Top-Down and/or Bottom-Up Processing in Iranian EFL Learners' Listening Comprehension at Pre-Intermediate Level

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Abstract

This research is aimed at finding out whether Iranian EFL learners of English at the pre-intermediate level would prefer bottom-up or top-down processing in their listening comprehension. There were 90 students, 72 girls and 18 boys. All were in term 2 studying English translation and English literature at Islamic Azad University of Hamedan. Three experiments were carried out. In experiment 1, they heard a list of related words in each question and were asked to write down the last word, the onset of which was changed to turn it into a similar word which did not belong to the set, in each. In this experiment the learners were able to recognize the target words correctly and used bottom-up processing. In experiment 2, a semantically constraining sentence was provided in place of a list of words in each question. A highly predictable word at the end of the sentence was replaced by one which differed from it by one phoneme. This substitute word was much less predictable but nonetheless acceptable in the context. In this experiment the learners were constrained by the sentences and could not realize the target words correctly and used top-down processing. In experiment 3, low frequency words were chosen which were unlikely to fall within the vocabulary of the learners but which phonologically resembled high-frequency words

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they were likely to know. Sentences were designed in a way to provide a meaningful context for the low-frequency words. Here, the learners neither preferred bottom-up nor top-down processing; they also wrote a lot of non-words, and the difference between using the words' onset and the words' offset was not significant.

Keywords: top-down processing, bottom-up processing, context, onset, proposition

Introduction

The terms "bottom-up" and "top-down" occur frequently in the literature on second language learning. According to Brown (2001), speech-processing theory distinguishes between these two types of processing in both listening and reading comprehension. They are often used to mark a distinction between information derived from perceptual sources and information derived from contextual ones (Field, 2004). Bottom-up processing proceeds from sounds to words to grammatical relationships to lexical meanings, etc., to a final message (Brown, 2001). Top-down processing is evoked from "a bank of prior knowledge and global expectations" (Morley, 1991, cited in Brown, 2001) and other background information (schemata) that the listener brings to the text (ibid.). Bottom-up techniques typically focus on sounds, words, grammatical structures, and other components of language. Top-down techniques are more concerned with the activation of schemata, with deriving meaning, with global understanding, and with the interpretation of a text. The terms refer not to particular levels of processing but to directions of processing. In a "bottom-up" process, small ("lower level") units are progressively reshaped into larger one; in a "top-down" process, larger units exercise an influence over the way in which smaller ones are perceived (Field, 2004). Field (2004) considers the vocabulary effects that occur in both first and second language listening, where the listener's interpretation of a string of phonemes is constrained by the knowledge that a particular word exists. He mentions that they qualify as a top-down process, since information from one level (the

word) shapes the interpretation of information at a lower level (the phoneme).

The term "contextual" as used in relation to "top-down" processing is somewhat misleading. It is sometimes used to refer to the impact of world knowledge upon processing; but writers also use it to refer to the impact of information gleaned from earlier content in the conversation or reading passage, what Brown and Yule (1983) term "co-text".

Statement of the Problem

This research is aimed at finding out which of the two processes, top-down or bottom-up, prevails in the case of Iranian pre-intermediate students studying English; and how do these learners deal with new items of vocabulary when they crop up in a listening passage.

Hypothesis

Neither top-down nor bottom-up prevails in a listening passage in the case of Iranian pre-intermediate students studying English; they neither use top-down nor bottom-up processing when new items of vocabulary crop up in a listening passage.

Limitations of the Study

Due to limited time available, this study was only limited to students at the pre-intermediate level. The participants were mostly girls; so having equal size of boys and girls was not possible. Their age ranged from 18 to 25 so the researchers could not carry out such a study for different age groups to find out whether different age groups performed differently.

Definition of Key Terms

Onset: A syllable can be divided into three parts: a. the beginning, called the onset; b. the central part, called the nucleus or peak; c. the end, called the coda. In the English word bed, /bed/, /b/ would be the onset, /e/ the nucleus and /d/ the coda.

