

The Effect of SignWriting on the Achievement and Acquisition of Vocabulary by
Deaf Students at “Al-Amal School for the Deaf” in the City of Amman-Jordan

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About This English Document

This document is a translation of portions of the Arabic dissertation.

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The translated sections contained in this document are:

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- 2.....Signature of approvals of dissertation
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The Effect of SignWriting on the Achievement and Vocabulary
Acquiring for Deaf Student at Al Amal School for Deaf in
Amman City

By

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ABSTRACT

The purpose of this study was to investigate the effect of SignWriting on academic achievement and vocabulary acquiring for deaf students at Al amal school for deaf in Amman city. To achieve this goal, the researcher developed and applied a training program by using SignWriting lesson which created by Valerie Sutton, to teach SignWriting for deaf students at the fifth grade at Al amal school for deaf in Amman city, and to teach them a selected part of science book from the second semester.

The study was conducted at a purposive sample contained of 32 male and female students from the 5th grade , the were divided into two groups, one of them was randomly assignment as an experimental group which contain 15 students (10 male ,5 female) , the second was a control group which contain 17students (11 male, 6 female). Two tools used to collect the data, the first was a multiple choice test which was built according characteristics table, the validity and reliability for this tool was verified. The second tool was a list of vocabulary that was selected randomly from the science lessons, validity and reliability for this tool was verified. The two tools were conducted as pre and post test for the two groups .The data were analyzed by using (ANCOVA).

The results of the study were indicated to significantly differences between the two groups in favor of experimental groups in achievement and vocabulary. Also, the findings showed effect to the interaction between the group and gender in vocabulary. The study recommended making more studies about SignWriting and expands the samples and the ages.

Importance of the study

The importance of this study is apparent through its attempt to understand the effectiveness of writing Sign Language (SignWriting). It will contribute to the scientific findings that will justify teaching SignWriting to the hearing impaired. In addition, the importance of this study is evident through pointing to the facets that can be developed and improved during teaching the hearing impaired. These facets are demonstrated in the following:

1. There is a great deal of talk regarding the weak academic level of hearing impaired students. This weakness is greatly attributed to the teaching methodologies employed on the deaf students, and are not due to a deficiency in their mental capacities.

Research has shown that the level of reading comprehension of the deaf does not exceed the fourth grade level, and in mathematics it does not exceed that of the sixth grade level. If traditional methodologies are used in teaching deaf students, then the deficiencies are a result of the teaching methods employed and not the mental capabilities of the deaf students (Hallahan and Kuffman, 1994). The deaf student needs teaching methods that cater to his/her specific needs as a hearing impaired individual. More specifically, the teaching methods must cater to their loss of hearing and inability to speak. As a result, this method of "SignWriting" was developed to remedy such a deficiency. SignWriting is based on teaching the deaf in their native language (Sign Language). This method eliminates forcing the student from dealing with the problems associated with spoken language. For it is such problems that contribute to the deaf student's inability to thrive academically as a result of their deficiency in hearing and inability to speak. It is this very issue that is apparent to all those who work with the hearing impaired and deal with them on a regular basis. It is through the researcher's own experience, in this field, continuously listening to the complaints of the teachers, and their independent attempts to resolve such issues, without any supporting research, that this problem was noticed.

2. SignWriting makes it possible for us to have books, newspapers, magazines, dictionaries, and written literature. All of which can be used to teach SignWriting and its rules to beginners up to experts in Sign Language. The researcher reviewed a number of documents and texts written in Sign Language in different countries, as mentioned in the introduction. It is possible for anyone to view these documents on www.signwriting.org, the SignWriting website. The availability of teaching aids usually increases the learning ability and the linguistic achievement. Therefore, considering SignWriting a teaching tool, at the very least, can accomplish a great deal for the hearing impaired student because Sign Language is the native language of the deaf and the spoken language is the second language.

3-Learning SignWriting assists in learning other languages in a better way. Moreover, it preserves history, education, and it gives depth to human thought, and it is these very items (history, education, and thought) that are firmly connected to language. We must respect Sign Language and greatly support it because we must value and respect the deaf individuals as part of society who has full rights and total responsibility. Therefore, a sign of support and recognition to the deaf is to strengthen their education in their own language.

4- SignWriting will create equality between the hearing impaired and the hearing population who write their own language and have positive self-esteem. Furthermore, SignWriting will increase the self-confidence of the deaf person and increase his self-understanding and self-esteem (www.Signwriting.org). We know how critical self-understanding is in learning. If learning Sign Language will raise the self-understanding of the deaf individual (Bouvet, 1990), then Sign Writing will reinforce the individual's self-esteem. As a result, it will raise the psychological health of the deaf, which is one of the goals of teaching the deaf. (Alzraigat, 2003)

5- Sign Writing works on reducing lost meanings when translating from the spoken language to Sign Language or vice versa. Additionally, through SignWriting, we will be able to compare the different Sign Languages in the world, as well as on a national and regional scale. This will reduce the necessary translations from one Sign Language to another. For instance, translating the word, "teacher" from the American Sign Language into the Arabic Sign Language, we will translate the sign of "teacher" into the word "teacher" in the English language. Then we will translate this word to "teacher" in the Arabic language. Then we will translate "teacher" from the Arabic language to the Arabic Sign Language. But, if we had the Sign language in a written format, we would be able to translate the American Sign Language directly to the Arabic Sign Language (William, 2001). When we reduce the lost meanings and increase the acquired meanings, during the learning process, we expect an improvement in the teaching level and the linguistic achievement. Therefore, learning is greatly associated to the average acquired meanings in the different age levels.

6- SignWriting will assist in transferring the information from the deaf individuals and the users of Sign language to other listeners that are concerned about using Sign Language for different reasons such as family members, teachers, friends, or relatives.

It is especially important if there was a problem following deaf individuals who are experts in Sign Language and who use it quickly. In contrast, the deaf individuals will be able to receive the information in Sign Language if it were written and not depend on others, especially, if their skills in Sign Language are limited (Butler, 2001).

Furthermore, this will increase the cooperation between the parents of the deaf students and the school. As a result, this will help the parents monitor their child's progress more effectively.

7- The supporters of Sign Language declare that learning this language will assist to seal the gap in learning the reading and writing of spoken language (William, 2001).

Keeping in mind that it, spoken language, is the basis of academic achievement. In addition, this will change the dark picture that is portrayed by the research about teaching the deaf. (Hallhan and Kuffman, 1994).

