efforts to put all the pieces together. If they fail to complete or at least complete almost all the pieces, they are not able to get a chance to see the whole picture, and they can only use their imagination to dream of what the picture is like. Sure enough, the "dreamed picture" is not necessary the "real picture." This finding suggests that even though conjunctions contribute to comprehension of expository texts, they are not magical enough to help students comprehend main ideas and details equally well.

Table 5

*t*-test Results for the Differences Between Global and Local Understanding of the Texts With / Without Conjunctions

<i>Type</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>t-value</i>	<i>Sig.</i>
With					
Main Idea	6.0	2.3	67	-10.0	.000***
Details	8.2	2.0	67		
Without					
Main Idea	4.8	1.7	67	-10.0	.000***
Details	7.4	2.7	67		

Note. \*\*\*Significant at  $p < .001$

***Is there any difference between high achievers and low achievers?*** The

previous findings suggest that students benefit from conjunctions in reading comprehension. However, the factor of levels of proficiency has not been taken into consideration. To investigate the differences between high and low proficiency groups, the researchers presented the results of the two groups and had discussion of them.

***Results.*** Table 6 reports the mean scores and standard deviation of the texts with / without conjunctions from the high group and the low groups respectively. A paired *t*-test was run on the data, revealing that conjunctions make a significant difference in both groups (high group=  $p < .05$ , low group=  $p < .01$ ). The low group, however, achieves greater difference than the high group in comprehension of the texts with conjunctions. Table 7 divides the reading comprehension in global understanding and local understanding. A paired *t*-test indicates that conjunctions only make a significant difference in the high group's global understanding ( $p < .05$ ), but not in their local understanding ( $p > .05$ ). On the contrary, it points out that

conjunctions do not make a significant difference in the low group's global understanding ( $p > .05$ ), but in their local understanding ( $p < .01$ ).

Table 6

*t*-test Results of the High Group and Low Group's Reading Comprehension of the Texts With / Without Conjunctions

<i>Conjunction</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>t-value</i>	<i>Sig.</i>
High					
With	16.3	2.1	21	-2.3	.032*
Without	15.0	1.8	21		
Low					
With	11.3	3.1	20	-3.2	.005**
Without	8.9	3.6	20		

Note. \*Significant at  $p < .05$ , \*\*Significant at  $p < .01$

**Discussion.** The results of Table 6 exemplify that logical conjunctions play a facilitating role in the comprehension of reading expository texts for both high achievers and low achievers. In other words, conjunctions seem to make no difference between the two groups. However, interestingly, Table 6 indicates that the low group relies more heavily on conjunctions than the high group. This finding suggests that students of high proficiency level choose to devote all available processing resources to understanding the semantic relationships being conveyed by the content words in the text. That is, they manage to get the whole picture by paying more attention to the content words, even though logical conjunctions are beneficial in their comprehension. On the other hand, it may be the case that the students of low proficiency level pay equal attention to every word. Because they dare not make inferences and guesses from the content words, conjunctions are more unlikely to be neglected and thus play

a crucial role in their reading comprehension.

Table 7

*t*-test Results of the High Group and Low Group's Global and Local Understanding of the Texts With / Without Conjunctions

<i>Conjunction</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>t-value</i>	<i>Sig.</i>
<b>High Group</b>					
Main Idea					
With	7.2	1.3	21	-2.4	.024*
Without	5.9	1.7	21		
Details					
With	9.1	1.0	21	-.2	.083
Without	9.0	1.0	21		
<b>Low Group</b>					
Main Idea					
With	4.7	2.0	20	-1.9	.079
Without	3.7	1.5	20		
Details					
With	6.5	2.0	20	-3.6	.002**
Without	5.1	2.5	20		