Proposition: (in philosophy, linguistics and semantics) the basic

meaning which a sentence expresses. Propositions consist of (a) something which is named or talked about (known as the argument, or entity) (b) an assertion or prediction which is made about the argument. A sentence may express or imply more than one proposition. For example:

sentence	underlying propositions
Maria's friend, Tony, who is a dentist, likes apples.	*Maria has a friend.* *The friend's name is Tony.* *Tony is a dentist.* *Tony likes apples.*

Review of Literature

For many years, listening skills did not receive priority in language teaching (Richards and Renandya, 2002). Teaching methods emphasized productive skills, and the relationship between receptive and productive skills was poorly understood. According to Chastain (1988), tradition also contributes to the slight attention paid to listening in many language classes. Rost (2000, cited in Carter and Nunan, 2001) claims that listening, the most widely used language skill, is often used in conjunction with the other skills of speaking, reading and writing. Listening is not only a skill area in language performance, but is also a critical means of acquiring second language (L2). Chastain (1988) argues that to learn to speak, students must first learn to understand the spoken language they hear. In classrooms, students always do more listening than speaking. Listening competence is universally "larger" than speaking competence (Brown, 2001).

Rost (2000, cited in Carter and Nunan, 2001) argues that listening is the channel in which we process language in real time – employing pacing, units of encoding and pausing that are unique to spoken language. Until recently, the nature of listening in a second language was ignored by applied linguists, and it was often assumed that listening skills could be acquired through exposure but not really taught (Richards and Renandya, 2002). According to Brown (2001),

perhaps human beings have a natural tendency to look at speaking as the major index of language proficiency. He (ibid) draws our attention, as an example, to the commonly used query "Do you speak Japanese?" Of course we don't mean to exclude comprehension when we say that, but when we think of foreign language, we first think of speaking. Richards and Renandya (2002) mention that this position has been replaced by an active interest in the role of listening comprehension in second language acquisition, by the development of powerful theories of the nature of language comprehension, and by the inclusion of carefully developed listening courses in many ESL programs. Some applied linguists go so far as to argue that listening comprehension is a t the core of second language acquisition and therefore demands a much greater prominence in language teaching (ibid).

Top-Down Processing

Top-down processing refers to utilizing schemata (background knowledge and global understanding) to derive meaning from and interpret the message (Chastain, 1988).It is suggested that the act of comprehension is essentially meaning driven, holistic, top-down behavior that is highly selective in the features it incorporates (Byrnes 1986).

Furthermore, Gillian Brown (1990) maintains native speakers obviously have a cultural advantage in this respect. She further explains that the advantage of the native speaker, in many everyday situations, is that even if you do not hear everything the other person says, you have a good idea of the sort of thing that will be said. This is constructed partly from the phonetic cues that you hear, and partly from your knowledge of what you would have said if you had been speaking, or perhaps from your stereotypic knowledge of what that sort of speaker is likely to say in such a situation. It is this familiar knowledge which as a native speaker you have been acquiring from infancy, which allows you to cope with a very reduced phonetic input (ibid).

Bottom-Up Processing

Bottom-up processing refers to deriving the meaning of the message based on the incoming language data, from sounds to words, to grammatical relationships, to meaning. Stress, intonation and rhythm play a role in bottom-up processing (Cook, 1997). However, there is some disagreement about which kind of processing predominates at different levels of learner L2 proficiency (Rubin, 1994). Nevertheless, the components of the listening process, including the listening text, the context, the task demands, and the responses required from the listener are all interrelated (Anderson and Lynch, 1988; Lund, 1991).

It is important to consider the fact stated by Brown (1990) who holds that foreign learners are less able to bring to bear top-down processing in informing an interpretation and hence are more reliant on bottom-up processing.

"Bottom Up" Dependency

One established view of the problems faced by the second language listener or reader takes the following form: *weaker second language learners worry about not understanding each word of the input. They focus their attention at word level and this occupies memory capacity, preventing them from building words into higher-level meaning.* Gernsbacher (1990) suggests that it is a characteristic of less skilled readers that they build small-scale units of meaning and are unable to integrate these units into larger ones (cited in Field, 1998).

There is ample evidence that shows learners with limited L2 competence, draw heavily upon perceptual data. After testing 235 learners, Hansen and Jensen (1994) interpreted their findings as "indirect evidence that low proficiency students rely heavily on bottom-up processing skills" (cited in Field, 2004).

