American sign language to improve deaf and hard of hearing (DHH) English reading comprehension skills

Alaa Aladini, Enas Aladini, Mohammad Shugair

Abstract: Palestinian Sign Language (PSL) is used for teaching English language for DHH students in their schools. This hinders Palestinian deaf students communication with deaf foreigners. Hence, the use of American Sign Language (ASL) can solve the aforementioned problem. ASL is considered as an international sign language, thus, it can be useful for DHH students to learn this language to be able to communicate with their peers all over the world. This study aimed at investigating the effectiveness of American Sign Language (ASL) program in developing the Palestinian DHH students’ English reading comprehension skills. In addition, the study explored the advantages and drawbacks of the ASL Program. The researchers used the quasi-experimental approach. One experimental group of (30) DHH, selected from Elrafie school for deaf in Gaza city, was assigned as the sample of the study. Those students attended a 20-hour training program which lasted for four weeks. In addition, the instruments used in the current study was a reading comprehension skills test which students did before and after the experiment, and a semi-structured interview to reveal the advantages and drawbacks of the training program from the participants’ perspectives. Results showed that the ASL training program is so effective in enhancing the reading comprehension skills of the DHH students. In addition, the findings revealed that the participants of the study liked the activities of the training program and they become so motivated to read various types of English texts. In light of the aforementioned results, the researcher recommends EFL Palestinian teachers to use the ASL when teaching English language to DHH students.

Keywords: ASL program, DHH students, TEFL

1. Introduction

Language is a very important aspect for developing countries on various sides. It is a means of communication between people worldwide. Learners study the languages of others to enable them to interact well. English is considered an international language, as it is utilized in all fields of life. Learning English language skills is important for all students, including students with disabilities. Since the 1997 Education for All Act in Palestine, deaf children have had the opportunity to receive free and appropriate education. However, deaf and hard of hearing (DHH) students can study in NGOs and many hard of hearing (HH) children are placed in governmental schools (ELC 2015).

Integrating DHH students in general/public education requires effective planning. Aladini (2020) confirmed that including DHH students in mainstream schools is effective. In the same regard, Alasim (2018) suggested various strategies that facilitate the participation and interaction of deaf and hard-of-hearing students in the general education classroom at a public elementary school. In addition, Alasim identified the issues that limit the participation of those students. In particular, the study focused on describing factors related to general education teachers, sign language interpreters, deaf and hard of hearing students, and hearing students to develop a practical framework for assisting students with hearing impairment to gain more social and communication skills. The findings indicated that DHH students, who face barriers to their participation and interaction in general education and classrooms, have good chances of participating in several contexts.

In Palestine, Palestinian Sign Language (PSL) is used for teaching English language for DHH students in their schools. This hinders Palestinian deaf students’ communication with deaf foreigners. Hence, the use of American Sign Language (ASL) can solve the aforementioned problem. ASL is considered an international sign language; thus, it can be useful for DHH students to learn this language to be able to communicate with their peers all over the world. Wilbur (2000) reviewed the literature on ASL use in teaching English and showed that early learning of ASL leads to the development of English structures, speech and other cognitive skills.
1.1. Study Problem

The results of a pilot study conducted by the researcher showed that Palestinian teachers use Palestinian Sign Language (PSL) to teach English to DHH students. Teachers at Alrafie School for Deaf Students in Gaza, the only school that can be found in Palestine, complained that they teach English using the PSL. However, DHH is not able to communicate with DHH around the world. This shows the urgent need for ASL programs to develop their English reading skills and be able to communicate with other DHHS abroad.

1.2. The Study Questions

1. What is the framework of the ASL program that aims to improve Palestinian DHH students’ reading comprehension skills?
2. What are the reading comprehension skills that DHH students should possess?
3. Are there statistically significant differences at ($\alpha \leq 0.05$) in the mean scores of Palestinian DHH students in the pre and post reading comprehension test?
4. What are the advantages and disadvantages of the ASL program from the participants’ perspectives?

