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Teachers' Perceptions about Teaching Sciences for Deaf Student in High Schools

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Abstract: The main aim of this paper is to investigate the science teachers' perceptions about the most suitable and appropriate teaching strategies that can be used in teaching science to students who suffer from hearing problems. It also aims to identify the use of technological devices which might be assistive during science classes. The paper is limited to the deaf students who study science in high schools during the academic year 2019/2020. The study is based on the quantitative approach in collecting the required data from a number of science teachers. An online questionnaire was distributed to 52 respondents. Then it was analyzed statistically and its results were discussed. The results showed that a great number of the participants are careful about and aware of using several teaching strategies and technological devices during science classes for deaf students.

Keywords: Teachers' Perceptions, Deaf Student, Teaching Sciences.

1 Introduction

Education is the process of facilitating learning, or the acquisition of knowledge, skills, values, beliefs, and habits [1]. And science education is a systematic enterprise that builds and organizes knowledge in the form of testable explanations and predictions about the universe [2]. Also, the science learning is inextricably tied to two aspects of students' lives: literacy and culture. For deaf and hard-of-hearing students, who have any degree of hearing loss or deafness, literacy levels can be hindered by an early dependence on a more survival-based language learning model that postpones basic scientific inquiry. The vocabulary for scientific curiosity is limited, which in turn affects the educational culture. And, I choose to study improving science education for deaf students in high schools because teaching deaf student suffers from a significant delay, especially the teaching of science subjects (chemistry, physics and biology). To educate all students, including those disable ones, to work and contribute to a future that is largely dependent on science and technology, science learning needs being accessible for all of them. In the past, educational programs for deaf learners did not stress subjects such as science. Therefore, studies pertaining science education for deaf students was limited (Lang, 2006).

Therefore, my research should focus on study the effect of using the dictionary of science sign language, the appropriate strategies, and the best technological tools in science education for deaf student because I believe that they are important aids that can help students to get a better understanding. And I want to know the best ways to teach science in the classroom for the deaf student and how they support students in having a comprehensive understanding. So, I will follow in my research the following steps. First of all, I will get an American science sign language dictionary. Then, I will make a literature survey of the strategies and the technological tools in science education for deaf

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student in the classroom. After that, I will create a survey questionnaire regarding teacher perceptions of the best strategies and technological tools which used to teach science for deaf student in the classroom. And I will send these surveys to some of the science teachers. Then, I will discuss and analyze the results of this survey. Finally, I will summarize the purpose of my paper and provide the next steps for educators in Saudi Arabia.

1.1 Statement of the Problem

Education in Saudi Arabia is of a major concern to the Saudi government. No one can deny the great efforts exerted by the Saudi government in the field of education. Experts and teachers exert great effort to impart proficiency in all levels of education among Saudi students. These efforts have extended to include not only normal and able students but also disabled students. Schools for students with special abilities have been spread all over the kingdom. Children with special abilities have integrated in normal schools. This requires much attention from the part of teachers to the teaching strategies and techniques they use when teaching disable students. Moreover, students who have impaired hearing problems need specific programs and strategies in learning such as adequate teaching techniques, as well as the use instructional materials, the correct teaching device, the use of the personalized educational system to measure their progress and development. The main focus of this study is to explore the science teachers' perceptions about the most appropriate teaching strategies that can be used with deaf students.

1.2 Objectives of the Study

1- To investigate which teaching strategies teachers use in a science class for deaf students.

2- To determine the means of instruction that teachers use to convey science to learners.

3- To identify the teachers'' opinions about the most beneficial strategies they use in teaching science to deaf students.

4- To provide teachers and educators with resources that can be used for the teaching science courses to students with hearing problems.

1.3 Questions of the Study

The current study attempted to find answers to these questions:

1- What are the most common strategies used in teaching science to deaf students?

2- Which technological resources used in teaching science subjects for deaf students?

3- How often do you use these strategies?

1.4 Significance of the Study

The findings obtained from the current study are likely to be of great significance for teachers, curriculum developers and parents for teachers, the findings of this study could be a resource for the most effective teaching strategies the enhance learning in science classes designed for students with hearing problems. this will probably lead to better performance in science classes for both teachers and deaf students.

