The Effects of English Audio-Visual Materials on Listening Comprehension from the Perspective of Schema Theory

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Abstract. English audio-visual materials have been widely used by teachers and students, and have been the important resources of teaching and self-study. What effects do these materials have on English listening comprehension? Based on the schema theory, this paper has this question expounded through empirical research. The result of the research indicates that if the sound messages are closely correlated with the visual ones, people's cognitive schema can be stimulated and enriched, which will give concrete and vivid clues to their treatment of the sound materials, and improve their level of listening comprehension. However, it also indicates that learners' language proficiency plays a fairly important role in their listening comprehension.

Introduction

With the popularization of TVs, videos and computers, the media of language learning have increased correspondingly. Application of multi-media in class makes language teaching more vivid and stereoscopic. The Internet and TV programs enable students to extend their language learning from classrooms to extracurricular environment. Students like making use of various audio-visual apparatuses to obtain their language learning resources, like the English programs of news broadcasts, documentary films, interviews, soap operas and films, etc. They are all excellent language learning materials.

The research in the effect of the application of audio-visual materials to foreign language learning began from the 70th of the 20th century, and great achievements have been made abroad. Among them, there are Balatova (1994) which studied the influence of language difficulty and correlation degree of videos on the effect of listening comprehension [1]; Herron, Hanley and Cole (1995) which approached the subjects of how videos provided visual assistance to the comprehension of language input, and how they improved the effect of listening comprehension [2]; Markham (1999) which analyzed the effect of captioned videos or TV programs on the study of second language vocabulary [3], and Canning-Wilson (2000) which analyzed and explored different aspects of video-using in foreign language classroom [4]. Most of the relevant studies unanimously pointed out that audio-visual materials could make language input more comprehensible, and could thus facilitate foreign language study, especially the activity of listening comprehension.

However, previous studies only focused on the analysis of the phenomenon, and seldom did they probe into the cause of how it happened. In the present study, the writer tries to analyze the effects that audio-visual materials have on ESL learners' listening comprehension from the perspective of cognitive schema, and to find out whether the effects are positive or negative.

Schema Theory

Schema theory was first proposed by Kant, a famous German classical philosopher in the 18th century, to explain the ways human beings applied to get to know objects of different traits and different classification. The importance of the theory was later recognized and developed by cognitive linguists. Rumelhart (1980) reckoned that schemas were a group of interactive structures of knowledge or "building blocks" that constituted a person's cognitive ability [5]. Taylor (2007) maintained that the schema was like a complex and mixed network, in which there densely existed

varied abstract theories, concepts and principles, which were recognized, memorized and stored in a person's mind in the form of concrete instances [6]. Anderson (2012) held that knowledge that matched the same default values were characterized and stored in slots, which was considered the typical features of objects of the same classification, and helped deduce and encode the new objects [7]. Though scholars defined "schema" in different ways, they shared the common view that schema is a complicated but well-ordered invisible network, which connects all the past experience and knowledge of an individual, and plays a crucial role in accessing and comprehending the new objects and new information.

According to the theory, once the information has been retained in long-term memory in the form of schemas, it would have strong stability and would not be easily forgotten. In the meantime, the content of schemas will be enlarged with the expansion of an individual's knowledge and experience. When new information is received or perceived, relevant schema will be stimulated to have it analyzed, edited and synthesized. Ultimately, when the information is comprehended and absorbed, the schemas are renewed and augmented. In this sense, the formation and renovation of schemas is an active and dynamic process.

Schema Theory and Listening Comprehension

Listening comprehension is a psychological and cognitive behavior which involves interaction of language input and the schemas in an individual's brain. The so-called top-down processing and bottom-up processing are the two ways to handle the information. So far as top-down processing is concerned, language input is processed with the help of the background knowledge. The correlated knowledge in one's schemas is taken advantage of to predict what is to be presented, to account what has been stated, and to test and absorb what has been grasped. Therefore, the integration of the new and old knowledge can be achieved. With respect to the bottom-up method, information processing starts from the fundamental language unit --- syllables. After that, words, sentences, chapters, and the whole article are dealt with in turns. This method lays particular emphasis on a person's language schema. The more phonetic, lexical, syntactic and contextual knowledge a person has, the quicker and the more accurate the language input can be decoded.