Evidence from Studies of L2 Listening

A number of researchers have studies the relationship between higher and lower level processes in L2 listeners. Conrad (1983) concludes that non-native listeners direct more attention to syntactic informa-

tion in the speech stream than do native listeners and less attention to semantic (cited in Field, 2004). However, Field (2004) mentions that her results should be treated with caution due to the fact that her criteria for distinguishing between "syntactic" and "semantic" are subjective. Mack (1998) found that non-native listeners made fewer syntactic errors than did native listeners (cited in Field, 2004). However, this was not the main point of the research. The experiment featured anomalous sentences (*A painted shoulder thawed the misty sill.*), depriving her subjects of the top-down information normally provided by background or by co-text. Her non-native subjects were, overall, extremely inaccurate, and Mack suggests that, if they had been accustomed to processing word-by-word, they would not have been as disadvantaged by the absence of contextual information as they proved to be (ibid.). Wolff (1987) also found that his subjects were more inclined to use top-down strategies when they were given a harder text to understand. Koster (1987) investigated the effects of information provided by lexical association. He found that the subjects could identify the words more easily when it was preceded by a word that it collocated with closely. He concluded that predictability aided recognition to a significant degree. But the most interesting finding of the experiment was that, of three groups of subjects (intermediate non-native listeners, advanced non-native listeners and native listeners) it was the first whose recognition of the second word improved most when co-text was provided (cited in Field, 2004).

Mueller (1980) brings further evidence that show L2 listeners use contextual information. He indicates that visual support enhanced the comprehension of lower-level students much more that it did that of higher-level ones. Long's results (1990) also indicated an important effect of background knowledge on ability to comprehend listening texts. Voss (1984) conducted a series of listening experiments with a group of native German speakers studying to become English teachers (cited in Long, 1989). Voss's subjects listened to tape recorded passages in English in a laboratory setting and were allowed to rewind and listen to the tapes as many times as they wished. When they felt ready, they transcribed the tapes in English (not in

phonetic alphabet). In the final experiment, subjects also listened to and transcribed a tape in their native language. The transcriptions were analyzed for different types of perception errors at the acoustic, linguistic, and content levels. Transcription errors revealed that successful speech perception relies heavily on top-down processing procedures, i.e., an overriding hypothesis is imposed on input segments and governs the decoding process. Bottom-up processing, on the other hand, starts with lower order acoustic level segments and identifies sequentially segments of increasing size. Voss's data show both processes at work, but reveal conclusively that overreliance on bottom-up processing is characteristic of unsuccessful speech perception, both in the native and non-native speech conditions.

In sum, despite the scarcity of listening research, much of the evidence from listening appears to support the view that low-level second language users rely heavily upon contextual and co-textual information. The most comprehensive investigation of the "bottom-up/top down" issue to date has been done by Tsui and Fullilove (1998). They analyzed answers given by 20,000 Hong Kong examination candidates to different types of listening question. They concluded that it was the less skilled listener who relied most heavily upon top-down processes, and he/she did so in order to compensate for problems of perception.

The finding on the compensatory use of "top-down" information also echoes on L1 reading. Perfetti (1985) demonstrated that weaker readers often fall back on contextual and co-textual evidence because their decoding skills are insufficiently developed (cited in Field, 2004).

Goh (2000) brings evidence that phoneme and word recognition are a major source of difficulty for low-level L2 listeners. He mentions that of 10 problems reported by second-language listeners in interviews, 5 were connected with perceptual processing. Low-level learners were found to have more difficulties of this kind than more advanced ones.

In dealing with listening comprehension again, some earlier studies found that skilled listeners are better able to use top-down, or

knowledge-based, processes whereas less-skilled listeners tend to rely on bottom-up, or text-based, processes. For example, Hildyard and Olson (1982) found that skilled listeners, like proficient readers, use a knowledge-based interactive mode of text processing whereas less-skilled listeners and readers both attend mostly to local details (cited in Tsui and Fullilove, 1998). More recently Shohamy and Inbar (1991) found that while high-level listeners seemed to process the text in a knowledge-based manner, the low-level listeners performed much better on "local questions", which required the listener to identify details and facts (cited in Tsui and Fullilove, 1998).