Note. \*Significant at  $p < .05$ , \*\*Significant at  $p < .01$

The results of Table 7 support this prediction. Conjunctions have a significant positive effect on higher achievers' global understanding of the expository texts, while they do not make any difference their local understanding. Conversely, conjunctions are significantly beneficial to lower achievers' local understanding, whereas they are of no help to their global understanding. This finding explains that higher achievers focus on and integrate content words to comprehend the texts during the reading process. They regard logical conjunctions as something helpful to their understanding instead of something essential in their comprehension. That is to say, higher achievers

ignore the existence of logical conjunctions during the reading process, but they attempt to count on them when they need to have an overall and thorough understanding of the texts. For them, the role of conjunctions is neglectable but helpful when necessary. On the other hand, lower achievers take conjunctions too seriously. They regard conjunctions as important as content words, which enable them to fully understand each sentence or every detail of the texts but lead them to go out of the focus of the messages to be conveyed. In other words, lower achievers adopt a bottom-up approach. But they still stay at the stage of putting up bits and pieces of information and have not reached up to the stage of integrating all the information. This accounts for the facilitation of logical conjunctions in local understanding and the uselessness of them in global understanding for lower achievers. From the discussion above, the researcher proposed the following assumption: in the reading process logical conjunctions play a flexible facilitating role, which benefits students of high proficiency level in high-level comprehension while which aids students of low proficiency level in low-level comprehension. Hopefully, the comparison between students' performance in questions for the main ideas and detailed information in next section will prove it.

**Results.** Table 8 demonstrates the paired *t*-test results of students' global and local understanding of expository texts with conjunctions as the independent variable. By comparing all the mean scores, both high and low groups perform better in questions for main ideas than questions for detail information. The results of the high group are just the same as those of all subjects (as shown in Table 5). Whether there are logical conjunctions or not, their global and local understanding achieves

significant difference ( $p < .001$ ). However, the results of the low group vary. Their global and local understanding of the texts with conjunctions achieves greater significant difference ( $p < .01$ ) than that of the texts without conjunctions ( $p < .05$ ).

Table 8

*t*-test Results of the High Group and Low Group: the Differences Between Global and Local Understanding of the Texts With / Without Conjunctions

<i>Type</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>t-value</i>	<i>Sig.</i>
<b>High Group</b>					
With					
Main Idea	7.2	1.7	21	-4.5	.000***
Details	9.1	1.0	21		
Without					
Main Idea	5.6	1.7	21	-7.7	.000***
Details	9.0	1.0	21		
<b>Low Group</b>					
With					
Main Idea	4.7	2.0	20	-3.8	.001**
Details	6.5	2.0	20		
Without					
Main Idea	3.7	1.5	20	-2.5	.023*
Details	5.1	2.5	20		

Note. \*Significant at  $p < .05$ , \*\*Significant at  $p < .01$ , \*\*\* Significant at  $p < .001$

**Discussion.** This finding suggests that logical conjunctions have different effects on reading comprehension for higher achievers and lower achievers. For higher achievers, in the texts with and without conjunctions, their performance in the questions for main ideas and detailed information both achieve significant difference ( $p < .001$ ). Namely, logical conjunctions are not necessary the main factor which affects their comprehension of expository texts. What affects their comprehension



more is probably something else. This finding proves that logical conjunctions play a facilitating, but not a determinative role in reading comprehension (as discussed in Table 7). On the contrary, for lower achievers, their performance in the questions for main ideas and detailed information achieve statistically significant difference  $p < .01$ , in the texts without conjunctions, but not in the texts with conjunctions. This expresses that a reader gains significantly more aids from logical conjunctions in combining bits and pieces of information than overall understanding of the passages. In other words, logical conjunctions are decisive in determining global and local comprehension of the expository texts. In conclusion, the findings and discussion of Table 7 and Table 8 altogether support and prove the researcher's previous assumption: in the reading process, logical conjunctions play a quite flexible role, which benefits students of high proficiency level in high-level comprehension, i.e. global understanding of the texts, while which aids students of low proficiency level in low-level comprehension, i.e. local understanding of the texts.

The findings discussed in the section suggest that logical conjunctions are helpful to students' comprehension in reading expository texts. However, they benefit the high group and low group in different aspects. Higher achievers improve more in global understanding than local understanding of the texts whereas it is the other way around for the lower achievers.

### ***Students' Comprehension Difficulties with the Four Types of Conjunctions of Logical Relations***

The second research question to be addressed in present study focused on comparing the sequence of the comprehension difficulty among the four types of

logical conjunctions. That is, which types are more easily understood by the EFL students and which types are more challenging? Students' English reading proficiency was explored as well.

Table 9

## ANOVA Results of the Four Types of Logical Conjunctions

<i>Category</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>F</i>	<i>Sig.</i>
Temporal	.429	.251	41		
Adversative	.358	.206	41		
Additive	.500	.255	41	7.24	.000***
Causal	.256	.142	41		

Note. Mean scores are presented with rate of correctness.