Goal of the study:

This study aims to find the effect of SignWriting methodologies on academic achievement and linguistic vocabulary of the deaf students at “Al-Amal School of the Deaf” in the city of Amman. This will develop SignWriting and contribute in spreading it to the Arab world in an effort to improve the learning of the hearing impaired as much as possible, to improve their communication techniques, and to find ways to assist them in preserving their education in their own special language which is Sign Language.

Glossary of terms used in the study:

- **Sign Language:** It is a collection of descriptive signs, facial expressions, and body movements, which the deaf use for communication and learning. It includes descriptive signs for nouns, verbs, and letters. And, it is a way of communication and a basis for learning that the deaf use at Al-Amal school in Amman.
- **SignWriting :** It is a writing system which uses visual symbols to represent a shape made by the hand and its gestures, and the facial expressions for the Sign Language. Such that it is an organized and consecutive way of using symbols in writing. (SignWriting.org)
- **Deaf Students:** Students who are enrolled in the “Al-Amal School for the Deaf” in the city of Amman.
- **Training Program:** It is a training program for SignWriting. This program is based on a training program on writing Sign Language that was prepared by Valerie Sutton.
- **Descriptive tables:** It is a table that was produced for developing the achievement test in the subject of “Science” for the fifth grade students. This test has acceptable psychometric measures.

Limitations of the study:

The limitations for the study were as follow:

1. The study was limited in the number of participants, which was very small. It is a purposeful sample, among a certain age which is 12 years old and in one school. In addition, the study instruments are designed for the purpose of this study only.
2. The precision of the study instruments and what was available to them in specific psychometric measures.

Previous Studies:

The topic of teaching the deaf is new and the idea is not one that is Arabic, in origin. Therefore, there is nothing available which discusses this topic in the Arabic literature, new or old (according to the researcher's readings and his communication with experts of this field). However, a young Saudi gentlemen residing in the United States, his work has allowed him to practice this idea in Saudi Arabia after earning the permission of experts in the field. He has worked on translating the basis of SignWriting, the guide to using the program "Signwriter", a children's story titled "The Pretty One and the Three Bears" and a collection of lessons for "Al Amal Institute for the Deaf" in Saudi Arabia. In addition, he trained a group of students and coworkers in the "Al-Amal Institute for the Deaf". He received recognition from teachers, students, and supervisors in the Ministry of Education in Saudi Arabia who are responsible for the hearing impaired.

As for international literature, there is small number of studies directly dealing with this topic. The actual number studies conducted amounts to three only, two of which are on the internet and the third was obtained from the inventor of the system of SignWriting by the researcher himself. We will present these studies in a detailed manner as follows:








A study was done by Vasquez (1998) titled "Assessing "Written Sign" (Recognition Skills) at the Escuelita de Bluefields school" in which she researched the possibility of using written Sign Language in teaching reading skills in the Escuelita de Bluefields for the hearing impaired in Nicaragua. This study was part of the requirements for the researcher to receive the Master's degree. The numbers of participants, in this study, were 15 deaf students from both genders and the age range was 13-22 years old. They were divided into three groups based on the amount of time they had spent studying Sign Language. One group were fluent signers in Sign Language, another were a group of individuals who learned Sign Language for five years, and group of beginners who learned Sign Language in the 6 months prior to the study.

The researcher hypothesized that individuals who acquire their first language at later ages will be able to learn reading and writing of this language. She also hypothesized

that Sign Language is the native language for the deaf and that the system of SW is the most appropriate for reading and writing Sign Language.

The procedures of this study included teaching students SignWriting and subjecting them to a multiple-choice test. The participants were asked to choose the correct answer from six choices, which included one correct sign and the other choices had mistakes either in the shape or the direction. The example in figure 9 clarifies a section of the test.

Figure 9: A Section of the Vasquez Test

Diccionario Entry	SignWriting Multiple Choices for YELLOW (AMARILLO)		
 <p data-bbox="336 927 480 981">YELLOW (AMARILLO)</p>	 <p data-bbox="523 779 786 813">a. Correct Response</p>	 <p data-bbox="810 779 1048 813">b. Handshape Error</p>	 <p data-bbox="1077 779 1315 813">c. Movement Error</p>
	 <p data-bbox="523 965 786 999">d. Orientation Error</p>	 <p data-bbox="810 965 1048 999">e. Location Error</p>	 <p data-bbox="1077 965 1315 999">f. Foil</p>

The test results indicated that even beginning signers can be taught to recognize written signs. The minimum score on the test was 75% even though the number of fluent signers in Sign Language was only two participants. The results also suggested that fluency in Sign Language does not necessarily mean literacy in SignWriting. Since fluent signers, with very little SignWriting training, scored less than 50% on the test. The importance of this study is that it establishes a baseline of literacy for the 15 participants. The test can be used in future evaluation of their reading skills and can become part of battery of tests as they progress through the school.

Although this study demonstrated the ability of the deaf to learn reading and writing in Sign Language, even if he was a beginner. However, the study did not explain the relationship between writing and reading Sign Language with the deaf student's academic achievement. Furthermore, the test that was implemented defined the student's ability to learn writing and reading Sign Language and did not show the level of understanding of the language and did not refer to the academics.

In a study by Rosenberg (1999) titled "Sign Writing Languages" which is a unique and historical study, in which she addressed the issues surrounding the Deaf community, its language, and the writing system proposed for recording its language by making a historical presentation about writing the spoken languages. Through this study, the researcher considered the deaf community; a unique cultural group that has its own characteristics, education and language which has not been recorded and she described the trials to find the system of SignWriting. Also the study was implemented in California, where Sign Language was invented.

The researcher concluded that the success of this writing system is evident by its use in the deaf communities of many countries and that SignWriting will provide the

opportunity for the deaf to learn spoken language in a better way, if he/she had learned Sign Language previously. It would also be possible to include it in school curriculums and it may provide, for the deaf, the means to produce books, newspapers, and computer programs.

The study presented some objections for the usage of SignWriting, but these objections are a result of lack of information and not understanding the subject comprehensively. One of these objections was that SignWriting might have a negative effect on learning spoken English. In addition, it will support the belief that the deaf community is a secluded one. However, the researcher pointed out that learning SignWriting would help improve learning reading and writing of the English language.

A third study was prepared by Flood (2002), titled “Experiences of the Deaf and Hearing Impaired in Learning SignWriting. A Method for Sign Reading and Writing”. Flood was able to answer the following question: How do experiences of the deaf and hearing impaired effect learning SignWriting? The researcher used a qualitative research method to answer the aforementioned research question. She answered the question through a three-phase procedure: collecting information, documentation, and interpretation. The study sample consisted of 17 deaf and hearing-impaired students from two schools where the participants were considered primary research tools.