Other studies, however, have indicated that skilled listeners are those who are able to monitor their developing interpretation of the incoming text by constantly checking it against the incoming linguistic cues and to modify their interpretation accordingly. For example, Tyler and Warren (1987) showed that comprehension takes place when the listener can successfully decode the incoming input (cited in Tsui and Fullilove, 1998). Similarly, Buck's investigation (1990) found that listeners must check and monitor their developing interpretation in the light of the linguistic input and their background knowledge to ensure that the interpretation is a reasonable one (cited in Tsui and Fullilove, 1998). Buck maintains that the ability to adjust the interpretation in response to new information is obviously an important listening skill, but especially so in the case of second language listening (ibid.).

Method

Participants

At first there were 120 students studying English translation and English literature at the pre-intermediate level at Islamic Azad University of Hamedan. In order to make them homogeneous, the researchers took a Comprehensive English Language Test (CELT). After the test, there remained 90 homogeneous students, 72 girls and 18 boys, and their age ranging from 18 20 25.

Procedure

The texts for each experiment were played twice on a cassette, using high-quality equipment in a classroom with good acoustics and the sentences were recorded by a British native speaker. Answers were written by subjects in the blanks. The researchers had some difficulty finding a native speaker. They made numerous attempts and went to and called numerous places for it. No foreign agencies agreed to help. At last they decided to call the British Embassy. After the exchange of a few e-mails, they managed to get an appointment with a native speaker to record her voice. For this, they got permission from the Ministry of Science, Research and Technology.

Administering the test

The researchers administered the test to three different groups as their final listening exam for their conversation classes. In order to make the participants take the test serious, the researchers had told them that he has devoted 3 marks (out of 20) for this listening exam. By using the K-R21 formula, the reliability of the test was obtained and it was 0.64.

Treatment

In his treatment during the term, the researchers indirectly taught the subjects the words that they were expected to know for the first two experiments. Because they were conversation classes, the subjects were faced with many listening exercises and questions, so they were not unfamiliar with listening in their final exam.

Design

Three experiments were designed to test the extent to which foreign language learners are inclined to place their trust in top-down or in bottom-up information.

Experiment 1: Groups of four to six words were composed; all were likely to be known by subjects. Sometimes all the items in a set belonged to the same lexical field

June – March – summer - spring

and sometimes only the last two words were associated

knife – earth – child – dog - cat

In the target items, the onset of the last word was then changed to turn it into a similar word which did not belong to the set (*spring → "string"*). (The exam questions are in appendix).

Subjects were asked to listen to each group of words and to write down the last word in each. The purpose was to establish whether top-down influences (here based on vocabulary sets) would so constrain the subjects that they would overrule the "bottom-up" evidence of their ears and substitute a semantically more appropriate item (SPRING for *string*). If so, it would provide strong evidence of top-down-dependency of an underlying view that inference is perhaps more dependable than the learners' ability to identify sounds and words accurately in the target language.

Experiment 2: Here, a semantically constraining sentence was provided in place of a list of words. A highly predictable word at the end of the sentence was replaced by one which differed from it by one phoneme. This substitute word was much less predictable but nonetheless acceptable in the context. Both original word and substitute were of high enough frequency to be within the subjects' vocabulary. Examples:

I couldn't listen to the radio because of the boys. [VOICE / NOISE]

The people at the party were Germans, Italians, Spanish and some friends. [FRENCH]

The sentences were played to subjects, who were asked to write down the last word in each. The purpose was again to see to what extent the context (this time, the propositional content of the sentence) encourages them to write down a different word from the one that they had heard.

Experiment 3: Low frequency words were chosen which were unlikely to fall within the vocabulary of the learners but which phonologically resembled high-frequency words they were likely to know. Sentences were then designed which provided a meaningful context for the low-frequency item but a contradictory one for the high-fre-

quency alternative. Examples:

They're lazy in that office; they like to shrink. [not WORK]
When the plane didn't arrive, the passengers were in a terrible plight. [not FLIGHT]

In most of the items, the target word occurred at the end of the sentence, and learners were asked to write down the last word they hear. In some of the items, the word was within the sentence. Here, the purpose was to see whether subjects opted for a known, frequent and phonologically similar word despite the fact that it is inappropriate in the context, or whether they were prepared to accept the presence of a new vocabulary item.