\*\*\*Significant at  $p < .001$

**Results.** Table 9 presents the mean scores and standard deviation of the four types of logical conjunctions. Students of high and low proficiency levels are observed together. A one-way analysis of variance (ANOVA) was employed to indicate the significant difference among the four types of conjunctions [ $F(3, 160) = 7.24, P < 0.001$ ].

Table 10 illustrates the comparison of each type of logical conjunctions. A post hoc LSD indicates conjunctions of temporal relations are significantly different from conjunctions of causal relations ( $p < .01$ ), but not from conjunctions of adversative and additive relations ( $p < .05$ ). In addition, conjunctions of adversative relations achieve significant difference from conjunctions of additive relations ( $p < .001$ ), but not from conjunctions of causal relations ( $p < .05$ ). Finally, conjunctions of additive and causal relations are significantly different as well ( $p < .001$ ).

Table 10

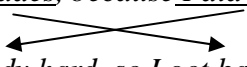
## Post hoc LSD Results of the Four Types of Logical Conjunctions

<i>Category A</i>	<i>Category B</i>	<i>M (A-B)</i>	<i>Sig.</i>
Temporal	Adversative	.071	.142
	Additive	-.071	.146
	Causal	.143	.004**
Adversative	Additive	-.142	.004**
	Causal	.720	.139
Additive	Causal	.214	.000***

Note. \*\*Significant at  $p < .01$ , \*\*\*Significant at  $p < .001$

**Discussion.** All these results revealed an approximate ascending sequence of comprehension difficulty for the four types of logical conjunctions: additive, temporal, adversative, and causal. However, there is no significant difference between additive and temporal, temporal and adversative, adversative and causal relations. This pattern was presented fairly consistently with the Pretorius' study (2006) in that additive and temporal relations are easier to be perceived, while adversative and causal relations proved to be more challenging. These findings provide some insight into the construction process of reading. As the concept of the cognitive load proposed by Ozono and Ito (2003), the cognitive load of logical conjunctions is inclined to vary in response to the interplay between the direction of perception (i.e. the direction of eye movement along the text) and the direction of reasoning within the reader's mind. In the setting of additive and temporal relations, that the direction of perception is corresponding to the direction of reasoning leads to smaller cognitive load, which makes these two types of logical relations comparably easier. On the other hand, the

opposite directions in the setting of adversative relations, which take up bigger cognitive load, contribute to more challenges for the reader to comprehend. Similar notions, proposed by Vonk & Noordman, (1990) is that recognition of an adversative relation may require a more complex backward search and computation of the meaning of surrounding content than the additive. As for causal relations, the situation is far more complicated. *Because* is on the counter way to *so*. Take the following two sentences for example.

1. *I got bad grades, because I did not study hard.*
  2. *I did not study hard, so I got bad grades.*
- 

*Because* is similar to adversative relations, which require more cognitive load and thus more difficult, while *so* is like additive and temporal relations, which demand less cognitive load and takes less effort. This complexity accounts for the finding that causal relations are the most difficult for the readers because they have to tell which way to go first before starting to process. Another assumption is concerning structural complexity. Causal relations are mostly represented by subordinate clauses, such as “*because*”, which are naturally more complicated than other types of logical relations represented by coordinate or modifying clauses. Some questions for the causal relations in the cloze test of the current experiment did require the students to be equipped with the knowledge and ability to differentiate and utilize the conjunctions with the function of modification, coordination, or subordination.

To interpret why additive conjunctions are more easily comprehended than temporal ones, frequency of occurrence is more likely the cause. As suggested in the study of Steffani & Nippold (1997), competence with adverbial conjunctions was

related to the amount of experience that an ESL student has with the English language. That is, the more a reader encounters the types of logical conjunctions, the better he/she learns them. Since additive conjunctions appear most often<sup>3</sup>, students are more likely to comprehend them the best. To sum up, even though additive and temporal relations share similar structural complexity and cognitive processing difficulty, additive conjunctions are absolutely easier due to higher frequency of occurrence.

In the following section, the interaction between students' proficiency levels and their comprehension of logical conjunctions was investigated and discussed.