2. Literature review

2.1. Reading comprehension

There are several definitions of reading comprehension. WETA (2021) defines comprehension in reading as the ability to understand a written text. When students comprehend a written passage, they construct meaning from the words to understand the passage as a whole. WETA adds that reading comprehension is the ability to communicate a text leading an integrated process that involves decoding vocabulary and sentences, employing prior knowledge relevant to the text and using cognitive and meta-cognitive strategies to make sense and to get the target message the author wants to convey. The researcher reviewed several studies by Hamouda (2020), Abukhaled (2019), Keshta and Al Udaini (2012), and Aladini and Jalambo (2021) concerning reading comprehension skills, but there was no consensus between researchers that there are certain skills of reading comprehension due to the educational level of students and their differences. The Ministry of Education in Palestine prepared a framework for the English for Palestine curriculum in 2015. This framework was inclusive for all students, including those without disabilities and those with disabilities.

The reading comprehension skills that were declared in this document for grades 10-12 were as follows:

1. Identify supporting details.
2. Distinguish main idea from supporting details.
3. Deduce meaning of unfamiliar words from context.
4. Skim for gist or general impression of text or graphics.
5. Distinguish fact from opinion.
6. Infer mood and author’s attitude or tone.
7. Scan for specific information from texts and realia (ads, menus, schedules, calendar, flight information and tickets, the like.).
8. Interpret information presented in diagrammatic display.
9. Relate text to personal experience, opinion, or evaluation.
10. Analyze text for setting, theme, characters and the like.
11. Extract and synthesize information from several sources.
12. Evaluate text for accuracy of information, soundness of argument, and the like.
13. Interpret information in diagrammatic form.
14. Scanning a text for detailed information.
15. Develop awareness of semantic fields (word mapping).
16. Identify the main idea of reading text.
17. Make predictions about reading text.
18. Identifying pronoun referents.
19. Develop awareness of synonyms and antonyms.
20. Answer factual, inferential, judgment or evaluation questions.
21. Read familiar material with correct pronunciation and intonation.
22. Make inferences about a reading text.
23. Summarize reading text.
24. Generate questions about reading text.
25. Understanding figurative language.
26. Making inferences about information that is not explicit to readers.
2.2. Reading comprehension difficulties for hearing Palestinian EFL learners

The problems for EFL learners in general have been identified in the literature as the focus of reading on “higher-level” areas such as syntactic processing and rhetorical structure, conceptual and cultural schemata, and learner attitude and motivation. Additionally, El Udaini (2017), Mourtaga (2008) and Aladini (2020) conclude that Arab EFL/ESL students, including Palestinian students, suffer from many reading problems as a result of teachers’ misunderstanding of the reading process, students’ lack of linguistic competences, differences between English and Arabic, and English spelling-pronunciation irregularities.

2.3. Reading Comprehension Difficulties for DHH Palestinian EFL learners

Abukhaled (2019) and Abubleama (2018) addressed the reading difficulties for DHH learners in Palestine, and they stated some examples of these difficulties as vocabulary, poor reading skills in Standard Arabic (Deaf students’ native language) and Deaf students’ lack of motivation. In addition, there are other reasons, such as poor teaching strategies and teacher training programs and unfamiliar reading topics. Especially for DHH.

In the same regard, EwaDomagała-Zyśk (2015) and Perfetti, Stafura, & Adlof (2013) state that DHHs often have problems using their native spoken/written languages. Thus, foreign language learning creates a new challenge for both Deaf students and their teachers. Additionally, it has been identified that there is a logical relation between word reading and reading comprehension skills. If the word reading level is poor, the reading comprehension level will definitely be poor. The reason behind that is the Deaf learners’ employment of their cognitive abilities for word processing instead of the higher level reading comprehension skills that help reading for meaning. Additionally, Cain (2015) investigated a comparison of deaf and normally hearing readers’ profiles by using reading comprehension assessment. The findings of the study indicated that Deaf students’ reading comprehension skills were similar to those of poor comprehenders.

A study by Holmer (2016) investigated reading development in DHH children who attend these schools and who are learning to read. The primary aim of the present work was to investigate whether the reading skills of DHH signing children can be improved via computerized sign language-based literacy training aimed at strengthening the connections between sign language and written language. Similarly, in another study by Andrew, Hoshooley and Joanisse (2014), who investigated the robust correlation between American Sign Language (ASL) and English reading ability in 51 young deaf signers ages 7 to 19, signers were divided into ‘skilled’ and ‘less-skilled’ signer groups based on their performance on three measures of ASL. The findings provided evidence that increased ASL ability supports English sentence comprehension both at the levels of individual words and syntax.