The research was conducted in two schools: The first was a specialized school for the deaf, and the second school had a mix of students including the deaf. The participants in this study were distinguished because they were teachers who had strong relationships with the deaf students. The students possessed information about their own education as deaf individuals. The students would be left to compare using the book of Sign Language since it is a middle step or aid in learning reading and writing. There was, also, cooperation between the assistant researchers and the participating teachers on one end and with the students on the other end, in order to reach a summary or recommendation regarding SignWriting. To get an idea of the students’ awareness and knowledge about SignWriting, they were placed into groups to write their thoughts and experiences in writing Sign Language.

The study showed that the students learned SignWriting quickly and they were active learners, because the researcher focused on the cooperative learning method. As for the result of the study, it concluded by giving the recommendation to include SignWriting as a part of the teaching curriculum for the deaf and hearing impaired. In addition the student should learn reading and writing in both languages, the English Language and Sign Language.

For more beneficial information, a number of studies were shown on teaching the deaf through different perspectives and they are as follows:

The study by Singleton, (2002) titled “Vocabulary Use by Low, Moderate, and High American Sign Language Proficient Writers Compared to Hearing English Sign Language and Monolingual Speakers”. In this study, the researcher compared the written vocabulary of 72 deaf individual in the elementary level with 60 individuals who were hearing at the same level and who use English Sign Language as a second

language and 61 hearing monolingual speakers of English all of similar age. Students were asked to retell a story previously viewed on video in a writing activity. Writing samples were later scored for total number of words highly frequent in children's writing, all deaf writers showed significantly lower use of words when compared to their hearing peers. Low American Sign Language proficient students demonstrated a greater usage of high frequency words and a repetitive use of a limited range of words than students that were moderate to high American Sign Language proficient. The writing of the deaf writers also differed from the writing of hearing ESL speakers. The recommendation made by the study was that deaf education should give special attention to teaching the English language to the deaf students as a second language.

In a study done by Sera and Martin (2006) titled "The Acquisition of Spatial Constructions in American Sign Language and English", both researchers studied the developing knowledge of language used to refer to the spatial relations (front, back, right, left, near, far, high, and low) by children learning American and English Sign Language. The research studied 23 deaf individuals that included children and adults who learned Sign Language before the age of five years old and 23 individuals who speak the English language. It was requested from the participants in both groups to choose which of two pictures depicted a signed or spoken relation. The results showed that the individuals who learned Sign Language learned spatial relations and understood it in a detailed manner.

A study was prepared by Story and Jamieson, (2003) and was titled "Using Sign Language Vocabulary and the Internet by Educational Translators". It aimed to know the demographic characteristics of translators in the educational field, in Columbia, in order to know the sources used to learn new vocabulary and the concentration on using the Internet to reach the level that they have attained. They also wanted to know the resources available to develop the vocabulary that they have in Sign Language and that would help them in their educational work. A comparison was then made of the participants' level in Sign Language and the time each one of them would spend on learning Sign Language and preparing themselves to become a translator in the educational field. The study showed that increasing the translator's common vocabulary depends on human sources (lecturer and adult deaf) more than the materialistic sources such as (books, internet and video). The study also showed that the level of comfort in using a resource is more important than the type or quality of that resource. Therefore, the study recommended having the internet readily available for translators of Sign Language, especially in the academic fields, as a means of developing Sign Language vocabulary.

In a study by Mayberry and Boudreault, (2006), regarding "Acquisition of Sign Language Rules", the focus was the role of age in acquiring the first language. The research was done on thirty deaf adults who were inflicted with a hearing impairment from birth, and who learned Sign Language from birth until age 13. They were exposed to six kinds of American Sign Language combinations which were: simple signs, their opposites, verbs, similarities, "who" questions, and relativity. A comparison was done between the signs in two separate cases: in the case where there was an available set of organized rules for it and in the case where there were not any rules. In the case where there were no available rules, the signs were less precise and slower. Also, the results point out that acquiring rules for the first language has a big effect on acquiring a second language.

In a study conducted by Harry et al (2007) about “Technical Signs in Science and its Effect on the Development of an Individual Dictionary for the Deaf.” They pointed out the benefit of classroom teaching and electronic dictionaries from the practical research on Sign Language. This research focused on the rules of Sign Language. In this study, it was found that the experience of teachers in using Sign Language and their knowledge of the subject matter to be a main factor in choosing the appropriate sign. Also the study pointed out that there is a need for organized ways to choose appropriate signs and implementing them while teaching the deaf. The recommendations of this study were to develop an electronic dictionary and conduct more research on using Sign Language in teaching.

As for the study conducted by Mary et al (Mary, Des, Louis, 2007), regarding different communication systems that the deaf use in Australia. The study indicated that despite the limited studies available about the usage of technological communication tools by the deaf in their social life and at work, the researchers were able to survey the hearing impaired through regular correspondence. The survey results show that the deaf use the following equipment most regularly: Short Message Service (SMS), which is distinguished because it allows for social interaction and secures individual privacy. Also telephone type (TTY), which is used to communicate for longer time periods with others. In addition to the vocal telephone (TTY/voice) and the fax machine which are both used during work; and email to enter chat rooms, to correspond and to use for studying.

A study by Conner (2006) titled, “Examining Communication Skills of The Deaf”. The purpose of this longitudinal case study was to closely examine one deaf child's experience with a cochlear implant with respect to his speech, language, and communication skills from kindergarten through middle and high school. The target child was the first child to receive a cochlear implant, in the United States in 1988, when he was 5 years of age. The initial data revealed that the child demonstrated profound delays in speech and language skill development. His speech and language skills grew slowly during the first 3–4 years following implantation, very rapidly from about 5 through 7 years post-implantation, and then slowed to rates that were highly similar to same-age peers with normal hearing. The child's communicative competence improved through the use of Sign Language but use of Sign Language decreased as his oral communication skills improved. The results of this study indicate that we must support children who use cochlear implants.

As for the study by Rochon, Soukup and Feinstein, (Rochon et al 2006) titled, “Effect of American Sign Language on Training Deaf Athletes”, it was conducted to understand the coaches' knowledge of Sign Language in the high school level and the extent of its usage while training the deaf athletes. Twenty two deaf athletes were chosen along with their non-deaf coaches. Surveys were used to collect data for the study. The study found that the most frequently used and most effective methods that help build positive relationships between the deaf athletes and their coaches were using translators of Sign Language. The deaf athletes and their coaches indicated in this study that direct communication removed all borders between the athletes and their coaches. Finally, the positive relationship between the deaf athletes and their coaches reinforced and developed the athletes and their performance. The study

recommended recognizing the importance of having coaches of deaf athletes learn American Sign Language.