As for the curriculum developers, the findings of the current study might help them to reassess/evaluate the existent teaching strategies used in science syllabus designed for student with impairing hearing problems. lastly, parents can find the findings of this study useful as they can broaden their understanding of the various methods used in teaching their deaf children.

1.5 Limitations of the Study

The current study is limited to investigating the teacher's perceptions of the most useful methods and strategies used in teaching science for deaf students. Due to the fact that the scope of this study, the researcher neglects measuring other important variables such as the variables related to the teachers themselves, as for instance, their teaching experience, gender, their abilities to access the recent technologies in communications, learning and so on.

In addition, during conducting this study, the researcher found it difficult to communicate with science teachers who been already taught in special education schools. The reason for this problem was the procedures which have been taken to face coronavirus which resulted in closing all the educational institutions. Also, some of the subjects of the study did not respond to the questionnaire. The supposed number of participants was 100, but the researcher excludes the invalid responses. The final number of the valid questionnaire form was 52 only.

2 Literature Review

This section presents the theoretical background of previous studies related to teaching strategies that have been used in teaching deaf and hard-of-hearing students. The following sections were reviewed in detail, a theoretical background about traditional versus recent technological methods of teaching the sciences to deaf students were introduced. Finally, previous related studies were overviewed.

2.1 Traditional Instruction for Students with Hearing Impairments

There are a number of comprehensive teaching strategies that can help all types of students learn, but there are specific techniques that are suitable for teaching a group of students that include among them deaf students. Following such specific techniques might eliminate the inequalities of giving opportunities to all students to participate in class activities. Naidoo (2008) investigated the best teaching methods teacher can use in teaching science for deaf students. The study examined the teacher’s perception and experiences about teaching science to deaf students and identified some of obstacles that students experience in learning sciences. The study focused on the traditional methods of teaching the deaf such as oral communication through using hearing aids, and total communication through using sign language. Sign language is based on the imitation of hand and body gestures, eyes, face and lips. It uses a visual-sign system for specified places, moves, finger and hand positions and facial gestures (Nelson, 2014).

There are two major principles that have impact on teaching the deaf. The first principles are concerned with the benefit the deaf students will get from acquiring high levels of sign language in performing classroom tasks and activities. The second principle emphasizes the necessity of developing metalinguistic skills including their ability of recognizing language structures and thinking and talking about language. (Muthukrishna, 2001).

Stewart (2006) alludes the importance of practical communication in teaching deaf students.

He emphasized the role of language acquisition and teachers possessing the skills of using English Language in different modes, i.e. in print, speech, and sign. Stewart (2006) explained some of the barriers deaf students encounter in learning a subject. These barriers include student's inability of learning the curricular content. He stressed the importance of learning both of the student’s first language and English-based signing which are helpful in providing deaf learners with English

literacy skills.

2.2 Teaching Science for Deaf Students

Lang & Propp (1982) conducted a research study about the qualification of science teachers who teach and deal with deaf learners. The study revealed that only few science teachers had the adequate training in science instruction, so the teachers felt that they lack enough competence and qualification to deal with students with impaired hearing.

Another study by Molander et al. (2001) claimed that the children instruction focused on language acquisition, while there is little interest in teaching science for deaf learners. Mangrubang (2004) confirmed these finding by nothing that very little attention is paid to science education for the deaf where as the most attention is paid to teaching language arts, math and social studies.

2.3 Using Technologies to in Improving the Academic Skills of Deaf Students

In the age of information technology, schools are mandated to do its expected duty towards students with special needs, especially hearing-impaired students. It is also required to conduct studies that might bring out change, innovation and creativity in dealing with difficulties hearingimpaired students suffer from. Schools can perform and plan multiple educational activated to think critically and improve their comprehension skills, as well. In addition, schools should and training students with disabilities to solve their problems with learning. (Baglama, Haksiz & Uzumboylu ,2018 (.

Ari & Bayhan(2018) indicated that there is positive effects of using computer software in training students in special education. They assessed the benefits of using computer software including, “individualization and self-improvement, immediate feedback, consistent correction process, repetition without pressure, immediate support, step-by-step training, frequent response by children, motivation, development of motor skills and visual motor coordination, reduction of difficulties, intensification, psychological satisfaction and active learning education” (p.54).