2.4. Deaf and Hard of Hearing

DHH is defined by the WHO (2021) as people who are not able to hear as well as people with normal hearing. Hearing loss may be mild, moderate, severe, or profound. It can affect one ear or both ears and leads to difficulty in hearing conversational speech or loud sounds. ‘Hard of hearing’ refers to people with hearing loss ranging from mild to severe. People who are hard of hearing usually communicate through spoken language and can benefit from hearing aids, cochlear implants, and other assistive devices as well as captioning. ‘Deaf’ people mostly have profound hearing loss, which implies very little or no hearing. They often use sign language for communication.

‘Deafened’ usually refers to a person who becomes deaf as an adult and, therefore, faces different challenges than those of a person who became deaf at birth or as a child. In Palestine, many people are deafened due to wars and bombardments near crowded inhabited areas.

2.5. Impact of Deafness on Language Development

There is a disparity among the deaf community in developing language patterns. Some acquire and use these patterns accurately. On the other hand, some DHHs lack accuracy in the structure of sentences and the use of words. This disparity is caused by different factors that are related to the child, the family, and the school. The factors were explained by Hall et al (2019), Tashjian (2018), Humphries (2012) and Bahrawi (2012) as follows:

1- The age at which hearing loss occurred (before language learning/after language learning).
2- The loss of hearing before acquiring the language leads to the child’s inability to develop his/her language.
3- The degree of hearing loss (mild/moderate/severe/profound).
4- As the degree of hearing loss increases, the child’s linguistic deficiency increases, and the child’s acquisition of language becomes more difficult.
5- The cause of hearing loss (hereditary/environmental). A child who has genetic deafness in acquiring language is faster than a child whose deafness is caused by an environment because environmental factors not only cause deafness but also extend to the presence of other disabilities that impede hearing.
6. The mental ability of the child affects the language development of the DHH.
7. Linguistic readiness or maturity and chronological age of the child.
8. The health and sensory status of the child.
9. Family factors as the economic and social conditions of the family.

2.6. Learning English Language in Palestine

Arabic is the native language for Palestinians. English is considered a foreign language for them, and it is taught as a compulsory school subject. English language is taught from grade 1 to grade 12 in all schools, UNRWA, public and private schools. Students have 3 to 5 classes within a week, with almost 40 minutes for each class. In the only secondary school for DHH students, three English language classes are given to students every week (Aladini and Jalambo 2021a; Aladini and Jalambo 2021b).

2.7. DHH among Disabilities in Palestine

There are 93 thousand persons with disabilities in Palestine. Approximately one-fifth of them are under the age of 18. In addition, approximately 75% of them live in urban areas of Palestine (see Table 1).

Table 1 Percentage Distribution of Persons with Disabilities (less than 18 years) by Region and Sex 2017.

<table>
<thead>
<tr>
<th>Region and Sex</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palestine</td>
<td>19.6</td>
</tr>
<tr>
<td>West Bank</td>
<td>17.3</td>
</tr>
<tr>
<td>Gaza strip</td>
<td>21.8</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>20.8</td>
</tr>
<tr>
<td>Female</td>
<td>18.1</td>
</tr>
</tbody>
</table>

Regarding the same concern, Figure 1 shows the distribution of disabilities based on type.

![Distribution of Disabilities in Palestine by Type of Disability, 2017](image)

Figure 1 Distribution of disabilities in Palestine, by type (2017).

Figure 1 shows the distribution of the percentage of types of disabilities in Palestine. Regarding the same concern, Figure 2 reveals that more than one-third of persons (10 years and over) with disabilities are illiterate. Data indicated that illiteracy rates among persons aged 10 years and over with disabilities reached 32% in Palestine in 2017. The gap in illiteracy rates between the sexes is large, as the illiteracy rates among males reached 20% compared to 46% among females. The illiteracy rate in the West Bank was 35%, while in the Gaza Strip, it was 29% among persons with disabilities aged 10 years and over.

![The Illiteracy Rates Among Persons with Disabilities (10 Years And Over) By Region And Sex 2017](image)

Figure 2 The Illiteracy Rates Among Persons with Disabilities (10 Years And Over) By Region And Sex 2017.
2.8. DHH in Palestine

According to the Palestinian Central Bureau of Statistics (PCBS), the percentage of hearing disability is 21.4%. The number of deaf people in Palestine is not identified accurately for cultural reasons. Some people hide the hearing disability of themselves or their children due to the social circumstances they may face. In the Gaza Strip, an increasing number of people are deafened because of the wars on Gaza. In the last war on Gaza in May 2021, heavy bombings occurred everywhere. However, people do not show their hearing disability due to social reasons. Khatib (2019) revealed that injuries, accidents or wars are causes of hearing disabilities.