Results

The minimum number of correct answers for experiment (1) is 3.00 out of 11 (27.2727%), while this number for experiment (2) is .00 out of 10 (0%) and for experiment (3) is 1.00 out 0f 20 (5%). For experiment (1) the maximum number of correct answers for each student is 11.00 which is 100%, for experiment (2) is 5.00 which is 50%, and for experiment (3) is 13.00 which is 65%. The results show that the students have mostly answered the first experiment correctly; that is, for experiment (1) they have opted for bottom-up processing. What is interesting is that, although experiment (3) was more difficult and had words that they didn't know, they were more inclined to use bottom-up processing (correct answers) than top-down compared to experiment (2); that is in experiment (2), because of the constraining sentences, they have trusted the highly predictable words (in brackets) and have overruled the bottom-up evidence of their ears.

Table 1: Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	a20 & b20	90	-.254	.016
Pair 2	a20 & c20	90	.466	.000
Pair 3	b20 & c20	90	.002	.986

The above table compares the three experiments in terms of their correlations. There is not a significant correlation between experiments (1) and (2) (.016 > .05), so by looking at the answers in experiment (1), we cannot guess if the subjects have answered experiment (2) right or vice versa. There is a significant (.000 < .05) positive (.466) correlation between experiments (1) and (3). So the students who have answered the first experiment correctly usually have answered the second experiment correctly as well. There is again not a significant correlation between experiments (2) and (3) (.986 > .05); that is, by looking at the answers in experiment (2) we cannot guess if the subjects have answered experiment (3) right or vice versa.

Next, the researchers considered whether the number of correct answers is significant compared to the answers in brackets or vice versa in each question. That is, if the correct answers were significant, then we could conclude that the subjects have opted for bottom-up processing; and if the answers in brackets were significant, then we can conclude that they have gone for top-down processing and the context has encouraged them to write down a different word from what they have heard: In experiment (1), in 10 cases out of 11 (90.9%) the participants have used bottom-up processing; that is they have ignored the context, which in this case is single words, and these words did not constrain the students to overrule their bottom-up evidence of their ears. This provides strong evidence that the learners have the ability to identify sounds and words accurately in the target language. Only in one question (9.09%) that is question number 10 they have used top-down processing.

In experiment (2), in 7 questions out of 10 (70%) the students have chosen the highly predictable words instead of the correct answers. In this experiment the context was a sentence in each question, and not a list of words as in experiment (1). The results in this experiment show that the contexts (sentences) were constraining enough for the subjects to overrule the bottom-up evidence of their ears and as a result substitute a semantically more appropriate word. In questions 3 and 5 (20%) they have chosen bottom-up processing and in one question (10%) that is question number 7 they have nei-

ther preferred bottom-up nor top-down processing.

In experiment (3), for questions 1, 3, 4, 5, 11, 12, 14, 15, 16, 18, 19, and 20, that is 12 questions out of 20 (60%), the students have neither preferred bottom-up nor top-down processing. For questions 2, 6, 7, 9, 10, 13, and 17, that is 7 questions (35%), they have used bottom-up processing and were able to identify the sounds accurately. Only for question 8 (5%) the sentence has constrained the subjects to use top-down processing. In this experiment, because the results are close and it's not possible to realize whether the participants have used bottom-up or top-down processing, the researchers have compared the correct answers with the answers in brackets in general for all the 20 questions in the experiment. The results show that in experiment (3) the participants have neither preferred bottom-up nor top-down processing (.017 > .05).

For experiment (3), the researchers have also considered whether the participants were able to identify the beginning of the words (word onset) or the end part of the words (word offset) more. You can see the number of cases that the participants have identified the words' onset and the words' offset for each question in appendix B. Overall in experiment (3), in 720 cases they have chosen the word onset and in 599 cases they have gone for the word offset. The following table shows whether this difference is significant or not:

Table 2: Paired Samples Test

		Paired Differences		t	df	Sig. (2-tailed)
		Mean	Std. Deviation			
Pair 1	ONSET - OFFSET	6.1500	19.3453	1.422	19	.171

As you can see the difference is not significant (.171 > .05), so the participants have neither preferred the word onsets nor the word

offsets in general.