The use of internet conferencing can be challenged technically and pedagogically for deaf students. This include the use of accompanied captions and other reading materials, and increasing interaction with teachers and friends through using sign language on the internet (Baglama, Haksiz

& Uzumboylu 2008).

2.4 Theoretical Framework of the Study

The study is based on Felder Silverman Dimension Model Theory to Science Learning (Felder Silverman, 1998). The variables of this study are teaching strategies, teaching resources and medium of instruction, and science syllabus. The theoretical framework reveals the relationship that exists between research variables and Felder Silverman Dimension Model Theory to Science Learning's key subject (Felder Silverman, 1998).

The current study simply hypothesized like that: If the students should take a more active role in their learning process, so the teacher would have to consider the most appropriate teaching technique, adjust science syllabus to the demands of the deaf students, utilizing instructional techniques in teaching, and appropriate teaching material in class. Such approaches are in line with the Science Learning Model Theory of Felder Silverman, which promotes learning which is based on learners' needs. The subsequent impact of these strategies is enhanced adaptation and integration of these strategies with the Saudi special Education for the deaf, which in turn will result in improved performance in science classrooms.

2.5 Previous Related Studies

Lewis and Jackson (2000) investigated a method that changes the TV captions in order that people with impaired hearing can use this method to access TV programs. A group of junior high school students with impaired hearing were provided with an instructional tool in order to train them to help them hear certain type of information through using this method, deaf students would be able to acquire knowledge related to language skills especially the reading comprehension skills. The researchers trained students their background knowledge to improve their reading comprehension skills. The results of the study showed that the training didn't help the students increase their captioning comprehension skills.

Daniele et al. (2001) experimented five a group of five mathematic video conferencing lessons together with an asynchronous website and a software. There was no possibility for sign language communication during broad casting the lessons because the room was not designed for split screen. However, the participation's scores in the pretest were varied; five students got 0%, while two got 60% and three of them got 80% on the posttest. According to Daniel et. al (2001) although distance learning proves to be an effective method for deaf instruction, certain requirements should be taken into consideration in order to deliver effective educational teaching for the deaf students.

Lang and steely (2003) conducted three experimental studies about the effect of using webbased science education for students with impaired hearing. The results of these studies confirm the assumption that deaf students who receive text and sign language instruction aided by animation and graphic organizers showed marked improvement in the amount of knowledge they gain by using these techniques in learning science subjects. The results of these empirical studies also support the tendency of utilizing multimedia instructional method for deaf students. They also show that there is a possibility of synergistic effect in using a combination of adjunct instructional aids on learning.

Barman & Stockton (2002) evaluated the SOAR-High project which was a web-based earth system science course especially designed for high school students with impaired hearing. Teachers and students at secondary school in California, Washington DC, and Indiana participated in the study, in which students used web-based technologies to get information. The researchers posed some questions addressing teachers and students. They used research tools such as classroom observation, student's reviews about their Internet-based tasks to. The results of the study questions about the effect of web-based science program in developing the student's skills and that the program helps them to work independently and it increases their motivation to perform the assigned tasks. The students who participate in the project found some kind of difficulty regarding the reading levels of the project materials.

Mallory and Lang (2002) studied the ability of high-speed connections carry a large amount of text, voice and video data via the cables of telephone. They assumed that whenever the computer networks are growing in quality and speed, the demands for higher levels of communication increases as well.

Haksiz (2014) examined the effect of using Tablets in courses given to students with special needs. A questionnaire was administered to teachers of special education and vocational training center in Nicosia. The results of the study showed that government school have not get used tablet computers as an instructional aid in teaching students in special education schools.

Baglama, Haksiz & Uzumboylu (2018) investigate the impact of using technologies in the education of hearing-impaired students. The finding of the study shows that literacy and academic skills of individuals with impaired hearing have been developed as result of using technologies in training them.

3 Methodologies

Numerous appropriate quantitative and statistical methods have been used according to the nature of the study questions and to the level of measuring the overall variables of the study.