The PCBS statistics in 2017 showed the following numbers of deaf people in Palestine in general and the Gaza Strip in particular, as shown in Table 2.

<table>
<thead>
<tr>
<th>Governorate</th>
<th>Number of Deaf people</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palestine</td>
<td>19,811</td>
</tr>
<tr>
<td>Gaza Strip</td>
<td>9,821</td>
</tr>
<tr>
<td>North Gaza</td>
<td>2,210</td>
</tr>
<tr>
<td>Gaza city</td>
<td>2,988</td>
</tr>
<tr>
<td>Deir El balah</td>
<td>1,504</td>
</tr>
<tr>
<td>Khanyounis</td>
<td>1,976</td>
</tr>
<tr>
<td>Rafah</td>
<td>1,143</td>
</tr>
</tbody>
</table>

The Palestinian government strives to deliver quality education for people with disabilities. The lack of resources and the occupations obstacles hinder the efforts conducted by the government in this field. Meanwhile, there are 6 educational private institutes that educate the deaf children from grade 1 to grade 9, students who age 6 to 15. The institutes are shown in Table 3.

<table>
<thead>
<tr>
<th>Institute</th>
<th>Area in the Gaza Strip</th>
<th>Grades</th>
<th>Number of children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palestine Red Crescent Society</td>
<td>Khanyounis</td>
<td>1 to 9</td>
<td>211</td>
</tr>
<tr>
<td>Jabalia Rehabilitation association</td>
<td>Jabalia city</td>
<td>1 to 9</td>
<td>97</td>
</tr>
<tr>
<td>Falastin Alghad Rehabilitation Institute</td>
<td>Nusairat camp</td>
<td>1 to 9</td>
<td>32</td>
</tr>
<tr>
<td>Atfaluna Society for Deaf Children</td>
<td>Gaza city</td>
<td>1 to 9</td>
<td>267</td>
</tr>
<tr>
<td>Deir Elbalah Rehabilitation institute</td>
<td>Deir Elbalah city</td>
<td>1 to 9</td>
<td>168</td>
</tr>
<tr>
<td>Rafah society for Rehabilitation</td>
<td>Rafah</td>
<td>1 to 9</td>
<td>123</td>
</tr>
</tbody>
</table>

2.9. Sign Languages

Deaf people around the world use different sign languages. There is no unified sign language for the deaf in the world, and almost every country strives to unify their own sign language. Some countries, such as Arab countries, have created unified sign language. However, there is still some privacy for each nation to use their own signs, which are originally related to their culture. These sign languages have their own vocabulary and grammar, which are as follows.

2.9.1. Arabic Sign Language

The Arabic sign language alphabet is known in Arabic countries. One hand is used to show the letters. Mouthing is optional while signing, as shown in Figure 3.

2.9.2. American Sign Language

Different sign languages are used in different countries or regions; for example, British Sign Language is a different language from American Sign Language (Figure 4), and therefore, the deaf people who use British Sign Language do not understand its American counterpart and vice versa.

Abubleamah (2018) aimed to identify the difficulties facing elementary DHH students in learning English as a foreign language in Gaza schools of deafness. The results revealed that the percentage of difficulty among deaf students according to teachers’ responses was 71.16%. The study also showed that the percentage of difficulty among deaf students as perceived by assistant teachers was 81.31%. Similarly, Zaien and Habbash (2020) evaluated a newly designed English language enrichment program with the help of ASL as the medium of instruction at the Community College of the University of Tabuk. The results revealed that the academic performance of the experimental group significantly improved compared to that of the control group. Additionally, Abu Shbika (2019) aimed to investigate the effectiveness of the educational environment based on learning approaches in developing English listening skills. The results showed that the educational environment based on the learning approaches achieved an effective degree in the listening skills test greater than 1.2 according to the black ratio coefficient.
Objectives

1- constructing an ASL program to develop DHH students’ English reading comprehension skills,
2- identifying the reading comprehension skills of deaf students,
3- revealing the effectiveness of an ASL program on developing deaf students’ English reading comprehension, and
4- Determining the advantages and disadvantages of the ASL program.