Conclusion

This research was aimed at finding out whether Iranian pre-intermediate learners of English would choose bottom-up or top-down processing in their listening comprehension; and also how do they deal with new vocabulary items when they crop up in a listening passage. The question of the study was "If top-down and bottom-up information are in apparent conflict, which one prevails in a listening passage in the case of Iranian pre-intermediate students studying English; and how do these learners deal with new items of vocabulary when they crop up in a listening passage?" In his hypothesis the researchers had claimed that the subjects would neither prefer top-down nor bottom-up processing in their listening comprehension; that is, the difference between top-down and bottom-up would not be significant.

Summary of Findings

The researchers have come up with interesting results in this research. In experiment (1) there were lists of four to six words. In this experiment sometimes all the items belonged to the same lexical field, e.g. June, March, summer, string (*spring*); and sometimes only the last two words were associated, e.g. *knife, earth, child, dog, hat (cat)*. In the exam, the onset of the last word in each set was changed to turn in into a similar and a more probable word and the students were asked to write down this last word. The purpose was to see whether they would choose the correct word (bottom-up processing) or would they go for the more probable word in the context (top-down processing). The results show that in this experiment the participants did not pay any attention to the context and when asked to write the target words, they trusted their ears and wrote down the correct words. They were able to identify the sounds and words accurately in the target language; that is, they used bottom-up processing. In this experiment they were familiar with all the words that they heard. The results of this experiment are supported by Gerns-

bacher (1990, cited in Field, 2004), Hanson and Jenson (1994, cited in Field, 2004), Chastain (1988), Hildyard and Olson (1998, cited in Tsui and Fullilove, 1998), Conrad (1989, cited in Rubin, 1994) and Brown (1990).

In experiment (2) the participants were faced with sentences instead of lists of separate words and were asked to write down the last word that they hear in each sentence. Here, the sentences were chosen in a way to see whether the students could identify the sounds of the target words accurately or would they be constrained by the context to use a highly probable word which differed from the target word only by one phoneme. This substitute word was less predictable but nonetheless acceptable in the context, e.g. *We can go into town when it's day and when it's light (night).* The results in this experiment show that the sentences were semantically constraining enough for the subjects to deceive them from writing the correct words; that is, they used top-down processing. In this experiment too, the participants were familiar with all the words in the sentences. The results of this experiment are supported by Field (2004), Tsui and Fullilove (1998), Wolf (1987), Mueller (1980), Perfetti (1985, cited in Field, 2004), Lund (1991, cited in Rubin, 1994) and Long (1989, 1990).

In experiment (3), as in the previous experiment, the participants were faced with sentences and were asked to write down the last words in most of the sentences, e.g. *When you've cut up the meat, add some spices (slices)*; and in others a word within the sentences, e.g. *The office workers had left litter (letter) all over the grass.* The difference between this experiment and experiment (2) is that in this experiment the words that the students were asked to write down, were unlikely to fall within the vocabulary of the learners but which phonologically resembled high-frequency words they were likely to know. Here, the purpose was to see whether the students chose a phonologically similar word which was known to them, despite the fact that it was inappropriate in the context (top-down processing), or whether they would accept the presence of a new vocabulary item (bottom-up processing).

The results in this experiment show that the subjects neither pre-

ferred bottom-up nor top-down processing. In this experiment the students wrote down a lot of non-words, so the researchers tried to find out whether they heard the beginning of the words; that is, word onsets or the end part of the words; that is, word offsets more. The results show that the difference between the number of word onsets being chosen and the number of word offsets being chosen is not significant, but nevertheless there were more going for the word onsets. This experiment shows that when learners hear sentences that they are not familiar with the words, they neither prefer bottom-up nor top-down processing; they don't either prefer the word onsets or the word offsets.