Statistical treatment has been done through using Statistical Package for the Social Sciences, (SPSS) version 19.

3.1 Population and Sample of the Study

The population of the study included a high school teachers, males and females, who teach the sciences to students with impaired hearing problems. The supposed sample of the study consisted of 100 science teachers, males and females. This number was reduced to 52 respondents after omitting invalid answers. The respondents were voluntarily agreed to participate in answering the questionnaire.

3.2 Instrument of the Study

The aim of this study was to investigate the science teachers' perception on the most appropriate teaching strategies they use in teaching science to deaf students in high schools. To fulfill this aim, the researcher conducted a questionnaire. This is a quantitative method that makes it possible for the researcher to have many responses to the items of the questionnaire. The questionnaire contained statements pertaining effective science teaching strategies used in teaching science subjects to the deaf. The responses were ranged according as (Always- Sometimes- Rarely– Never). The researcher distributed the questionnaire in both English and Arabic. The questionnaire was sent and answered online.

The questionnaire which represents the point of view of the study sample has been prepared in a way that meets the objectives of the study and facilitates input of the study variables on computer so that they can be analyzed by SPSS.

3.3 Validity of the Instrument

Questionnaire validity means making sure that it will measure what it has been prepared for. Validity also requires that the method contains all the factors to be used in the study, on the one hand, and consistency of its elements and terminology, on the other, so that it is obvious to those using it. The researcher identified to what extent the study tool is valid in measuring what it has been prepared for and then it is refereed, revised and evaluated by an arbitrator from UCF University. The aim of this step was to guarantee and verify the validity of the questionnaire. In the light of the views of arbitrators, the tool of this study had been prepared in its final form.

3.4 Reliability of the Instrument

Reliability is the extent to which the study tool, after repeated trials, produces the same results. After the pilot study, reliability coefficient of all the instruments was determined. After the pilot study, the coefficient of reliability of the questionnaire was calculated. This was achieved by the use of test-retest method. The researcher administered the questionnaire to a small number of the study participants twice within two successive days. After that Pearson Correlation Formulae was used to calculate the correlation between the two sets of data. The obtained reliability coefficient was (0.3), which signaling the presence of a close connection between the two sets of data obtained from the pilot study.

3.5 Procedures of the Study

For the investigation of the present study, the researcher used a questionnaire. Before administering the questionnaire, a pilot study was administered and then analyzed to guarantee the reliability of the questionnaire. The subject of the main study randomly and voluntarily participated in

answering it. Before administering and distributing the questionnaire, the subjects were informed of the objectives and significance of the study. They were also requested to state their true and honest responses. After that, the questionnaire was analyzed statistically and the results will be displayed and discussed.

3.6 Analysis of the Study Data

Results of the questionnaire were analyzed statistically and the results were discussed accordingly. The participant's responses were analyzed statistically via SPSS package, results and interpretations of these responses were clarified in tabular form regarding the different items of the questionnaire. This analysis was reinforced by providing frequencies and percentages of the questionnaire's items.

4 Results and Interpretation

The present study aims to answer the following questions:

1. What are the most common strategies used in teaching science to deaf students?
2. Which technological resources used in teaching science subjects for deaf students?
3. How often do you use these strategies?

To answer these questions, opinions of the sample of the study about "Teachers' Perceptions about the Most Suitable Strategies and Technological Tools Used to Teach the Sciences for Deaf Students in High Schools" were studied; this was done through the responses of the sample of the study by extracting frequencies and percentages of the questionnaire items. The following tables illustrate Frequencies, and Percentages of each statements of the questionnaire:

1- I keep my instructions simple, clear and exact as much as possible.

Table (1):

Response	Frequency	Percentage %
Always	32	61.53
Sometimes	8	15.38
Rarely	8	15.38
Never	4	7.69

Table (1) shows that 61.53% of the respondents always keep their instructions simple, clear and exact in science classes for deaf students.

2- I repeat the instructions more than one time.

Table (2):

Response	Frequency	Percentage
Always	30	57.69
Sometimes	16	30.76
Rarely	4	7.69
Never	2	3.84

Table (2) shows that 57.69% of the respondents always use the repetition strategies in teaching science to the deaf.

