ISSN 1799-2591
Theory and Practice in Language Studies, Vol. 7, No. 12, pp. 1320-1326, December 2017
DOI: http://dx.doi.org/10.17507/tpls.0712.21

Effects of PowerPoint Presentations on Reading Comprehension of Deaf and Hard of Hearing Students in Iranian Exceptional High Schools

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***Abstract*—It is becoming increasingly difficult to ignore the role of PowerPoint presentation on reading comprehension of deaf and hard of hearing (D/HH) students in schools. Based on different studies, PowerPoint, a common multimedia tool, has a crucial role in teaching and learning through providing a suitable understanding of the text and motivating students. The present study aimed to examine the predictive effects of PowerPoint presentations on reading comprehension of D/HH students. As reported in the literature, reading levels of deaf high school students are equal to those of fourth grade hearing students. Therefore, a visual computer-mediated approach was implemented to monitor the reading comprehension progress of 20 D/HH students in Iranian high schools. The reading comprehension of the experimental and control groups were compared by conducting the Stanford Achievement Test and applying paired t-tests. Our findings indicated a significant difference between the mean reading comprehension scores of the two groups.**

***Index Terms*—deaf students, PowerPoint, reading comprehension, technology, visual intervention**

I. Introduction

English language is viewed as a second language for deaf and hard-of-hearing (D/HH) students and allows us to emphasize on complexity in acquiring and learning in a related framework to improve skills and to address the educational goals. Since nearly a high percentage of D/HH students struggle with literacy barriers, a fundamental educational framework with adequate attention to relevant monitoring and design strategies is needed to improve literacy-dependent skills in these students. It is known that some D/HH students have problems with reading skills due to their English competencies (Trezek & Wang, 2006). About 90% of D/HH children are born into non-deaf families and are not exposed to sign language until later in life. This can result in lack of communication, which leads to learning problems in school (Andrews & Covell, 2006).

It is necessary to perform further research on the strengthening of the learning environment, increasing the availability of the materials, and meeting the educational needs of deaf students. Print literacy and functional literacy levels in reading comprehension are usually challenging for deaf learners. The nature of deafness presents an impediment to the acquisition of the spoken language in the hearing environment and thus interferes with literacy development in that language (Garberoglio 2012). It is well known that for hearing individuals, phonological codes play an important part in learning to read. The role that these codes play in determining advanced reading skills in deaf readers, however, is a matter of debate. Because deaf children and adults only have degraded access to the sounds of spoken language, they may only develop partial or underspecified phonological representations that support reading acquisition of an alphabetical language in readers who can hear. The phonology of spoken language consists of language-specific patterning sounds which are combined to construct the word. The recoding of written symbols into correct sounds is the main step during the reading process. Most deaf students are fitted to cochlear implant and hearing aids to distinguish speech sounds and interpretation of auditory inputs. The Qualitative Similarity Hypothesis (QSH) suggested that D/HH children require match speech representation with the written text to correctly read. Consequently, lip-reading and visual cuing system could have been developed by speech representation. The reading skills of D/HH students are considered as a critical challenge in the educational system, mainly for high school settings. The Federal Commission of Education of Deaf (1988) has reported the failure of the education system in the deaf community. Based on the analysis of almost four decades of national-level achievement data, the median achievement gap between D/HH and hearing students remains large and since the gap is larger in reading than in mathematics and other fields, the identification of related factors that affect the academic performance for D/HH learners should be the center of focus. So far, however, there has been little discussion about technological interventions for promoting the reading comprehension ability of deaf students. The current research sought to clarify the effects of visual inputs to specify the ability of PowerPoint presentation to improve the reading comprehension of high-school D/HH students in Iran.