3. Materials and Methods

This study aimed to investigate the effectiveness of the ASL program in developing Palestinian DHH students’ English reading comprehension skills. The researcher used a quasiexperimental approach. One experimental group was assigned as the sample of the study. The researcher selected a purposeful sample that represented one group whose students attended the (20) training hours of the ASL program and performed pre- and postreading comprehension tests.

The study participants were all deaf students in Mustafa Al-Rafi school who were enrolled in the first semester of the school year from 2021-2022. They were 90 students enrolled in three grades, 10th, 11th, and 12th. The sample of the study is students who are interested in learning ASL to develop their reading comprehension skills. The ASL training program was announced in the school. Then, the students who wanted to get the training were asked to fill out a registration form and hand it to their English teacher. The 30 female students who agreed to participate in the current study represent 33.3% of the study community. Two of them were hard of hearing (HH), and 28 were deaf.

3.1. Instrumentation

The instruments of the study were a reading comprehension skills test and a semistructured interview. The test included 4 questions based on reading comprehension skills that were identified by the teachers in the focus group.
To achieve the validity of the reading test of the study, the researcher prepared the test based on the most important reading comprehension skills. She distributed the first version of the reading test to a panel of referees, including university professors, supervisors, and experts in deaf studies from Palestine and Europe. The test was modified according to their valuable comments and remarks.

The researcher conducted a pilot study on a sample of 20 students from the same school. She measured the Pearson correlation coefficient between the test questions and the total degree of the test. The results of this correlation are stated in Table 4 below.

Table 4: The Pearson correlation coefficient between the test questions and the total degree of the test.

<table>
<thead>
<tr>
<th>No</th>
<th>Questions</th>
<th>Pearson cor. Coeff.</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Q1</td>
<td>0.557 **</td>
<td>0.001</td>
</tr>
<tr>
<td>2</td>
<td>Q2</td>
<td>0.906 **</td>
<td>0.000</td>
</tr>
<tr>
<td>3</td>
<td>Q3</td>
<td>0.887 **</td>
<td>0.000</td>
</tr>
<tr>
<td>4</td>
<td>Q4</td>
<td>0.410 *</td>
<td>0.024</td>
</tr>
</tbody>
</table>

** The correlation coefficient is significant at 0.01
* The correlation coefficient is significant at 0.05

Table 4 shows that all the questions of the test are correlated and significant with the total degree of the test. The correlation coefficients were (0.410-0.906). In light of the results, it is confirmed that the test questions and the degree are internally consistent.

3.2. Reliability of the Reading Comprehension Skills Test

Hariri (2012) confirms that the test is reliable if it gives the same results in the case of its retest in the same conditions.

3.2.1. Split-Half

This method depends on splitting the test into two parts and then determining the correlation coefficient between the two halves using the Pearson method. After that, the correlation coefficient is corrected using the Pearson-Brown coefficient in the case of part variation. The Guttman method does not need the partial variation test equality. The test reliability was measured using the split-half method by measuring the correlation coefficient averages in the first and second parts of the test, as shown in Table 5:

Table 5: Guttman methods between the test two halves.

<table>
<thead>
<tr>
<th>No</th>
<th>Value</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.034</td>
<td>Test part one variation</td>
</tr>
<tr>
<td>2</td>
<td>2.79</td>
<td>Test part two variation</td>
</tr>
<tr>
<td>3</td>
<td>0.758</td>
<td>Correlation coefficient between the two parts</td>
</tr>
<tr>
<td>4</td>
<td>0.862</td>
<td>Guttman Split-Half</td>
</tr>
</tbody>
</table>

Table 5 shows that the correlation coefficient between the two parts of the test was (0.758) and the reliability using Guttman Split-Half equals (0.862), and this value indicates that the test is highly reliable.

3.2.2. Cronbach’s Alpha

The items of the test were measured by Cronbach’s alpha, and the result was 0.741. This value assures that the test is reliable.

3.3. Semistructured Interview

The second tool of the study is the semistructured interview, which was used to investigate the advantages and drawbacks of the program from the students’ perspectives.

3.4. Framework of the ASL Program

The researcher defines the ASL program as a program that has acquaintances and skills based on American Sign Language, a complete natural language that is expressed by movements of hands and face and has the same linguistic properties as spoken languages, with grammar that differs from English. This program includes performance skills, content, training strategies and assessment tools.