As for the study by Gerrit et al (Gerrit, Wolfgang and Isabel, 2006), titled “The Impact of Visual Communication on the Intersubjective Development of Early Parent–Child Interaction With 18- to 24-Month-Old Deaf Toddlers”. In this study, a test was done to examine the effects of visual communication on the quality of the early interaction between deaf and hearing mothers and fathers and their deaf children aged 18-24 months. The participants were divided into three groups as follows: 1. Auditory/oral communication between the hearing father and the deaf child. 2. Total communication. 3. Deaf parents using Sign Language. Parent-deaf child interaction was analyzed according to the occurrence of Loots et al’s Intersubjective Developmental Theory during free play with a standard set of toys. It was shown through analyzing the data that using Sign Language among deaf children ages 18-24 months and their fathers helped produce objective results. While the fathers who used only oral communications were not able to produce objective results. As for the fathers who used total communication, their role was similar to the role of deaf fathers. Thus, there was a difference in the linguistic and symbolic meaning with the deaf children.

In the study performed by Barkat (1999) on 180 children who suffered from hearing impairment and they were subjected to early educational programs, he pointed out that those children can be communicated with easily and smoothly. Also, they do not have fear of entering school, and they accept their teachers easily. Additionally, their linguistic knowledge along with their knowledge of vocal sounds is better than those who enrolled in school at a later time, or those who were confronted with problems with social assimilation and low academic achievement. Despite this, Barkat did not point to the time period over which the study performed or the instruments that were used.

In a study that was done by Richardson (2002) under the title of “Academic Engagement of Students with a Hearing Loss in Distant Education”, the researcher did a performance comparison between students who had a hearing loss and those who did not have hearing loss and who were taking courses by distant learning (The study does not define ‘distant learning’ and whether it is it through the internet, video, television, or phone. The first group was students who had a hearing impairment and it included 267 students. The second group had 178 students without hearing loss. The study reached a result that the students who had a hearing loss and who received distant learning was lower achievers than the students who were not hearing impaired. The deaf students indicated that communication was better than traditional learning (classroom). Degrees of independence and control were higher than in a traditional classroom. The conclusion is that the effect of distant learning was weak on the achievement of deaf students.

A study performed by Hadjikou and Nikolarizi (2006) about the role of educational experiences in the development of the deaf’s identity. The researchers analyzed a qualitative study about the experiences of 25 deaf participants. They indicated that the most important role of educational experiences in the development of the deaf’s identity, is the interaction of the deaf students with their hearing and non-hearing

peers and the communication in school. The deaf participants pointed out that they wished to be enrolled in a school specialized for the deaf so that they can interact, through Sign Language, with their peers and that is what forms their identity. As for the individuals who knew that they were bilingual, they leaned towards the interaction with hearing individuals in a normal school. However, they interacted with the deaf outside the school which helped to form their identity as deaf individuals.

A study conducted by Bouvet (1990) titled "Teaching the deaf through Bieducational methods". The study aimed to understand the effect of learning using bilingual methods on deaf children, and training them to overcome any psychological problem resulting from lack of ability to use the spoken language. The researcher depended on teaching the deaf children Sign Language, then the spoken language as a second language, and then teaching them communication skills. The results indicated the effectiveness of the bilingual method in overcoming psychological problems.

A study by Nuria and her colleagues (Nuria, Anna and Irenka, 2007) regarding conversational skills in a semi-structured interviews and self-concept for the deaf students to learn their language abilities and its relation to social interactions. In her study, Nuria compared 56 deaf participants with the following demographic variables: age, gender, degree of hearing loss, and educational factor. This was done through the Self Development Questionnaire (SDQ, 1992) and TST-Who Am I? test in order to obtain data about their conversational abilities with the hearing adults. The results showed a relationship between the positive self-concept and most of the conversational skills. The study concluded that it is necessary to teach deaf students conversational strategies along with the non-deaf students, especially in the combination programs for the deaf.

Al-Qudat (2005) studied the effectiveness of an improved Arabic curriculum by using the Complete Communication method in the linguistic achievement for the deaf students in both first and second grades. The study sample was formed of 36 female and male students who suffered from severe to extremely severe hearing impairment. They were divided into two groups and a control group which consisted of 18 male and female students and experimental group which consisted of 18 male and female students, from both first and second grades. The program was applied daily in two periods for a span of one and one-half months. The students were subjected to a Pre-test and a Post-test. The results were then analyzed by the Analysis of Covariance (ANCOVA) method. The study showed that there is a statistically significant difference in favor of the experimental group regardless of the grade or gender, which indicates the effectiveness of this experimental program.

As for Hilwani (1999), he studied reading skills of a sample of 114 female and male students in the schools of the United Arab Emirates where the students were divided into three groups. The first group consisted of 38 average-achiever male and female students, 8 years of age. The second group consisted of 38 low-achiever male and female students, with a group average age of 10 years old, who failed and repeated one of their school grades at least once. The third group consisted of 38 female and male students with an average age of 11 years old and who suffered from hearing impairments of various levels; 9 students with low impairment, 7 students with moderate impairment, 15 students with severe impairment, and 7 students with very severe impairment. All of them used hearing aids. The researcher found that there

was a similarity in the reading skills between the students who were moderate achievers and the ones who were hearing impaired.

Hassouna (2005) studied the development of written expression skills, the academic achievement and self-understanding of deaf students in Middle Schools in Jordan through a training program suggested to develop these skills. The program was applied on a sample of deaf students in the Counties of Zarqaa and Amman. The sample consisted of 48 female and male students who were divided into experimental and control groups. The experimental group consisted of 24 male and female students, and the control group was 24 male and female students. Three measures were used for the studies: testing the writing expressions, academic self-understanding measure and the suggested program. The study showed statistically significant differences between the experimental group and the control group in favor of the experimental group in the written composition skills and self understanding.

As for the study conducted by Jones et al. (Jones, Ouellette and Kang, 2006) titled “Stress Recognition of the Deaf Adults”, he described the effective ways to manage and reduce the psychological stress recognized by the deaf adults who express the sources of their psychological pressure. Jones also described the circumstances that increase the sources of stress for the deaf in comparison with non-deaf individuals.