Various studies have confirmed the crucial role of technology in pedagogy. In fact, effective learning methods based on this approach have been developed to remove educational barriers. Lately, the employment of PowerPoint (a type of interactive media) presentations in classroom direction has expanded around the world. However, the impacts of this method on the students' learning and demeanors have not been determined. Moreover, there is a paucity of research on instructional strategies aiming to obviate these barriers in D/HH learners. Most studies in the field of deaf education have only focused on online interventions and teacher consultants in learning and have generally ignored the most common multimedia tool. In this point of view, implementing an effective practical and accessible strategy to decrease reading-related issues can facilitate the development of an evidence-based intervention for improving the reading comprehension of the D/HH. With the large number of technological tools and complexity of their application (in some cases), little effort needs to be taken to encourage educators and teachers to apply materials and then increase the functional ability of hearing impaired students. The evolution of technology combined with educational necessities led to communication between deaf and hearing people. As Cardoso et al. (2016), Maiorana-Basasand Pagliaro (2014), and Strickland (2013) stated, with the aid of technology, deaf students go through the learning route without any sources of concern and stress in their communications with others.

Purpose of the Study

This researcher intended to explore the effects of PowerPoint presentation on reading comprehension of D/HH students in high school context.

II. Literature Review

In recent years, there has been an increasing amount of literature on PowerPoint presentation and reading comprehension of hearing students in high schools.

Visual tools are the most important tools for D/HH people in classroom setting. D/HH people require visual input in order to process information (Trezek & Wang, 2006). In other words, since these people have some degree of hearing loss, they require visual input to perform any learning-based activity. Virtual classrooms are normally supposed to provide any form of visuals, such as PowerPoint presentations. Knowing that D/HH people have a harder time with the English language depending on the language used in the home while growing up, interpreters or other visual input methods using the American Sign Language is one of the best methods for D/HH people to learn classroom material (Trezek & Wang, 2006).The proof that PowerPoint presentations affect learning is to a great extent recounted. Bryantand Hunton (2000) argued that the level of enhanced learning is a component of a perplexing arrangement of cooperation between the learner and medium characteristics. Mason and Hlynka (1998) believed that PowerPoint structures the substance and handling of a lesson. Utilizing PowerPoint can also help learners take notes (Cook, 1998). According to Harrison (1999), PowerPoint improves direction and persuades learners to comprehend. PowerPoint presentations fuse design, live picture, and shading (symbolism). Human information processing theories concentrate on how the human memory framework accumulates, changes, compacts, expounds, encodes, recovers, and uses data. Sensory registers, short-term memory, and long-term memory are the three noteworthy stockpiling structures of the human mind. The sensory framework registers boost and hold memories for a short time until they are perceived or lost. Short-term memory, with its restricted limit, gets data from tangible registers. It holds data longer than the sensory registers through a practice procedure, reusing the data over and over. Long-term memory is a changeless store of human learning and gets data from both sensory registers and the transient memory framework (Moore et al., 1996).

Reynolds and Baker (1987) found that introducing materials on a computer screen expanded consideration and thus learning.

Furthermore, cognitive theory proposes that learning is enhanced when the learners' favored presentation styles are harmonious with the properties of the instructive innovation. While providing teachers with rules of utilizing innovation for direction, Bryant and Hunton (2000) suggested that individual attributes had to be checked in instructional outline. Double coding hypothesis recommends that learners should favor presentation styles. While a few people learn and review well from outwardly displayed data, others gain the most from verbally exhibited data. Kozma (1994) indicated that comprehending the relationship between media and learning required the consideration of the cooperation between the properties of the medium and the intellectual procedures of learners.

Reading skill is the main domain among different approaches in second language learning. In any written passage, the ultimate aim of reading is reading comprehension. Reid and Lienemann (2006) and Cawthon et al. (2011) referred to reading as a complex process which involved reading real words in isolation or in context with comprehension. Prestigiacomo (2012) defined reading comprehension as an ability to understand and describe a piece of text and to answer related questions.

According to Hoover and Gough (1972), two components, decoding and linguistic comprehension, are involved in reading comprehension. Decoding refers to the recognition of words and consists of phonological skills. Linguistic comprehension refers to the ability to achieve semantic information at the word level and consists of general language skills. On the one hand, comprehension relies on the decoding process by someone who can powerfully use his/her meta cognitive capacity needed to draw meaning from text. On the other hand, decoding depends on comprehension and comparing the meanings of words. Therefore, there is a mutual relationship between comprehension and decoding (Benedict, Rivera, & Antia, 2015).