Table 11

ANOVA Results for High Group and Low Group's Comprehension of Logical Conjunctions

<i>Proficiency</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>F</i>	<i>Sig.</i>
High Group					
Temporal	.552	.200	21	10.85	.000***
Adversative	.452	.199	21		
Additive	.643	.196	21		
Causal	.324	.166	21		
Low Group					
Temporal	.300	.238	20	1.19	.318
Adversative	.259	.165	20		
Additive	.350	.224	20		
Causal	.246	.118	20		

Note. Mean scores are presented with rate of correctness. \*\*\*Significant at  $p < .001$

**Results.** Table 11 reports the high group and low group's comprehension of the four types of logical conjunctions. A one-way ANOVA illustrates a statistical significance

<sup>3</sup> By counting the logical conjunctions in the textbooks (Far East Version) from Book One to Book Six, the additive type appears most often. The exact frequency of occurrence is described below: 251 times for additive, 128 times for adversative, 125 times for temporal, and 65 times for causal conjunctions.

among the types of conjunctions only in the high group [ $F(3, 80) = 10.845, P < 0.001$ ], but not in the low group [ $F(3, 76) = 1.192, P > .05$ ]. Table 12 presents the results of the post hoc multiple comparisons of the high group, in which an LSD test indicates significant difference logical conjunctions between temporal and causal relations ( $p < .001$ ), adversative and additive relations ( $p < .001$ ), adversative and causal relations ( $p < .05$ ), additive and causal conjunctions relations ( $p < .001$ ).

Table 12

Post hoc LSD Results for High Group's Comprehension of Logical Conjunctions

<i>Category A</i>	<i>Category B</i>	<i>M (A-B)</i>	<i>Sig.</i>
Temporal	Adversative	.100	.093
	Additive	-.090	.128
	Causal	.229	.000***
Adversative	Additive	-.190	.002**
	Causal	.128	.032*
Additive	Causal	.319	.000***

Note. \*Significant at  $p < .05$ , \*\*Significant at  $p < .01$ , \*\*\*Significant at  $p < .001$

**Discussion.** The results of the high and low groups' comprehension of the logical conjunctions share some similarities and differences. For both groups, the comprehension difficulty order of the logical relations is causal, adversative, temporal, and additive. This finding suggests that the difficulty order of types of logical conjunctions probably has nothing to do with proficiency levels. Instead, it is more related to linguistic complexity and cognitive processing difficulties. However, despite the same difficulty order, statistics show that these four types of logical conjunctions make no difference among each of them for the low group, meaning that

that no one type of relations is especially easy and no one type is especially challenging. To put it more straightforward, lower achievers are equally poor at these four types of logical conjunctions. This finding suggests that both the high and low groups are on the same of course of mastering these four types of logical conjunctions, but the lower achievers have just not reached up to the stage of differentiating the degree of difficulty among them. To explore the differences between the high group and low group in the comprehension of logical relations, the temporal, adversative, additive, and causal conjunctions were examined respectively (as shown in Table 13).

Table 13

Paired t-test Results of the Comprehension in the Logical Conjunctions between High and Low Groups

	<i>Proficiency</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>F</i>	<i>Sig.</i>
Temporal	High	.552	.199	21	3.7	.001**
	Low	.300	.238	20		
Adversative	High	.452	.199	21	3.4	.002**
	Low	.286	.165	20		
Additive	High	.643	.196	21	4.5	.000***
	Low	.350	.224	20		
Causal	High	.324	.166	21	1.7	.093
	Low	.246	.118	20		

Note. Mean scores are presented with rate of correctness.

\*\*Significant at  $p < .01$ , \*\*\*Significant at  $p < .001$

**Results.** Table 13 displays the high group and low group's comprehension of the four types of logical conjunctions respectively by four paired *t*-tests. High group's performance is significantly different from the low groups in conjunctions of temporal relations ( $p < .01$ ), adversative relations ( $p < .01$ ), additive relations ( $p < .001$ ).

However, in causal relations, both groups' performance achieved no statistically significant difference ( $p > .05$ ).