The ASL program was designed in light of the need to understand English reading texts and interact effectively using an international language that enables deaf students to communicate with other deaf people around the world.

English language is a very important aspect for developing countries on various sides. It is a means of communication between people worldwide. Palestinian sign language is considered the communication medium among deaf students. Deaf
students use the Palestinian Sign Language to learn English, which contradicts the taught English Language, which should be taught using an English Sign Language. Thus, this study can help students understand English and use it in meaningful contexts to be able to interact with deaf people abroad.

3.5. The ASL Program Bases

- Setting a clear plan for each class of the course.
- Stating the aims of the course to students
- Building upon students’ previous knowledge of PSL to the new ASL to help them relate relative techniques and materials in the trainers’ teaching practices.
- Facilitating and demonstrating the activities and topics of ASL help students understand and respond well.
- Various teaching aids should be designed to motivate students to participate in teaching activities.
- Administering teaching activities using group work and pair work techniques.
- Three types of evaluation are used: formative assessment, summative assessment and alternative assessment tools.
- Providing students with various activities that help achieve the general aims of the course is a kind of supplementary material that helps enhance students’ autonomy.

3.6. The Outcomes of the Program

At the end of the training course, students are expected to be able to
1. identify the ASL alphabet,
2. recognize their names using the ASL alphabet,
3. greet each other using ASL,
4. identify the world countries using ASL,
5. identify numbers from 1 to 100, 1000, 1000000,
6. identify family members; father, mother sister, brother, son, daughter, grandfather, grandmother,
7. make predictions about a reading text related to family members,
8. identify the days of the week,
9. skim various types of English reading texts,
10. scan various types of English reading texts,
11. identify the months and the seasons of the year,
12. identify different jobs,
13. identify English pronouns correctly,
14. identify transport items and colors,
15. talk about transport items and their colors,
16. identify different animals, and
17. develop awareness of synonyms and antonyms.

3.7. Content of the ASL Program

The researcher reviewed the literature for suitable ASL training topics for the deaf that help them empower their reading competencies. Then, she presented the topics to a panel of referees to assure their validity. The ASL program contains the ASL alphabets; numbers; colors; family members; transportation; countries; greetings; jobs; future wishes; animals in Palestine; weather, seasons, months, days of the week and daily routines. The training classes were (10). Each class lasted for 2 hours. The training program was conducted within 4 weeks during the first semester of the 2020-2021 scholastic year.

3.8. Validity of the ASL program

The ASL program was submitted to a focus group consisting of Palestinian teachers of deaf students. See Appendix (8), which presents detailed information about those teachers. The teachers approved the construction and logical sequence of the activities and topics that were motivating for the deaf students. However, they added some remarks regarding the construction of some topics of the program, and the program was modified accordingly. Appendix (5) presents the final version of the suggested ASL program.

4. Results

4.1. The first question: What is the framework of a program based on ASL to improve DHH students’ reading comprehension skills?

The framework of the ASL program contains topics and reading comprehension texts that improve students’ English reading comprehension skills. The program consists of activities and topics of ASL that help students understand the taught
items and respond effectively. In addition, it contains teaching activities using group work and pair work techniques and various teaching aids to motivate students to participate in the teaching activities. Furthermore, the framework of the ASL of the program consists of various types of evaluation as formative assessment, summative assessment and alternative assessment tools.

4.2. The second question: What are the reading comprehension skills that DHH students should possess?

To answer this question, the researcher reviewed the literature to determine the reading skills that are suitable for deaf students. The literature review and the focus group that the researcher carried out helped her to pinpoint the following DHH students’ reading skills:
- Making predictions about a reading text.
- Scanning a text for detailed information.
- Develop awareness of synonyms and antonyms.
- Identifying pronoun referents.

4.3. The third question: Are there statistically significant differences at (α ≤ 0.05) in the mean scores of Palestinian DHH students in the pre- and postreading comprehension test?

To answer this question, the researcher verified its hypothesis, which states that there are no statistically significant differences at (α ≤ 0.05) in the mean scores of Palestinian DHH students in the pre- and postreading comprehension test. The first step of verifying this hypothesis is to measure the normality of the data distribution using the Shapiro–Wilk test. The results of this test are stated in Table 6 below.