Some reading models have been specifically developed to offer a profound understanding of the reading process to comprehend the text. Advocates of the bottom-up processing model assumed that inferring meaning from text is a process that begins with learning letters, words, and sentences as parts of the language (Dockery, 2013). They argued that the reading component takes place via decoding and linguistic comprehension (Gough, 1972; Gough & Tanmer, 1986; Mueller, & Hurtig, 2010). During the reading process, reader systematically advances by decoding single words and then sounding out to reach comprehending phase. In fact, failure to comprehend a piece of text indicates that decoding and comprehension of a word is missed in the process. Meanwhile, successful reading comprehension requires the mentioned critical elements. The top-down processing model suggests that the interaction between prior knowledge of the reader and the text facilitates the comprehension process. Thus, when the readers do not have experience with the topic being read, the appropriate comprehension will not occur. Dockery (2013) and Harris and Terlektsi (2010) believed that because of deficits of D/HH students in knowing critical elements necessary for reading, most of these students continuously face difficulties in the top-down process.

Over the past two decades, minimal developments have been reported in the academic writing and reading performance among D/HH students (Rose, 2006). Due to dynamic communication in all children, cognation and language are seen to be two crucial factors in learning process. However, the deaf community face underachievement in reading and have to deal with barriers in the comprehension process.

In a recent study, Belenger et al. (2012) found that reading difficulties among individuals with early severe to profound deafness stemmed from their additional visual cognation in processing information compared to hearing people. At the same time, they suggested that the visual span of skilled deaf readers was larger than that of skilled hearing readers. In general, the results showed that although skilled deaf readers read at a slightly lower grade level than skilled hearing readers, attention distribution of these individuals was wider (See Rayner, 2009).

According to Spencer and Marschark (2010) and Easterbooks and Beal-Alvarez (2013), due to limited access to large and representative samples, there have not been sufficient empirical studies about D/HH students. Many studies have evaluated reading comprehension problems in D/HH children. Nikkhou et al. (2012) showed that one of the main long-standing concerns among D/HH students was their low levels of reading comprehension. In 2009, the Office of Special Education Programs reported that during 2000-2001, in the national level, nearly 85% of the D/HH students scored below 50th (Bendict). The low academic performance of D/HH students in processing language is caused by difficulties in comprehending texts (Marschark, Sapere, Convertino, Mayer,Wauters, &Sarchet, 2009). Mussel white and King-debaun (1997) argued that classes for impaired students traditionally lacked relevant activities. In fact, due to academic or social reasons, the students' physical attendance in the classroom seemed sufficient and their full participation was neglected. Within the context of national large-scale assessment data, Traxler (2000) reported that the average reading comprehension scores a norm sample of D/HH students was less than the levels of knowledge and skills required for effective grade-level work.

Miller (2006) examined the relationship between Jewish students with pre-lingual deafness and their reading comprehension skill. He found that the students' comprehension ability was considerably lower than that of their hearing peers. Likewise, Sharifi et al. (2010) indicated that Iranian hard-of-hearing students had significantly lower reading comprehension ability compared to their hearing peers.

Regarding the use of PowerPoint in the classroom, Samiei Lari (2014) conducted an experimental study on 56 female students of a secondary school in Lar. The experimental and control groups were taught separately by using technology (PowerPoint presentation) and a traditional method, such as textbooks, respectively. While the two groups had no significant differences at the beginning of the year, post-test scores of the experimental group were significantly higher than those of the control group. In addition, Kuo et al. (2014) conducted a study on 134 students (72 boys and 62 girls) from six classes of two public elementary schools in Taiwan. The content materials and teachers were the same for both the experimental and control groups. The researchers examined the academic achievement (e.g. semester grades and test scores) of the students and found that multimodal presentation system (MPS) improved the effectiveness of English as a Second Language (ESL) learning. In fact, there was a statistically significant difference between the experimental and control groups in terms of learning effectiveness (i.e. academic achievement and learning satisfaction).