3- I present the new information using visual instructional materials such as chalkboard, PowerPoint slides, overhead projector, etc.

Table (3):

Response	Frequency	Percentage
Always	25	48.07
Sometimes	15	28.84
Rarely	7	13.46
Never	5	9.61

Table (3) shows that 48.07 % of the respondents always use the strategy of using visual materials in teaching science to the deaf.

4-I use sign language to explain the information.

Table (4):

Response	Frequency	Percentage
Always	27	51.92
Sometimes	13	25
Rarely	10	19.23
Never	2	3.84

Table (4) shows that 51.92% of the respondents always use sign language as a means of instruction communication with deaf students.

5-I get a sign language interpreter if I do not know sign language.

Table (5):

Response	Frequency	Percentage
Always	15	28.84
Sometimes	9	17.30
Rarely	12	23.07
Never	16	30.76

Table (5) shows that 28.84 % of the respondents always use interpreter to deliver information to the deaf.

6-I review the previous lessons before presenting new information.

Table (6):

Response	Frequency	Percentage
Always	26	50
Sometimes	14	26.92
Rarely	8	15.38
Never	4	7.69

Table (6) shows that 50 % of the respondents always use the strategy of reviewing the previous lessons before introducing new materials.

7-I make sure that I face the class while speaking in order that students can see and follow my instructions.

Table (7):

Response	Frequency	Percentage
Always	35	67.30
Sometimes	10	19.23
Rarely	5	9.61
Never	2	3.84

Table (7) shows that 67.30 % of the respondents always use the strategy of face- to face interaction with deaf students.

8-When using visual aids, I allow enough time for lighting and preparing the devices before starting the class.

Table (8):

Response	Frequency	Percentage
Always	21	38.46
Sometimes	20	40.38
Rarely	9	17.30
Never	2	3.84

Table (8) shows that 38.46 % of the respondents always allow enough time to make sure that lighting and preparing visual materials are all right before starting the class. 40.38 % of the responses uses this strategy from time to time.

9-I provide students with impaired hearing with sign language dictionary.

Table (9):

Response	Frequency	Percentage
Always	26	50

Sometimes	8	15.38
Rarely	8	15.38
Never	10	19.23

Table (9) shows that 50 % of the respondents always uses sign language dictionary with deaf students.

10-I use specific and direct words when referring to objects or written information on the board, for example use “on the right corner “instead of “there”.

Table (10):

Response	Frequency	Percentage
Always	30	57.69
Sometimes	10	19.23
Rarely	4	7.69
Never	8	15.38

Table (10) shows that 57. 69 % of the respondents always tries to be specific about the word or phrase they are used to refer to objects or written information by pointing directly to them.

11-I use gestures and face expressions without exaggeration.

Table (11):

Response	Frequency	Percentage
Always	28	53.84
Sometimes	8	15.38
Rarely	10	19.23
Never	6	11.53

Table (11) shows that 53. 84 % of the respondents always use non- verbal communication strategy with students with hearing problems.

12- It is better to use subtitled or captioned videos and films or provide students with commentary transcripts for such visual aids.

Table (12):

Response	Frequency	Percentage
Always	37	71.15
Sometimes	10	19.23
Rarely	3	5.76
Never	2	3.84

Table (12) shows that 71.15% of the respondents always uses captioned videos and films.

13-When using Power Points slides in a dark room, I allow some light on the speaker or sign language interpreter.

Table (13):

Response	Frequency	Percentage
Always	10	19.23
Sometimes	16	30.76
Rarely	16	30.76
Never	10	19.23

Table (13) shows that 30. 73 % of the respondents sometimes care about allowing some light on the speaker or the sign language interpreter while presenting Power Points slides in a dark room. The same parentage of responses rarely uses this strategy.

14-I translate auditory materials such as audio tapes into print format and make them accessible for deaf students.

Table (14):

Response	Frequency	Percentage
Always	23	44.23
Sometimes	10	19.23
Rarely	12	23.07
Never	7	13.46

Table (14) shows that 44. 23 % of the respondents always provide deaf students with a print form of the auditory materials.

15-I use Assistive Learning devices that electronically send enhanced sound to students with impaired hearing.