**Discussion.** The results reveal that higher achievers' comprehension in additive, temporal and adversative conjunctions is significantly better than lower achievers'. Moreover, the  $p$  value suggests that the difference between the two groups in additive relations is the biggest ( $p = .000$ ), then in temporal relations ( $p = .001$ ), then in adversative relations ( $p = .002$ ), and finally in causal relations ( $p = .093$ ). The results support the previous finding of the sequence of difficulty. What makes higher achievers different from low achievers lies in that they are better in perception, faster in response, effective in learning, and so on. Therefore, given that the high group and low group are learning an easy task together, the high group will definitely learn faster and better. On the other hand, when they are learning a more difficult task, the high group will probably still perform better and faster than the low group, but not that good and fast compared with the easy task. This example described the situation of students learning logical conjunctions. Among the four types, the high group and low group achieved the greatest difference in additive relations, implying that additive conjunctions are the easiest types. Similarly, when both groups achieve no difference in causal relations, causal conjunctions are supposed to be the most challenging types. To put it more simply, the easier the type of logical relations is, the wider the gap between the high group and low group in comprehension, and vice versa. This finding provides a valid proof to the ascending sequence of difficulty in comprehension of logical conjunctions: additive, temporal, adversative, and causal.

The findings and discussion in this section provide an answer to the second



research question. The additive conjunctions can be the most easily understood by the EFL students, and then the temporal, adversative, whereas causal conjunctions are the most challenging. The difficulty sequence is of no difference between higher achievers and lower achievers. Nevertheless, the gap between the two groups is becoming widened as the difficulty level is decreasing.

### *Students' Preferred Selections of the Logical Conjunctions*

In addition to analyzing the correct conjunctions chosen in the cloze test, the researcher also examined the subjects' incorrect choices so as to find out whether they have a favoring selection tendency toward different types of logical conjunctions in this section. Error analysis was the method adopted. Hopefully, the finding not only supplemented the previous discussion but also provided a more solid argument for the second research question.

**Results.** Table 14 and figures 1 and 2 display the occurrences and distribution of the selections of logical conjunctions by the two proficiency groups. Table 14 presents the number of times which the high group and low group selected each type of logical relations respectively. The high group was composed of 21 subjects. The 5 questions were prepared for the temporal relations, 6 for the adversative, 5 for the additive, and 8 for the causal. Therefore, the temporal conjunctions subsumed 105 chances of selection, adversative—126, additive—105, causal—168, and the total—504. The low group consisted of 20 subjects, who did the same test as the high group did, so the temporal conjunctions contained 100 chances of selection, adversative—120, additive—100, causal—160, and the total—480. In both groups, additive conjunctions were the most popular type (143/504, 140/480) while causal

conjunctions were the least popular one (114/504, 101/480).

Table 14

Frequency of Selections of Logical conjunctions by High Group and Low Group

Correct conjunctions	Selected conjunctions				
	temporal	adversative	additive	causal	total
<b>High Group</b>					
Temporal	<u>58</u>	9	25	13	105
Adversative	32	<u>55</u>	15	24	126
Additive	4	12	<u>68</u>	21	105
Causal	28	49	35	<u>56</u>	168
Total	122	125	143	114	504
<b>Low Group</b>					
Temporal	<u>30</u>	13	39	18	100
Adversative	39	<u>34</u>	21	26	120
Additive	15	31	<u>36</u>	18	100
Causal	29	47	44	<u>39</u>	160
Total	113	125	140	101	480

Note. The correct selections underlined; the most popular error selection italicized.

Figures 1 and 2 illustrate the distribution of the choices for conjunctions in terms of the correct options for each type of logical conjunctions, shown in percentage. Figure 1 demonstrates that the high group had the most choices in the correct options in all the four types of logical conjunctions. But Figure 2 exhibits that the low group's choices in additive conjunctions are quite consistent with the correct options, but not in the other three types of logical relations.

