

**Introduction:**

Deaf or hard of hearing is one of the disabilities that has a major impact on the personality and interactions of the disabled. It affects his language, emotional and social development, causing him to face many problems as a result of the negative impact of this disability on his interaction and communication with others and on the skills he possesses that qualify him to continue studying, working, and practicing various activities. (Al-Khatib, 1998, 85)

Visual thinking skills are among the skills necessary for the hearing impaired in the 21<sup>st</sup> century.

The development of those skills is an important goal that the teaching of science must strive to achieve, where the visual sense represents the window through which the handicapped acquires many experiences.

Learning centers are one of the important directions of science education programs that contribute to teaching science to hard-of-hearing students, as these centers include many educational activities and media that provide an opportunity for students to go ahead with the educational mission according to their own pace, and contribute to the development these skills necessary for them (Muhammad, 2002: 1).

The integration of technology in the teaching of science also contributes to developing many skills, facilitating the learning process, and facing various challenges faced by the hearing-impaired in the learning process.

In light of this, technology was used with its various applications in learning centers to become technology learning centers, which can provide a technology-rich learning environment through many technological programs and applications that allow them to learn and gain many skills in an atmosphere full of fun and excitement.

**Making sense of the problem**

Many previous studies and research such as the study of Abdul Malik (2010), the study of Abdo (2012), the study of Obaid (2016), the study of Ibrahim (2018), and the study of El-Sayed. (2018) have indicated the importance of visual thinking skills among the hearing impaired. Despite its importance, deficiencies in the current curriculum that are provided for the hearing impaired are very common. These curricular materials do not suit the students' needs and characteristics, as they are the same as those offered to ordinary people with some modifications represented in deleting some subjects presented to the hearing impaired who are two years older than the ordinary. They are also characterized by a lack of activities and illustrations, and the inadequacy of the means used for the nature of their impairment, which hinders skill acquisition.

Given the diversity of activities offered by the technology learning centers in the educational process that take into account the individual differences between the hearing impaired, and the freedom to choose a method of learning that suits their capabilities and preferences, and the enjoyment of learning, the current research seeks to prepare a proposed unit in science based on technology learning centers to develop certain visual thinking skills that represent one of the 21st-century skills necessary for the hearing impaired.

## **Research problem**

The research problem was determined by the need of the hearing impaired for visual thinking skills and the inadequacy of the curricula and teaching methods used to develop these skills.

To address this problem, the current research sought to answer the following main question:

## **What is the effectiveness of a proposed unit in science based on technology learning centers in developing some visual thinking skills among students with hearing impairment in middle school?**

The main question was subdivided into the following sub-questions:

- What is the proposed unit based on technology learning centers suitable for the hearing impaired in the middle school?
- What is the effectiveness of the proposed unit based on technology learning centers in developing the visual thinking skills of hearing-impaired students in middle school?

## **Research objectives:**

The aim of the research was to prepare a unit in science based on technology learning centers and to identify its effectiveness in developing visual thinking skills for students with hearing impairment in their first year of middle school.

## **Research Importance:**

The importance of the current research was as follows:

- The research presents a proposed unit in science based on technology learning centers. That unit may benefit researchers and planners in developing science curricula for the hearing impaired in the preparatory stage.
- The research provides a visual thinking test of first graders who are deaf or hard of hearing. This test may be useful for researchers and teachers in measuring the level of hearing-impaired students in middle school in these skills or use it in preparing such tests.

## **Research Limitations:**

The limitations of the study were:

- A group of technical middle school first graders at El Amal School for Deaf in Benha.
- The following technology learning centers: Animation Center - Educational Film Center - Educational Puzzles and Games Center - Knowledge Web Tours Center - Presentation Center.
- The following visual thinking skills: Picture description (writing)- Analysis of the visual form and understanding each of its parts- Optical distinction and identifying the distinct boundaries of the visual form- Infer information through pictures and figures - Use pictures and drawings to communicate ideas- Interpretation of information through symbols and signs included in the visual form.