The Psychological Stress Measure, which was prepared by Cohen, Kamarck, and Mermelstein (Cohen, Kamarck, and Mermelstein, 1983), was applied as a Pre-Test for the deaf participants in the study. The study pointed out that: 1. the deaf suffer from psychological stress more than the non-deaf; 2. the appropriate interference helps the deaf to reduce the level of psychological stress and reduce the dangers inflicted by such stress.

Malkawi (2005) pointed out in his study the effectiveness of a training program for the mothers of the moderately hearing impaired children, at a pre-school stage, in order to improve the vocal pronunciation of Arabic sounds. He studied a sample consisting of 30 mothers with their children and they were divided into two groups, a control group that consisted of 15 mothers with their children and an experimental group that consisted of 15 mothers with their children. The ages of the children were between 4-6 years old and their impairment was neurosensory. As part of an experiment, the children were asked to name pictures in order to discover the disturbances in their vocal pronunciation. The training program was applied on the mothers for 32 sessions over four a month period. It was determined that by applying the Post-test and running the Analysis of Covariance (ANCOVA), there was a statistically significant difference in favor of the experimental group in the pronunciation of the Arabic vocal sounds. There were also gender differences and gender-group interaction differences, where females performed favorably.

Analysis of previous studies:

The previous studies were divided into two groups. **The first:** the studies that pointed to the subject of SignWriting in an indirect way. The studies concentrated on the following main topics: 1. SignWriting is a new idea and it is spreading quickly around the world among the deaf communities; 2. regardless of the deaf individual's ability in Sign Language, he has the ability to both learn SignWriting and to use it to interact with his peers. Also, the deaf individual accepts the idea of SignWriting and interacts with it positively.

The second: the studies that pointed to teaching the deaf in general. The studies indicated the following: 1. the ability of the deaf to learn and acquire vocabulary; 2. teaching the deaf in an appropriate way will increase the learning level of the deaf to a degree that is comparable with the non-deaf individual; 3. the mental abilities of the deaf children can be improved to reach the level of normal individuals, as we noticed in the studies that researched the creative thinking abilities of the deaf children; 4. the studies generally pointed to the benefits of early learning and early enrolment in school for the deaf children.

These studies contributed to the researcher's study by helping him to deeply understand the abilities of the deaf and their problems. Also it helped him to track areas of weakness in teaching the deaf. Through these studies, it became quite evident how important Sign Language was to the deaf. It became clear that it is not possible to function within the deaf community without Sign Language. This is what instigated the researcher to look for a way to develop and strengthen Sign Language.

Hence, the SignWriting method, invented by the American Valerie Sutton, and its effectiveness was chosen as the subject of this study.

These studies give us an indicator of the importance of teaching the deaf in an appropriate manner. The studies also point out that the weak level of the deaf is attributed to the weakness of the teaching methods, rather than to the deaf individual's mental or educational incapacity. Skimming through the studies gives us a clear indication that it is possible to have the deaf individuals reach the level of normal individuals, in different academic areas.

Chapter 2: Methodology and Procedure

First: Participants:

The participants were chosen from a group of fifth grade students in the “Al-Amal School for the Deaf” in Al-Qawasmah, Jordan, as a study sample. This choice is due to the proximity of the researcher's place of employment and the availability of qualified participants- who have hearing impairments ranging from severe to complete impairment. They were randomly divided into two groups, an experimental group and a control group. Group A was the control group and it is made up of 17 students, 11 males and 6 females. Group B was the experimental group and was made up of 15 students, 10 males and 5 females.

Balance of the Groups

Table 1. The signs of equivalency between the two groups are as follows:

Control Group	Experimental Group	
2 & 12 years old	12 years old	Average age
Impairment ranges from severe to complete		Hearing ability
All participants are within the normal range, where as the lack of any mental disability is a condition to accept them in school.		Mental ability
66.6	67	Results in Science Classes for the previous semester
17 (6 females & 11 males)	15 (5 females & 10 males)	Number of students

Second: Research Instruments

For this study, the following instruments were used:

1. A training program on SignWriting. The program has been prepared based on teaching lessons on SignWriting done by Valerie Sutton, which were originally taken from www.signwriting.org. The translation has been done with the official permission of the inventor of the symbols of SignWriting, the American Valerie Sutton. After presenting the program to the advisor, Dr. Ibraheim Zarayqat, it was presented to a group of experts in Sign Language.
2. Twenty four periods from the Science Curriculum for the fifth grade in the second semester. The following topics were chosen that match the time table of the lesson plan for the subject of “Science”. Finishing these periods will coincide with finishing the training on SignWriting. The periods included the following topics.

- The Plants Change
- Life Cycle of the Plants
- Seasonal Plants and Permanent Plants
- Tree Age and the Annular Rings (Tree Rings)
- The Plants and the Seasons
- Perennial Green Plants and Non-Perennial Green Plants.
- Role of the City Councils
- Agriculture and Production Improvement
- Introducing the Agricultural Equipments
- Irrigation Methods
- Methods for fighting Agricultural diseases
- Olive Tree Fly
- Locusts
- Chemical Pesticides
- How to Improve the Agriculture Production

3. These topics were translated into SignWriting using the Sign-Edit program. This is a program which was developed in Brazil for the cause of SignWriting, which can be downloaded and installed on Windows XP.

4. Multiple Choice Exam: The test covered topics in the subject of “Science”. The Exam was developed based on the Table of Specification, included in the Appendices at the end of this research. The exam material was presented to a group consisting of five experts in the deaf sciences. The elements of the exam, 36 in total, were agreed upon by four of the five experts.

Validity and Reliability of the Exam

Validity: Validity of the Exam was established based on the integrity of the experts who enforced the elements that were agreed upon by four of the five experts. The content validity was shown through considering all the elements which cover the subject of “Science” that was taught to the students. Sampling Validity was shown through exam questions that represent the behavior sample which is meant to be measured: Achievement in Science.

Reliability: Reliability was measured by the process of repetition. The exam was applied on a survey sample of ten students from the sixth grade at the school. The exam was repeated two weeks later. The reliability factor was 0.64.

5. List of vocabulary words from the Science book about the topics that were chosen and mentioned earlier. A random sample of 150 vocabulary words were selected and then were presented to five experts to edit and select the words that are appropriate for the deaf fifth grade students. They then eliminated all the words that were not agreed upon by four out of the five experts. At the end, 109 words remained.

Validity and Reliability of the Vocabulary List

Validity: The validity of the experts was established through the agreement on the vocabulary list between four out of the five experts. The content validity was shown through the random selection of vocabulary from the subject of “Science” that was taught to the students.

Reliability: Reliability was measured through the process of repetition. The list was implemented on a survey sample of ten participants from the sixth grade in the school. The list was applied again two weeks later. The Reliability Factor was 0.53.