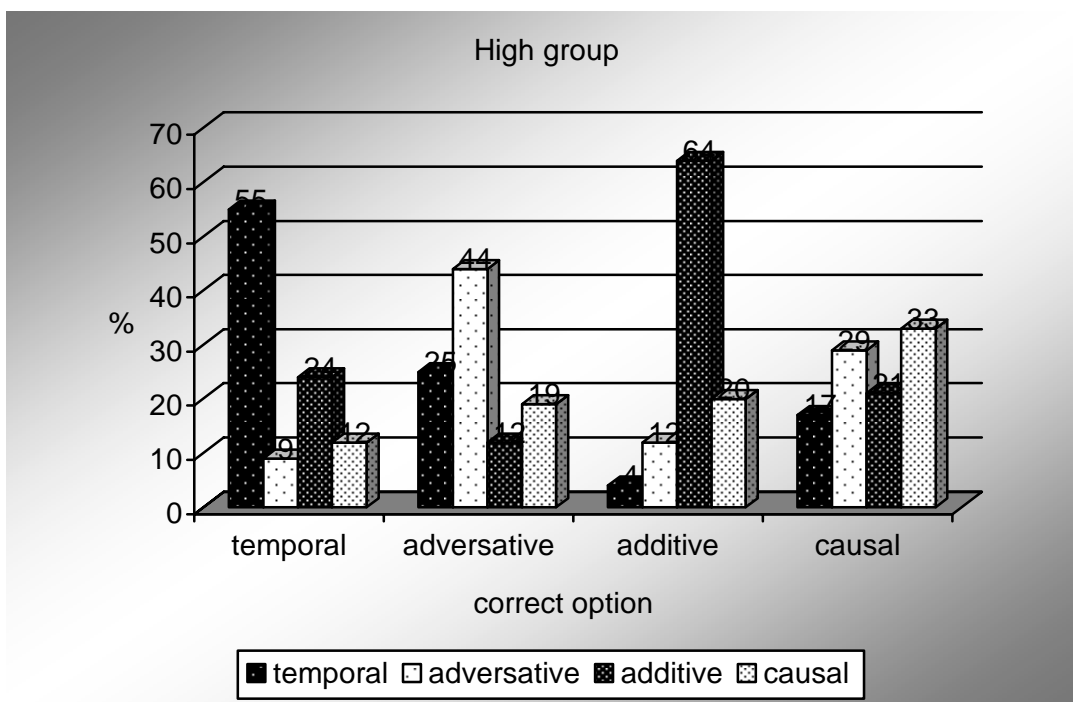


Figure 1. Selected Conjunctions by the High Group (%)

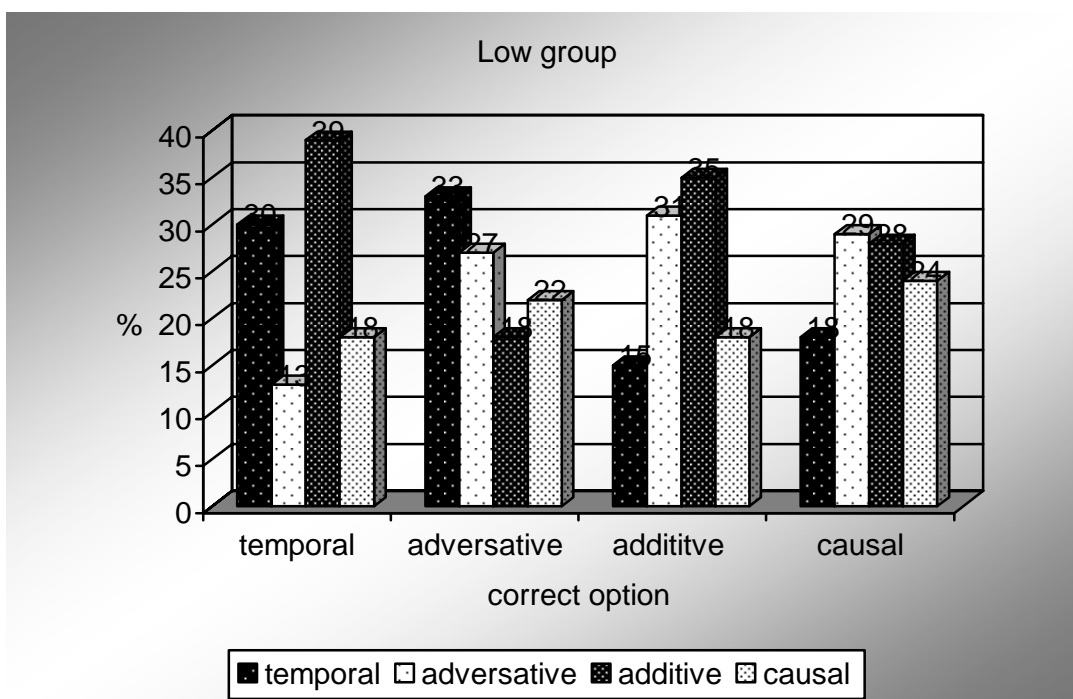


Figure 2. Selected Conjunctions by the Low Group (%)