In listening comprehension, the two ways of information processing are always flexibly integrated to achieve mutual reparation and acceleration. On the one hand, comprehension of language items can activate background knowledge; on the other hand, stimulation of background knowledge can enhance deeper and better understanding of language input. Therefore, they are the integral parts of a unified entirety.

Method

In order to examine if schemas affect the understanding of aural-visual programs, and what influence they have on them, an experiment was carried out to have the issues studied.

A. Subjects

Seventy 2nd-year-university-level students majoring in English participated in the study. They were randomly divided into two groups, an experimental group and a control group. Each group had 35 students, and the mean scores of the two groups in the final listening test of the previous year did not have significant difference.

In the experiment, the experimental group students could, at the same time, watch and listen to the video, while the control group students were only allowed to listen to the material, which meant they couldn't get any visual support from the listening material.

B. Material

An excerpt from a scientific and technological program on "putclub.com" was selected. It was about the luminous principles, as well as the merits and demerits of bulbs of three generations. The theme of this segment was pretty unfamiliar to students, while its utterances were closely backed up by the narrator's actions and the objects on display. Such a topic was selected to address the issue of what effects visual clues may have on the evocation and build-up of schemas while students have

limited background knowledge. Meanwhile, the performance of students from the control group, who were not provided with any visual aids, would be examined.

C. Measures

A test including five interrogator-responder exercises was designed to check students' comprehension of different information in the program. Each question took 20 points, and 100 points for all the questions. A popular form of exercise, multiple- choice test, was not employed in the study lest hints of the key information be given away in the choices. Moreover, the questions were not shown to students until the end of the program, and were presented to answer in sequence. In this way, information leakage might be minimized to some degree. The questions and answers are as follows:

Questions:

1. What object has been recounted in the program?

2. How many kinds of bulbs have been recounted in the program?

3. How do incandescent bulbs waste their energy?

4. What is one of the disadvantages of compact fluorescent lights?

5. What makes bulbs made of LED better than traditional incandescent bulbs? （Give two of the advantages.）

Key:

1. Bulb.　　2. Three kinds.　　3. Through heat.

4. They contain mercury which is a pollutant material. (OR) They create very harsh white light.

5. They produce very nice bright light using 80% to 90% less energy that traditional incandescent bulbs. They don't contain any mercury and they can last 15 years.

D.　Results

Table I illustrates the means, standard deviations of the two groups' achievements, and the z test of their results. As can be observed, there's a significant difference between the performance of two groups, $p < 0.05$, which proves that the experimental group did make much better overall performance than the control group. However, the standard deviations of both groups are fairly high, 23.65 for the control group, and 20.20 for the experimental group, which suggest sharp disparities in students achievements. The span of the control group's scores is from 80 to 0, and 100 to 20 for the experimental group.

TABLE I.　MEANS, STANDARD DEVIATIONS, AND Z TEST OF THE TWO GROUPS

Variable	n	M	SD	Z test	Significance
Control Group	35	64.8	23.65	Z= 3.85	P<0.05
Experimental Group	35	40.83	20.20	Z>1.67	

Table II illustrates the proportion of correctness of each question in the two groups and the results of z test of each question. As is revealed, the correctness of the experimental group in doing the first three questions is significantly better than that of the control group, especially in doing the 1st and 3rd questions. However, there isn't significant difference in the two groups' correctness of the 4th and 5th questions, though the percentages of the experimental group are a bit higher than those of the control group.

TABLE II.　PROPORTION OF CORRECTNESS OF EACH QUESTION, AND Z TEST OF EACH QUESTION

Variable	Proportion of Correctness		Z test	Significance
	Experimental Group	Control Group		
Question 1	83%	38%	Z=4.013	P<0.05
Question 2	49%	26%	Z=2.279	P<0.05
Question 3	75%	43%	Z=2.855	P<0.05
Question 4	55%	46%	Z=0.729	P>0.05
Question 5	58%	40%	Z=1.402	P>0.05

Discussion

A. *Visuals-related Factors*

It is manifested by some of the test's results that visual stimuli are beneficial to the activation of viewers' background schemas. The visual aid in the program can be divided into two aspects, the narrator's body language and actions, and the environment of the background.