Table (15):

Response	Frequency	Percentage
Always	38	73.07
Sometimes	10	19.23
Rarely	2	3.84
Never	2	3.84

Table (15) shows that 73.07 % of the respondents always makes sure that electronic

Assistive Learning Devices are available for students with hearing problems.

16-I minimize visual pollution on the board. I erase unnecessary writing. I keep only the information I am discussing.

Table (16):

Response	Frequency	Percentage
Always	29	55.76
Sometimes	13	25
Rarely	6	11.53
Never	4	7.69

Table (16) shows that 55.76% of the respondents are always aware of noise level.

17-I label laboratory equipment and material in order to help students learn technical terms.

Table (17):

Response	Frequency	Percentage
Always	42	80.76
Sometimes	6	11.53
Rarely	2	3.84
Never	2	3.84

Table (17) shows that 80.76 % of the respondents always labels laboratory equipment and material in order to help students learn technical terms.

17-I use only one visual device at a time in order to minimize student's distraction.

Table (18):

Response	Frequency	Percentage
Always	40	76.92
Sometimes	8	15.38
Rarely	3	5.76
Never	1	1.92

Table (18) shows that 76.92 % of the respondents are always aware of minimizing the number of visuals devices used in each period to avoid students' distraction.

18-I provide students with hand – outs of my explanation beforehand.

Table (19):

Response	Frequency	Percentage

Always	45	56.53
Sometimes	3	5.76
Rarely	2	3.84
Never	2	3.84

Table (19) shows that 56.53% of the respondents always provides students with hand – outs of my explanation beforehand.

19-I make sure that my sentences and phrases are easy to be lip- read by students.

Table (20):

Response	Frequency	Percentage
Always	44	84.61
Sometimes	5	9.61
Rarely	2	3.84
Never	1	1.92

Table (20) shows that 84.61 % of the respondents always makes sure that my sentences and phrases are easy to be lip- read by students.

5 Conclusions

The present study was conducted to identify the science teachers' perspectives about the most appropriate teaching strategies and the technological devices they could use for teaching science to students in high schools who suffer from hearing problems. The researcher used a questionnaire to collect the data from 52 respondents who answered the questionnaire online. The questionnaire responses were analyzed and the results were monitored and discussed. More than 80% of the respondents always make sure that the sentences and phrases are easy to be lip- read by deaf students. 76.92 % of the respondents are always aware of minimizing the number of visuals devices used in each period to avoid students' distraction, while 80.76 % of the respondents always labels laboratory equipment and material in order to help students learn technical terms.

Science education is beneficial for students with impaired hearing since it enables them to think critically, understand, evaluate, interpret, analyze and synthesize. Although there are numerous obstacles and challenges that might face those students in learning and studying science, they should not be deprived from their rights to have equal opportunities to develop and improve their skills that they could acquire from learning science in a formal way. Deaf students may have the sufficient knowledge and understanding of scientific terms and theories, but find it difficult to express their skills. Thus, it is the duty of teachers, educators, curriculum developers and even parents to facilitate learning and teaching the sciences to those students with problems in hearing. Deaf students should have the chance to learn science whenever we create and maintain the atmosphere that clearly helps make the knowledge available to them.

Recommendations

Based on the previous above findings of the study, the researcher recommends the following strategies to teaching sciences to deal students:

1. It is important to use a wide range of varied strategies for teaching science to deaf students.
2. Concentrate on the strategies that focus more on the student's participation i.e., studentcentered strategies.
3. Provide schools with the necessary equipment that facilitates the application of new teaching strategies.
4. Reduce the teaching burden on science teachers who teach children with special needs.
5. Hold conferences and work shop to train effective on job-teachers on the up-to-date teaching strategies for student with impaired hearing.
6. Activate programs especially designed for teacher's preparation.
7. Conduct similar studies adding different variables and data collection methods.
8. Enable students with impaired hearing problem develop their communication skills.
9. Provide students with impaired hearing problem with extra with extra time and with an acoustic environment to enhance their abilities for communication and studying.

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10. Allow deaf students carry out their everyday study routines through using technological devices available to them in homes and schools.
11. Establish well equipped private schools for students with hearing problems.

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