<table>
<thead>
<tr>
<th>Item</th>
<th>Pre application</th>
<th>Post application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample number</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Means Average</td>
<td>6.93</td>
<td>13.97</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>2.227</td>
<td>3.200</td>
</tr>
<tr>
<td>Shapiro–Wilk</td>
<td>0.980</td>
<td>0.967</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.823</td>
<td>0.471</td>
</tr>
</tbody>
</table>

The results show that the test is significant in the pre- and postapplication of the test. The sig. values (0.471 – 0.823) are higher than 0.05, which ensures the normal distribution of the data. Thus, the researcher used the T Test for paired samples to verify the null hypothesis. The test results are stated in Table 7.

<table>
<thead>
<tr>
<th>Tool</th>
<th>Test</th>
<th>Sample number</th>
<th>SD</th>
<th>Mean</th>
<th>Value T</th>
<th>Sig value</th>
<th>Statistically significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test</td>
<td>Pre</td>
<td>30</td>
<td>2.227</td>
<td>6.93</td>
<td>22.776</td>
<td>0.000</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>30</td>
<td>3.200</td>
<td>13.97</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7 shows that the standard deviation of the posttest was (3.200), which is higher than the pretest, which was (2.227). Additionally, the T value equals 22.776, and the Sig equals 0.000, so we reject the null hypothesis, which states that there are no statistically significant differences at (α ≤ 0.05) in the mean scores of Palestinian DHH students in the pre- and postreading comprehension tests. Therefore, the results show that there are differences in the total average score of the pre- and posttest in favor of the posttest. Apparently, the mean score of the posttest was 13.97 out of 20, which indicates much progress in the achievement of the students during the intervention.

The researcher analyzed the test questions, and the results were as follows in the Table 8:

<table>
<thead>
<tr>
<th>Questions</th>
<th>Test</th>
<th>Mean</th>
<th>SD</th>
<th>T</th>
<th>sig</th>
<th>Statistical significant</th>
<th>(\eta^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>Post</td>
<td>2.53</td>
<td>0.583</td>
<td>11.789</td>
<td>0.000</td>
<td>0.01</td>
<td>0.827</td>
</tr>
<tr>
<td></td>
<td>Pre</td>
<td>1.07</td>
<td>0.571</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q2</td>
<td>Post</td>
<td>4.47</td>
<td>1.408</td>
<td>8.515</td>
<td>0.000</td>
<td>0.01</td>
<td>0.714</td>
</tr>
<tr>
<td></td>
<td>Pre</td>
<td>2.47</td>
<td>1.456</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q3</td>
<td>Post</td>
<td>4.60</td>
<td>1.269</td>
<td>8.789</td>
<td>0.000</td>
<td>0.01</td>
<td>0.733</td>
</tr>
<tr>
<td></td>
<td>Pre</td>
<td>2.33</td>
<td>1.429</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q4</td>
<td>Post</td>
<td>2.37</td>
<td>0.828</td>
<td>8.963</td>
<td>0.000</td>
<td>0.01</td>
<td>0.734</td>
</tr>
<tr>
<td></td>
<td>Pre</td>
<td>1.07</td>
<td>0.718</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The results in Table 8 show the degree score of each skill in the reading comprehension test. The mean score showed a higher degree of postapplication of the test than preapplication of the test. The mean score of the first question, which
investigates (making predictions about a reading text), was 2.53 out of 3, and the T value was 11.79. Additionally, the second question, which examines scanning a text for detailed information, was 4.47 out of 7, and the T value was 8.515. Additionally, the degree of the third question (Develop awareness of synonyms and antonyms) was 4.60, and the T value was 8.789. Finally, the fourth question, which investigated identifying pronoun referents, was 2.37 out of 3, and the T value was 8.963.

The size effect was calculated from the collected data by the researcher using the size effect rule of the T test for paired samples as clarified by Afana (2016):

\[
\eta^2 = \frac{t^2}{t^2 + df}
\]

Table 9 shows that the size effect is \(\eta^2 = 0.947\), which indicates a large size effect based on the effect size levels clarified by Afana (2016) in Table 9.

Table 9 Size Effect table.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Large</th>
<th>Medium</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\eta^2)</td>
<td>0.14</td>
<td>0.06</td>
<td>0.01</td>
</tr>
</tbody>
</table>

4.4. The answer to the third question: What are the advantages and drawbacks of the ASL program from the participants’ perspectives?

To answer this question, the researcher conducted a semistructured interview with the participants of the study. The 30 students who participated in the study were interviewed separately, one at a time, and the idea that gains more than 50% was accepted. Table 10 includes the advantages of the ASL program, and Table 11 includes the drawbacks of the program.