In experiments (1) and (2), the researchers have rejected their hypothesis due to the fact that in he first one the learners have preferred bottom-up processing and in the second, they have preferred top-down processing; but in experiment (3), they have failed to reject the hypothesis because the participants have neither preferred bottom-up nor top-down processing.

Pedagogical Implications

The pedagogical implication of the research is that the teachers should devote time on both bottom-up and top-down processing of the learners when teaching listening and none of them should be undermined. This view is supported by Brown (1990), Rost (2000, cited in Carter and Nunan, 2001), Nunan (1977, cited in Richards and Rogers, 2002), Chastain (1988), Anderson and Lynch (1988), O'Malley, Chamot, and Kupper (1989) and Tsui and Fullilove (1998). This would help the students in their learning English due to the fact that listening is a major obstacle they usually face. Drawing on the outcomes of this study, we understand that students must be able to proceed from sounds to words to grammatical relationships to lexical meanings, etc., to a final message; that is, they must be able to use bottom-up processing. They also must be able to activate their schemata and interpret the text to have a global understanding of the text; that is, they also must be able to use top-down processing.

Suggestions for Further Research

This study was only carried out for the EFL learners at the pre-intermediate level. Other levels may be subject to other studies. Due to the fact that top-down and bottom-up processes also occur in reading, such studies could be carried out in reading comprehension too. In a top-down process, older people may have the advantage of having more experience and world knowledge than the younger ones; so a study with different age groups may also be done for future research.

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Appendix

Bold typeface indicates target words; words in brackets are possible substitutes. Italic typeface indicates words that potentially provide false co-textual cues.

Experiment 1:

1. *wet cloudy dry cold* **got** (hot)
2. *walk earn read* **night** (write)
3. *look shirt heavy hands* **meat** (feet)
4. *orange black red blue* **clean** (green)
5. *knife earth child dog* **hat** (cat)
6. *friend ill take buy* **tell** (sell)
7. *plate cup knife* **talk** (fork)
8. *high sorry small near wrong* **quite** (right)
9. *light time new key eat* **think** (drink)
10. *June March summer* **string** (spring)
11. *old young early* **wait** (late)

Experiment 2:

1. I couldn't listen to the radio because of the **boys**. (voice / noise)
2. The people at the party were *Germans, Italians, Spanish* and some **friends**. (French)
3. We arrived at the *airport* on time, when we had to wait two hours for the **train**. (plain)
4. You can go into town when it's *day* and when it's **light**. (night)
5. He's good at *football, tennis, and running*; you often see him in shorts. (sports)

6. I thought of the *husband* I had just **buried.** (married)
7. Number 7 ran very *slowly*, but number 3 was **last**. (fast)
8. Do you know what *books* the children **need**? (read)
9. I've lived in the north and *east*, but this place is **best.** (west)
10. I saw him climb on the *roof,* then I heard him **call**. (fall)

Experiment 3:

1. We can't go skating because there's no ice in the **rink**. (drink)
2. They're lazy in that *office*; they like to **shirk**. (work)
3. There aren't many *children* in the town; in fact, there's quite a **dearth**. (birth)
4. When you've *cut up* the meat, add some **spices**. (slices)
5. *The money* disappeared to Switzerland as the result of **a fraud**. (afford)
6. We *rode* along the river to its **source**. (horse)
7. He *argues* a lot, but I like to hear his **views**. (news / lose)
8. When the *plane* didn't arrive, the passengers were in a terrible **plight**. (flight)
9. He hardly ever smiles. I'd describe him as **grave**. (great / brave)
10. I'm sorry but the *cheque* is **blank**. (bank)
11. After ten minutes in the rain the *cigarettes* were completely **soaked**. (smoked)
12. The water ran off the *platform* into a **drain**. (train)
13. Going to *hospital* fills me with **dread.** (bed)
14. More *information* about the *soldier* was never **sought**. (thought / fought)
15. The ship's carrying a **freight** that's *dangerous*. (afraid)
16. I don't know how he **copes** with all his problems. (hopes)
17. They *travel* at such a **pace** that they see very little. (place / space)
18. We need some wooden **stools** for the *children*. (schools)
19. He *stood* there and **spat** on the pavement. (sat)
20. The *office* workers had left **litter** all over the grass. (letter)