In contrast, Moore (2012) examined the differential effects of a computer-based program on improving the reading performance of deaf students. He used the reading component of the Ticket to Read (TTR®) to determine if this educational program could promote deaf students' fluency and comprehension. A dependent t-test was conducted using 27 deaf students' pre- and post-test scores (before and after nine weeks of education, respectively) and the exploratory data analysis involved 54 students in 27 matched pairs. Moore applied the TTR® as an intervention just for the reading component and the phonic component was not investigated. The differential effects of the TTR® were also examined across two variables, i.e. gender and grade level, to evaluate reading comprehension of the students compared with deaf students who did not use the TTR®. The mean differences between the pre- and post-test reading assessment scores of the experimental group were also analyzed. The research findings suggested that the TTR® used to develop the reading comprehension did not yield statistically significant differences in the experimental group. Furthermore, there was no significant difference between the control and experimental groups in reading comprehension across gender and grade level variables.

The present study is different from previous research on the application of PowerPoint in English as Foreign Language (EFL) classrooms as it sought to plan an intervention to remove challenges faced by D/HH students in reading comprehension. Many of the instructional interventions used for hearing students are difficult to use for students with hearing loss because they are often based on the use of auditory elements such as reading aloud. A student with hearing loss will not benefit from instruction based on an auditory input unless he/she has access to sound. Previous studies mainly focused on technological interventions other than PowerPoint presentation among hearing students (not deaf students). This accessible multimedia tool allows both teachers and students, especially deaf students, to engage in an interactional mode of the learning process.

We intended to explore whether the semiotic visual stimulus, such as graphics and pictorial text, would make a progress in reading comprehension of D/HH students in exceptional high school settings.

III. Methodology

Procedure

In Iran, the D/HH students study the same English book taught to hearing students and no attention is paid to their physical and cognitive limitations. In fact, the contents of course books are not different in usual and exceptional high schools. The learners study the English book over 12 sessions, and at the end of the semester, their performance is evaluated through a final exam.

In the present experimental study, both groups were tested based on an adaption from the Stanford Achievement Test (SAT) before the teaching process. The pre-test contained four short passages followed by seven multiple choice questions to assess reading comprehension proficiency. The participants were asked to read the multiple choice questions and select the correct answer based on the passages.

After the pre-test, the experimental and control groups began the learning of short passages in their English books to improve their reading comprehension. Besides the teachers' usual instruction, the experimental group was presented with PowerPoint slides. However, the control group continued their learning with traditional oral delivery of content and teacher writing on the whiteboard (without any PowerPoint presentation). In each session, the slides were presented in the class with some following multiple choice questions for more struggling. The content of the training material was the same for both groups. Furthermore, the teacher acted as an interpreter and it took 12 weeks to execute the research plan. A total of four lessons of the textbook were taught during the winter semester, 2015 (three days a week). At the end of the term, when the teaching of the passages was finished (over 12 sessions), the post-test was administrated to evaluate the students' progress in reading comprehension.

Participants

The participants of the study were recruited from Jamal Aldin Asad Abadi (Baghcheban) high school, an urban exceptional high school for D/HH students, in Tehran, Iran. Two 10 person groups of male students (age: 17-21 years) with various degrees of hearing loss were enrolled as the control and experimental groups. In all students, deafness started before the age three and had a hearing loss greater than 85 DB on the better hearing ear. They had usual nonverbal intelligence and used lip-reading and sign language as the language of communication in the classroom setting.

Instruments

The pre- and post-tests were developed by the researchers exactly based on the short passages and their related questions in the students' textbook. The SAT was applied to assess the students' reading comprehension. The SAT is a standardized testing package used in the schools of the United States to determine how well the students understand different subjects. It is available for all grades (kindergarten through the 12thgrade). The students' mean scores were using paired t-tests in SPSS (SPSS Inc., Chicago, IL, USA).

IV. Results and Discussion

In order to use parametric tests, it was necessary to ensure the normality of data distribution. Therefore, one sample Kolmogorov-Smirnov test was first applied to evaluate normality.

Paired t-tests were applied to compare pre- and post-test scores in the experimental group (Table1).There was a significant difference between the mean scores ($t=6.676$; $p<0.05$).This supported the positive effect of PowerPoint presentation on the participants' reading comprehension.

TABLE 1
PAIRED SAMPLES T-TEST FOR EXPERIMENTAL GROUP

		Paired Differences			T	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean			
Pair 1	Pre-test , post test	8.43000	3.99322	1.26277	6.676	9	.000

The mean pre- and post-test scores of the control group were compared using paired t-tests. According to Table 2, there was no significant difference between the mean scores of the control group ($t=2.185$; $p>0.05$).