Table 10 Advantages of the ASL Program.

<table>
<thead>
<tr>
<th>No.</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The program is so motivating.</td>
<td>27</td>
</tr>
<tr>
<td>2</td>
<td>The program includes useful teaching activities.</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>The AVMs used by the trainer, facilitate the various tasks</td>
<td>24</td>
</tr>
<tr>
<td>4</td>
<td>The trainer’s teaching techniques were varied.</td>
<td>22</td>
</tr>
<tr>
<td>5</td>
<td>The program enables me to communicate with DHH foreigners.</td>
<td>20</td>
</tr>
</tbody>
</table>

Table 10 reveals that 27 students showed their motivation during the ASL program. In addition, 83% of them confirmed that the program included useful teaching activities. Moreover, 80% assured that the AVMs used in conducting the teaching activities of the ASL program facilitated the conducted tasks. Pertaining the trainer’s teaching techniques, 73% of the participants ascertained that they were varied. Finally, 66.6% of the participants showed that the program enabled them to communicate with DHH foreigners. The qualitative analysis of the participants’ answers also indicates that the program successfully enhanced the participants’ reading skills, as nineteen students mentioned “I like reading” and “I want to read more reading texts”. This proves that students were motivated to use the ASL. This may be attributed to their interest in studying a new language and contacting new people around the world. Additionally, it may be attributed to their awareness of the importance of the English language. In the same regard, eighteen students responded to their motivation to communicate with DHH foreigners using ASL. This ascertains their awareness of the importance of the ASL to reach the outside world. These results are similar to some empirical studies, such as Ikasari et al (2019) and Salehomoum (2018), which confirmed that DHH students respond effectively to reading activities and tasks by showing their motivation.

Table 11 The Drawbacks of the ASL Program.

<table>
<thead>
<tr>
<th>No.</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Limited number of lectures.</td>
<td>28</td>
</tr>
<tr>
<td>2</td>
<td>Heavy loads of information and materials.</td>
<td>26</td>
</tr>
<tr>
<td>3</td>
<td>Power shortage that hinders contacting DHH foreigners.</td>
<td>21</td>
</tr>
</tbody>
</table>

Some drawbacks were listed by the participants, such as the limited number of lectures, heavy loads of information and materials, and power shortages that hinder their contact with other DHHs abroad. In this regard, 26 students responded “I need more”, which confirms that the students are in bad need of this sign language that assists them in being open to the outside world. DHH students have the right to communicate with other DHH people abroad.

5. Discussion
This study aimed to investigate the effectiveness of the ASL program in developing Palestinian DHH students’ English reading comprehension skills. The findings revealed that the ASL program was effective in enhancing the reading skills of Palestinian DHH students. This result is in agreement with Alawad and Musyoka (2018), Aladini (2020), Hrastinski and Wilbur (2016), and Holmer (2016), who stated that ASL improves DHH reading skills. The positive effectiveness of the ASL program in enhancing the reading comprehension of the participants of the study can be attributed to the variety of the topics presented in the training sessions. In addition, the plan of the program includes all information that enables the students to be competent in using the ASL.

The ASL program showed improvement in the students’ reading comprehension skills. This may also be attributed to the varied teaching techniques used by the teacher of the ASL program. Those techniques fulfill students’ needs and preferences, as 91.3% of the participants of the study mentioned that they were motivated to participate in the various teaching activities of the ASL program. In addition, the effectiveness of the ASL training program in enhancing the reading comprehension skills of the participants of the study could be attributed to the urgent needs of DHH students to learn in international language, which enables them to communicate with foreigners. Hence, the participants of the study showed their interest in studying American Sign Language.


6. Conclusions

The effective teaching of the English language to Palestinian DHH students necessitates careful planning and necessary adjustments. This includes the implementation of an ASL program, which has proven to be highly effective in improving the reading comprehension skills of Palestinian DHH students. It is crucial to address the current situation in which teachers at Palestinian deaf schools lack proficiency in ASL and instead rely on Arabic Sign Language for teaching English. By providing proper training and resources, educators can enhance their ability to utilize ASL effectively in the English language instruction of DHH students, thereby facilitating their language development and overall academic success.

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Ethical considerations

Not applicable.

Conflict of Interest

The authors declare that they have no conflict of interest.

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