Three: Studying Procedures

1. The students in the experimental group were trained in SignWriting for two months. They were trained to define the writing method of the symbol and to read it. Sample writings were given to enable the students to read and write while depending on the program that has been established. The training was on the basis of SignWriting, and was given four periods per week for two months. Each period was 45 minutes long; therefore the total length was 24 hours (4 periods x 45 minutes x 4 weeks x 2 months = 24 training hours). The students were eventually able to read and write under this new technique.

The Pre- test was implemented on the experimental and control groups.

2. The vocabulary list was applied (Pre-Application) on both the control and experimental groups.
3. Consequently, a translation was made on the topics that were aforementioned in SignWriting.
4. The students were taught the Science curriculum, which was written in Sign Language for 24 periods as follows:

Teaching begins with prior preparation of the two groups and in accordance with the school schedule. The lessons are intentionally not organized in any manner, therefore the lessons may be taught first to the experimental group and then to the control group, or vice versa.

First step: the lesson usually begins with the warm up which includes greeting the students, asking about the day of the week and the date and sometimes rearranging the students in the classrooms. Rearrangement may be necessary for many reasons. Some students might be in a bad mood or there might be conflicts between students. Having individuals with such conflicts in close proximity to each other might lead to constant conflicts between them for no reason.

Second step: Lesson introduction which can be achieved by asking the students questions about their knowledge of the prior period. Through their answers, you can build up on their knowledge to lead them to the new lesson.

- **Third step:** Explanation of the lesson as shown in the following table:

Table 2: Method of applying the lesson on both groups:

Control Group	Experimental Group
Reading the lesson: the students will focus on the residual hearing by using the hearing aids and focusing on lip reading.	Reading the lesson: the students will focus on the residual hearing by using the hearing aids and focusing on lip reading.
Writing difficult vocabulary words on the board and explaining it in Sign Language.	Writing difficult vocabulary words on the board and explaining it in Sign Language, then writing the words in SignWriting.
Reading the written words in the Arabic language.	Reading the written words in Sign Language.
Explain the whole lesson in Sign Language.	
Writing a summary for the lesson in the Arabic language.	Writing a summary for the lesson in Sign Language.
The students read the lesson in the Arabic language.	The students read the lesson in written Sign Language.
Doing the exercises in the Arabic language.	Doing the exercises in written Sign Language.
Performing a quick evaluation through questions about the lessons in Sign Language.	

6. A Post-test evaluation is conducted through applying the achievement test and the vocabulary list on both groups.

7. Find the results based on using the SPSS program which employs: a. the Analysis of Covariance (ANCOVA) to compare between the experimental and the control groups; and b. the T-test to compare between the averages of the experimental groups before and after the studies.

8. Discussing the results (this will be presented in the Results Discussions chapter).

Variables of the study:

The variables are shown as follows:

- 1. Independent variables:** The teaching method has two levels:
 - a. Teaching methods using SignWriting.
 - b. Traditional teaching methods

2. Dependent variables

- A. Achievement level which is measured by the grade the student receives in the Achievement Test prepared for this purpose.
- b. Linguistic achievement which is the amount of vocabulary that the participants of this study possess or acquire. This achievement will be obtained by comparing the performance on the Vocabulary List before and after the studies, which was prepared for this purpose.

The Study Design and Statistical Recovery

This study is considered a quasi experimental study that uses a pre-test, treatment, post-test, and two groups: control and experimental, as follows:

O1 X1 O2
O1 X1 O2

O1: Pre-test

O2: Post-test

X1: Learning by SignWriting

X2: Learning by the traditional method

Table 3. Statistical Design of the Study

Dependent Variable		Independent Variable	Group
Vocabulary	Achievement	Learning by Sign Language Writing	Experimental
		Learning by the traditional method	Control

Results of the study

This chapter will show the results related to the answers of the study question. We will discuss the answer to each question separately, as follows:

Question 1: Does SignWriting have an effect on the academic achievement of the deaf students according to the group and the gender variables, and the interaction between them at the level $\alpha = 0.05$?

To answer this question, an academic achievement test was implemented on both groups after teaching. The averages and standard deviations were then calculated for the performance on the post-achievement test as shown in Table 4.

Table 4: Performance on the Post-achievement Test

Number	Standard Deviation	Average	Gender	Group
10	3.62	22.00	Male	Experimental
5	2.70	21.60	Female	
15	3.24	21.86	Total	
11	5.61	10.09	Male	Control
6	3.01	11.33	Female	
17	4.78	10.52	Total	
21	7.66	15.76	Male	Total
11	6.01	16.00	Female	
32	7.04	15.84	Total	

Table 4 indicates that the total average of the experimental group equals 21.86 and the average of the control group equals 10.53. The difference between them equals 11.33.

The average performance of males in the experimental group was 22.00. In the control group, the average male performance was 10.09, and the difference between the two groups equaled 10.48. As for the average female performance in the experimental group on the post-achievement test was 21.60 and the average female performance on the post-achievement test in the control group was 16.00 and the difference between the groups equaled to 5.60. To know the statistical relevance of these differences, the Analysis of The Double Covariance was conducted as shown in Table 5.

Table 5. The Analysis of the Double Covariance for the Performance on the Post-Achievement Test between the Control and Experimental Groups.

Source of Variance	Total Squares	Degrees of Freedom	Middle Squares	—	Reference Level
Achievement	105,304	1	105,304	7.070	0.013
Group	697,776	1	697,776	46.849	0.000
Gender	1,679	1	1,679	0.113	0.740
Interaction between Gender and Group	9,756	1	9,756	0.566	0.425
Error	402,139	27	14,894		
Total	1,538,219	31			

The data given in Table 5 indicates that there is a statistically significant difference in the achievement where the value of alpha (α) equaled 46.849 at the Reference Level of 0.000.

To know the source of difference, mean averages were calculated for both the experimental and control groups which is shown in Table 6

Table 6. Mean Averages of Achievement of both Experimental and Control Groups.

Group	Average mean
Experimental Group	21.159
Control Group	11.007

From Table 6, it is shown that the difference of both groups is in favor of the experimental group, because the average performance on the achievement test for the experimental group was 21.156; whereas the average performance on the achievement test for the control group was 11.007.

The results in Table 6 also indicated the lack of a statistically significant difference in the achievement according to the variables of the gender, where the value of alpha (α) was 0.113 which has no statistical relevance.

Similarly, Table 6 indicated the lack of a statistically significant difference in the achievement according to the variable of Interaction between Gender and Group, where the value of alpha (α) was 0.655 which has no statistical relevance.