TABLE 2
PAIRED SAMPLES T-TEST FOR CONTROL GROUP

		Paired Differences					
		Mean	Std. Deviation	Std. Error Mean	T	Df	Sig. (2-tailed)
Pair 2	Pre-test, Post-test	1.77200	2.56474	.81104	2.185	9	.057

As seen in Table 3, there was not a significant difference between the mean pre-test scores of the experimental and control groups (t= 0.165; p>0.05). However, the two groups had a significant difference in terms of post-test scores (t = 6.181; p < 0.05; Table 4). This, again, highlighted the role of PowerPoint presentation in improving deaf learners' reading comprehension.

TABLE 3
INDEPENDENT SAMPLES TEST FOR PRE-TEST OF TWO GROUPS

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Scores	Equal variances assumed	.211	.651	.169	18	.868	.17000	1.00824
	Equal variances not assumed			.169	16.337	.868	.17000	1.00824

TABLE 4
INDEPENDENT SAMPLES TEST FOR POST-TEST OF TWO GROUPS

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Scores	Equal variances assumed	1.032	.323	6.181	18	.000	7.22800	1.16946
	Equal variances not assumed			6.181	16.876	.000	7.22800	1.16946

D/HH students seem to be heavily reliant on the American Sign Language for their communication needs. Therefore, they may also need something "visual", such as PowerPoint presentations, to help them learn.

The purpose of the current study was to explore the effects of PowerPoint presentation on the reading comprehension of Iranian deaf students. Based on our findings, the use of PowerPoint presentation led to a significant difference between the two groups regarding comprehension performance. Similarly, SamieiLari (2014) demonstrated a significant difference between the two control and experimental groups. In fact, the use of technology to teach the experimental group resulted in significantly higher learning and motivation at the end of the educational year. Therefore, the use of new ways of teaching language, such as PowerPoint presentations, was reported to play a critical role in language learning and was suggested as a facilitator in pedagogy. What is so different and novel about this study, however, is that it recruited D/HH students and mainly focused on the reading comprehension skill of these students as a main part of English language learning. The current study supported the findings of Kuo and et al. (2015)who examined the predictive effects of the multimedia presentation system (MPS) on academic achievement of students. They found that the MPS facilitated ESL learning and concluded that implementing a multimedia program in class led to significantly better learning achievements among the students. They argued that in comparison to traditional methods, MPS could increase the learners' achievements and satisfaction.

On the contrary, the findings of the current study were not in line with those reported by Moore who suggested that using TTR® did not improve the reading comprehension of deaf students across gender and grade level variables. One possible reason for such an inconsistency might be that the computer-based program itself was planned for hearing students and not D/HH people.

The current study had some limitations. First, the scarcity of studies related to deaf education and technology made the work route more complicated. Another limitation of the study was time constraints on PowerPoint presentation. In order to achieve effective learning outcomes among deaf learners, more time should be devoted to presenting the slides. In fact, additional sessions are needed to teach the reading comprehension materials in order to prevent interfering factors in routine educational program. In the point of empirical view, however, considering the limitations of deaf education, designing a practical technology method would be beneficial to improve the deaf educational system mainly in the Iranian context.

V. CONCLUSION AND RECOMMENDATION

This study highlighted the effective role of PowerPoint presentations in promoting the academic reading skills and reading comprehension of D/HH students. The use of PowerPoint during a semester significantly enhanced the achievements of the experimental group in reading comprehension. A significant difference was observed between the mean post-test scores of the experimental and control groups, i.e. PowerPoint presentations could improve deaf learners' reading comprehension (t=6.181; p<0.05). In the future, instructors and teachers may be able to use technological applications and new multimedia interventions to remove the existing instructional barriers and enhance

reading comprehension in second language learning of students with hearing loss. However, considering the physical and cognitive limitations of the deaf community, further research is required before the planning of any intervention. In fact, all aspects of deaf education should be considered in instructional methods. Moreover, there may be other computer-based programs made for hearing students that would be more beneficial in helping deaf students improve their reading performance. Future research should be conducted using those computer-based programs to assess their viability as an educational intervention for deaf students.

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