*Discussion.* The results from Table 14 revealed that both higher achievers and lower achievers' share the same favoring tendency of selecting the four types of logical conjunctions. They were inclined to favor additive over adversative, adversative over temporal and temporal over causal. Surprisingly, causal conjunctions received the least choices, but the fact was that they were supposed to have the most chances to be selected. On the contrary, additive conjunctions enjoyed the most choices, but it was true that they offered the fewest chances to be selected. This finding shows that students' selection preference is not equal to their competence. The selecting hierarchy not only suggests that causal conjunctions belong to the types of the relations which students are most unfamiliar with and thus are afraid to choose, but also indicates that additive conjunctions are of the types of the relations which students feel the most comfortable with and have more confidence to do them right. Another interesting finding is that the high and low groups show an exactly-matched pattern of preferred error selection, like additive for temporal, temporal for adversative, adversative for causal, supporting the previous claim that the structural complexity and cognitive processing difficulty are the cause for comprehension difficulty of logical conjunctions for both groups. That is, higher and lower achievers have quite similar cognitive process, implying that lower achievers have an opportunity to learn conjunctions well, but they may need more time and efforts.

The results from Figure 1 and 2 showed that the correct options received the most choices from the high group, but it was not the case from the low group. From the interview, the researcher found that the higher achievers depended on their ability and confidence in the choice of conjunctions and the lower achievers just relied on

their intuition and made guesses. Interestingly, the lower achievers' performance in additive conjunctions, with the highest rate of correctness, manifesting that additive relations are the easiest type of logical relations.

During the process of classifying the data, the researcher discovered two question items which needed further investigation (as shown in Table 15).

Table 15

The Questions to Which Students had Particular Answers

1. *Tamshui is small enough to see in a few hours. Most people who go there make sure they don't leave \_\_\_\_\_ the sun has sunk.*

Alternative	High Group	Low Group
(A) until	<u>18</u>	7
(B) but	1	2
(C) and	1	<u>9</u>
(D) because	1	2

2. *This is how it works: \_\_\_\_\_, write down a 10-digit numbers, and then try memorizing the digits one at a time. Use this technique often by trying to memorize phone, credit card and personal identification numbers.*

Alternative	High Group	Low Group
(A) first	<u>13</u>	7
(B) however	1	2
(C) for example	6	<u>9</u>
(D) therefore	1	2

Note. The alternative receiving most choices are underlined.

**Results.** Table 15 demonstrates the question items which needed further investigation. In Item 1, the subjects of the high group were quite consistent in their choices—*until* (18), which was the correct answer in the slot. However, in the low group, the choices for *and* (9) outnumbered the choices for *until* (7). Interestingly, the situation of Item 2 is quite similar. In the high group, the correct alternative *first*

enjoyed the most selections (13), and the second popular alternative was *for example* (6). Conversely, in the low group, the most popular alternative was *for example* (9), and the second popular was *first* (7).

**Discussion.** The results support the argument that higher achievers were more assured of their ability in the selection of conjunctions, but also refute the assumption that lower achievers answered the questions by guessing. In these two items, even though the correct alternatives did not enjoy the highest frequency of selection by the low group, they were the second popular. This finding suggests that the lower achievers are still building up their comprehension in the logical relations instead of completely being unknown and unaware of them. Let's take a closer look at Item 1 and Item 2. In Item 1, the difference between the two groups lies in the capability of using the structure "*not...until*". Nearly all of the higher achievers got it right. However, nearly half of the lower achievers replaced "*until*" with "*and*", suggesting that "*and*" seems to be the most popular substitute when they have no idea of what to choose from. In Item 2, "*for example*" was the number two choice for the high group and the number one for the low group, implying that "*for example*" is likely to be the subjects' favorite selection. Item 1 and Item 2 together clearly illustrated that additive conjunctions are the most preferred type of logical relations since "*and*" and "*for example*" both belong to additive relations.

The findings in this section revealed that students favored additive conjunctions over adversative, adversative over temporal, temporal over causal. However, the higher achievers are confident of themselves in the selection of conjunctions while the

lower achievers have a tendency to substitute additive conjunctions for the other types when not knowing what to choose from. In addition, the findings supported the argument that additive conjunctions were the easiest type of logical relations and causal conjunctions were the most challenging one.