Question 2: Does SignWriting have an effect on the deaf student acquiring vocabulary according to the variable of gender, group, if the interaction between gender and group is $\alpha = 0.05$?

To answer this question, the vocabulary list was applied on both groups, the experimental and control after teaching. The average means and standard deviations were then calculated for the performance on the vocabulary list as indicated in Table 7.

Table 7. The performance on Post-application of the vocabulary list for both the experimental and control groups.

Group	Gender	Average	Standard Deviation	Number
Experimental	Male	47.6	21.32	10
	Female	44.0	12.40	5
	Total	46.40	18.42	15
Control	Male	25.00	16.37	11
	Female	56.33	18.53	6

	Total	36.05	22.65	17
Total	Male	35.76	21.73	21
	Female	50.72	16.57	11
	Total	40.90	21.10	32

Table 7 indicates that the total average of the experimental group equals 46.40 and the average of the control group equals 36.05. The difference between them equals 10.53.

The average performance of males in the experimental group was 47.60. In the control group, the average male performance was 25.00, and the difference between the two groups equaled 11.1. As for the average female performance in the experimental Group on the post-application test, which was 44.0 and the average female performance on the post-application test in the control group was 56.33 and the difference was 12.33. To know the statistical relevance of these differences, the Analysis of The Double Covariance was conducted as shown in Table 8.

Table 8. The Analysis of the Double Covariance for the Performance on the Vocabulary List Post-test between the Control and Experimental Groups.

Source of Variance	Total Squares	Degrees of Freedom	Middle Squares	–	Reference Level
Pre-achievement	7,312,815	1	7,312,815	110.125	0.000
Group	884,925	1	884,925	13.326	0.001
Gender	158,856	1	158,516	20387	0.134
Interaction between Gender and Group	413,549	1	413,549	6.228	0.019
Error	179,919	27	66,404		
Total	13,812,719	31			

The data in Table 8 show that there is a statistically significant difference in the performance on the vocabulary list according to the variables of the group where A was (13.326) and which is a statistically significant value of (0.001).

To know the source of variance, the middle squares were calculated for the performance on the vocabulary list between the control and experimental group, as shown in Table 9.

Table 9. Average Middle Squares of Vocabulary List of Control and Experimental Groups

Control	Experimental	
36.36	47.67	Average

As shown in Table 9, the difference in the groups is in favor of the experimental group because the average performance on the vocabulary list for the experimental

group was 46.67 and it is greater than the average performance on the vocabulary list for the control group, which was 36.36.

It is also shown in Table 8, that there is no difference in the performance on the vocabulary list according to the gender variable where the value of A is 20.387 and it is not statistically significant.

Table 10. Averages for Vocabulary Acquisition According to the Interaction Between Gender and Group.

Group Gender	Experimental	Control	Total
Average Male	49.2	29.96	39.58
Average Female	46.15	42.77	44.46
Average Total	47.67	36.36	

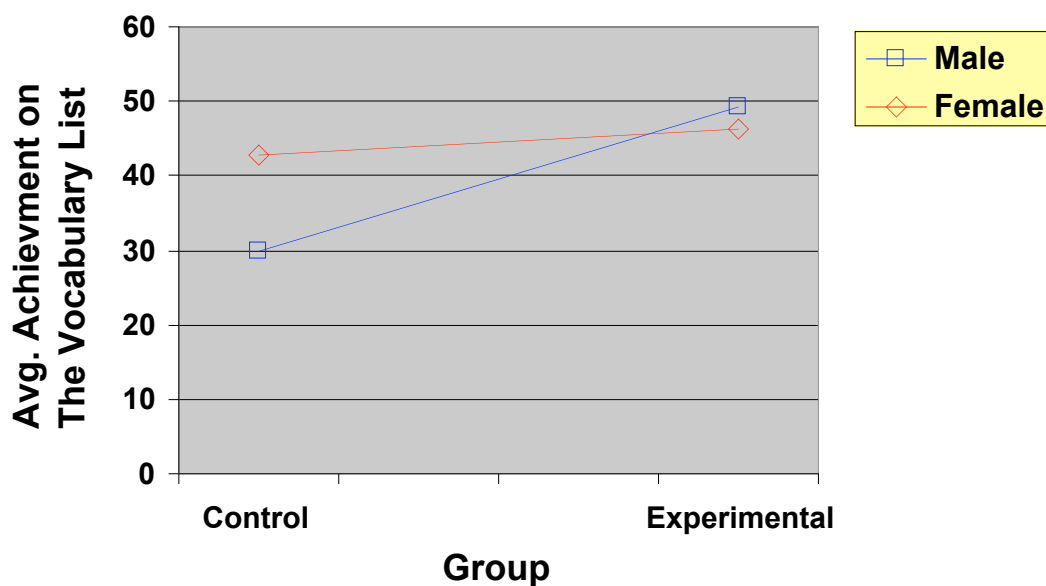


Fig. 10 Interaction Between The Gender And The Group In The Performance On The Vocabulary List.

Discussion of Results:

This chapter of the dissertation presents the discussion of the results, and what has been pointed out by world literature, that is related to this subject. This is in an attempt to have a deeper understanding for the conclusion of this study. The discussion is organized according to the study questions as follows:

Discussion of results for the first question:

Does Sign Language have an effect on the academic achievement of deaf students, according to the variables of group and gender and the interaction between them at the level of $p \leq 0.05$?

The results indicate there is a difference in the achievement due to the use of the SignWriting method. This method was used by individuals in the experimental group who had the favorable results. The researcher attributes the favorable results to the effectiveness of the SignWriting method in teaching the deaf.

Many studies demonstrated that adjusting the teaching methods for the deaf, in accordance with their abilities, greatly improves their level of achievement. In our research, we calibrated the teaching method with the Sign Language skills of the deaf in the experimental group beforehand. The results revealed an improvement in the achievement of the participants of this group compared to that of the control group. This is consistent with the previous studies that stressed the importance of teaching using the SignWriting method, as in the study of Rosenberg (1999), Flood (2002) and Vasquez (1998).

The style of SignWriting is an attempt to reduce, as much as possible, the achievement gap between the deaf and the non-deaf. Teaching using the method of SignWriting focuses on a dual-language approach, which considers Sign Language to be the mother language of the deaf and the spoken language is the second language. The result of this study agrees with the study of Bouvet (1990) which emphasizes that the dual-language approach is the best for teaching the deaf. It is also apparent here that SignWriting helps to give the complete meaning and at a high level of clarity. This contradicts the common beliefs concerning Sign Language, as cited by Halhan & Kaufman.