In the program, one big table lamp and two small ones with shades were on the table in front of the narrator. They are so obvious that they can surely be noticed by all viewers. It is empirically suggested that allocation of attention determines one's tendency of information processing. With the visual stimuli provided by the video, students of the experimental group would subconsciously predict that the program was about lamp, (which is close to the real theme), and simultaneously activate their relevant schema (though not rich) to get ready for the auditory input. Correspondingly, the narrator made a series of actions which basically tallied with students' prediction. When she introduced the first kind of bulb, she stretched out her hand to touch the bulb in the shade, but suddenly drew it back at being heated. After that, she in turn presented two other kinds of bulbs. Apparently, the program was about "bulb". So, when the first question was shown to students afterwards, the schema of how the bulbs had been introduced popped into their minds, and helped them solve the problem.

To observe the answers of the control group students, it is found that 22 students (62%) mistook "BULB" as "boat", "ball", "box", "budle", etc, which close to "bulb" in sound and form. Though the word has been repeatedly mentioned in the program and is pretty simple, without the assistance of visuals, improper background knowledge had been invoked, and misunderstanding of the word was led to.

Another finding is that by transmitting information in a more vivid way, dynamic pictures can effectively enable viewers encode and reintegrate their schemas in higher speed. Students of the experimental group originally lacked comprehensive knowledge of the properties of different bulbs, but the narrator's movement of drawing back her hand after having been heated by incandescent bulb sent them a message that this kind of bulb would give out heat when it's on. This knowledge would be retained in students' brain to have the relevant schema enriched, and consequently assisted them to answer the third question in a top-down way.

Experimental group's significantly higher proportion of correctness in answering the 1st and 3rd questions support the finding that visual cues contribute to the formation of a viewer's schema, which subsequently improve comprehension of the aural-visual input.

Nevertheless, viewers may sometimes be misled if they merely depend on the visual clues and decode auditory information only in the top-down way. Take the 2nd question for instance, about half of the experimental group students mistook that there were "four kinds" of bulbs introduced in the program, which was actually "three kinds". The reason for such a mistake was that one kind of the bulbs has been exhibited by the narrator for two times. Those who solely resort to the visuals as aids would inevitably make wrong inference based on the schema of the scenes.

B. *Language-related Factor*

In addition to visuals, some phonetic cues can also help generate language schemas and stimulate top-down processing. For example, the word "heat", and the phrase "harsh white light" have been stressed in the narrator's introduction to indicate the importance of the information. Correspondingly, students immediately evoked their background knowledge about these phenomena to have the information decoded. Together with the help of the visual component, schemas of those theories of bulbs were constructed, and were used for tackling the 3rd and 4th questions afterwards.

Sometimes, phonetic cues would fail to trigger schemas if the language is labeled as being difficult. Take the word "mercury" for instance, due to the rareness of this specific chemical term and lack of sufficient visual clues, very few students could recognize it and decode it even though it has been stressed. In this case, not only the means of top-down processing, but also bottom-up processing was blocked. Most students therefore chose not to mention it in answering the 4th and 5th questions.

The control group students' limited prior knowledge of the passage topic and lack for lively

visual cues from the scenes made sound stimuli and their language competence crucially important in their listening performance. Those who could make good use of the skills could get satisfactory test scores. Meanwhile, similar situation was confronted by experimental group students when they tried to answer the 4th and 5th questions. Since the answers have longer stretches of expressions and more unfamiliar technical terms, students' language proficiency seemed to be more important on this occasion than the visual support. That's why a large percentage of experimental group students who were relatively poor in language competence failed in answering the last two questions properly.

Conclusion

Based on the findings of the present study, it is found that both visual and auditory aids can enhance listening comprehension by helping ESL learners arouse their background knowledge or create new schemas. Furthermore, the significantly higher mean score of the experimental group not only suggests that lively scenes can improve comprehension scores, but also verifies that combination of visual and auditory aids is more satisfying for listening comprehension than auditory stimuli alone.

Nevertheless, it is also reflected by the insignificant difference in the two groups' correctness of the last two questions that if the language of the material is fairly challenging, like involving relatively longer utterances with complicated structures and rarely used words, visual support would be insufficient to assist comprehension, while learners' comprehensive language knowledge would be a more decisive factor that matters.

It is necessary to clarify that this study is only a preliminary effort to investigate the effects that audio-visual materials have on intermediate ESL learners' listening comprehension from the perspective of cognitive schema. The material selected has high correlation between the auditory content and the visual content of the utterances. If the two kinds of content do not correspond to each other so closely, will the visuals still be of any help to the audio input? Meanwhile, if the subjects are of higher or lower levels of English competence, will they perform differently? These are the issues to be further investigated in the future.

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