Teaching in deaf schools, in Jordan, depends on Sign Language one way or another. For instance, In Al-Arabi Al-Mukaddasa School there is a complete dependence on Sign Language. As for Al-Amal School for the deaf, in Qawasma-Jordan, teaching the deaf is conducted utilizing the comprehensive style, which is primarily based on Sign Language. The presence of inconsistencies in some of the signs leads to confusion in the meanings understood from one student to another. Based on the understanding of specifically used signs, it became necessary to establish a practical system that unifies the signs as much as possible. This would be only possible with the presence of lessons written with Sign Language. The application of these lessons in teaching the deaf clarifies the sign and its meaning. Hence, the deaf individual or the teachers are not forced to go back to the picture of the sign, which may not be available. Frequently, the teacher or the student might not find someone to guide them to the correct sign, either because it is not available in the picture gallery or because of the

lack of such a gallery. This is exactly why the availability of the written lesson reduces the misunderstanding of sign as much as possible, if not stopped. Adding more to the student's vocabulary helps to improve the academic achievement, as was pointed out by Baumann and Kaem'enuei, 1991. Using a dual-language program in teaching the deaf helps to increase the academic achievement of the deaf in all areas of reading, writing, the sciences, math, and more. The level of academic achievement was very comparable to that of non-deaf students. (Smith et al, 2001; Smith 2004 and Hallhan and Kuffman 1994).

Furthermore, analysis of the results indicated that achievement is not impacted by the gender variable or by the gender-group interaction. One may conclude that perhaps the increase in achievement is not what motivated the students to learn SignWriting, but rather that it was the students' desire to learn reading and writing, in their mother language, which is Sign Language. And, it is this new idea which attracted their attention and with its role had a positive influence on their achievement. This is different than what I referred to earlier when answering the third question, which was the male students who wish to acquire the vocabulary for the sake of communicating in social situations and this was made available to them through the method of SignWriting. The results of the study conflict with previous research results, which call for the use of full communication methods. These previous studies were from the 60's and were referenced by the study conducted by Most, Arma and Andorn (2004). The summary is that we can attribute the student's improvement in achievement to the usage of SignWriting in teaching the experimental group.

Discussion on answer of question 2:

Is there an effect to the usage of Sign Writing on acquiring vocabulary of deaf students based on the variables of group, gender, and the interaction between them on level $\leq(0.05)$?

When answering the second question, it was evident that there is a statistical difference between the Experimental and Control groups in gaining vocabularies. The researcher believes that this is due to the SignWriting, which proves its effectiveness in teaching the deaf. This also proves that the deaf are generally able to learn and more specifically to acquire vocabulary. This is consistent with many research studies which proved the ability of the deaf to adopt the spoken and the written language vocabularies. For instance, the study by MacGregor and Thomas (1988) pointed to the ability of the deaf to gain vocabularies if and when the appropriate method of teaching the deaf is utilized. Additionally, this study addressed the use of the computer in teaching the deaf. The study of MacGregor and Thomas agrees with Al-Hilawani study (2003) which used the Key Word Strategy to increase vocabulary and comprehension of the deaf. These two studies agree concerning the benefits of using electronic dictionaries and computer games to increase the vocabularies of the deaf. In other words, hearing impairment does not limit the deaf's abilities to increase their vocabularies.

The researcher noticed the following through implementing the experiment: He noticed that the students displayed strong interest which was shaped in two forms; the attention and high concentration during the lesson; and the continuing education outside the lesson. Wherein a student misses a lesson during the learning process, he returns to class with the ability to read the lesson he missed as well as understanding

its meanings through studying with his friends. The researcher never encountered a similar situation during his previous work with the deaf. Although this is a positive indicator, it can also be a threat to the conscious, which is known as the 'Seriousness Trace'. In other words, the excitement of the new subject causes an improvement in the performance of the experimental group more than what the treatment can cause.

However, the length of the training program for two months in addition to teaching the sciences in the SignWriting is enough, in the view of the researcher, to offset the lower performance caused by the treatment.

What was reached to answer the second question, agrees with Vasquez (1998) which showed the ability of using SignWriting in learning reading skills and also even beginners in Sign Language can learn reading and writing Sign Language. This clarifies that the method of SignWriting is appropriate in teaching the deaf. Furthermore, the second question results agree with the study of Al-Shawaikee (1991) which referred to the ease of understanding Sign Language vocabulary and distinguishing them by the deaf students. The signs are related to the meaning and do not need clarification which is why it is easy to learn by the deaf and the parents.

The answer to the second question showed that the gender variable has no effect by itself on gaining vocabularies based on the SignWriting. This perhaps goes back to the fact that the students are from both genders and they were both simultaneously exposed to the same experiences, same teaching conditions and subject to the same requirements. The requirements were to equally compete in order to gain as much vocabulary as possible.

However, the presence of a trace of statistical significance in the gender and group variable in vocabulary acquisition, based on the program of SignWriting, perhaps goes back to the large improvement in vocabulary acquisition of females which was high in both experimental and control groups. Both groups received specific treatment, and it has been pointed out in detail in the chapter of methodology and procedures. Even individuals in the control group learned and increased their vocabulary. The increase was greater for the females than the males. When the gender variable was added and the interaction between gender and group was researched, we found an effect of interaction of the gender and the group. This can be attributed to the fact that SignWriting caused curiosity in the students, which in turn caused the improvement in their performance in comparison to the male performance.

We cannot decide the reasons behind increased vocabulary of the males, is it due to the method or the male characteristics in this age group. In the opinion of the researcher, this is due to society's expectations of males and the life situations that the deaf male encounters, which requires him to have more vocabulary in order to deal with social situations outside the class. Society is more considerate towards the females in this matter because the female deaf, at this age, might face extra protection from the family which might have an affect on her drive to acquire new vocabulary.

For this reason, the improvement in new vocabulary acquisition for them was associated with improvements in vocabulary achievement more than encountering of life situations.

Recommendations

According to the results of this study, the researcher recommends the following:

- Run more research studies about the effect of SignWriting and Sign Language reading in a variety of fields such as math, science, history, and geography. In addition, conduct more research on their effects on the psychological sides (such as self-understanding, social assimilation, cognitive ability, etc.)
- Have books for the deaf that are written with Sign Writing method be readily available.
- Publicize SignWriting in teaching the deaf in the schools in Saudi Arabia at different teaching levels, and preferably starting at the kindergarten level.
- Train the deaf and their families and those close to them to read and write Sign Language.