

Received: October 2023 Accepted: December 2023

DOI: <https://doi.org/10.58262/ks.v12i1.131>

## The Role of the Multi-Sensory Environment in Developing Learning Skills Among Students with Learning Difficulties in the Asir Region

Mohamad Ahmad Saleem Khasawneh<sup>1</sup>

### Abstract

*The objective of this study is to investigate the impact of the multi-sensory environment on the development of learning skills in students with learning difficulties residing in the Asir region. In order to accomplish the study objectives, the researcher employed a descriptive design and utilized a quantitative technique, relying on the questionnaire as the primary tool for data collection. The study was conducted on a sample of 221 teachers from the Asir region, who were recruited by a random sampling method. The findings of this study indicate that the development of learning skills in students with learning difficulties is influenced by cognitive skills, emotional skills, and performance skills. The findings indicate that there are no statistically significant variations in the progression of the multi-sensory environment's role in fostering learning skills among students with learning challenges, when considering the factors of gender and degree of qualification.*

**Keyword:** *The Multi-Sensory Environment Developing Learning Skills, Students with Learning Difficulties.*

### Introduction

Students with learning difficulties are seen as a distinct subgroup within the educational domain, warranting particular attention and specialized services. These services aim to address the challenges impeding their cognitive, psychosocial, and academic advancement (Alenizi, 2019). The academic concept of learning difficulties pertains to the lack of orderly development of an individual's mental capacities, resulting in weaknesses. The individual exhibits an inability to acquire proficiency in reading, writing, and numerical skills, which is accompanied by a noticeable incongruity between their cognitive capacities and academic performance. It is important to note that this impairment or disparity is not attributed to physiological or sensory factors (Cahyana et al., 2021).

The domain of learning challenges experienced substantial progress and advancement in the final two decades of the 20th century. This progress has continued into the present decade, encompassing several aspects such as the establishment of clear definitions, improved methods for identification, accurate diagnostic procedures, and effective treatment approaches (Matter, 2022). The primary emphasis of the study was on the preventative and therapeutic aspects of developmental and academic learning challenges, employing a range of medical, behavioral, neuropsychological, cognitive, and integrative perspectives (Manja et al., 2022).

Over the course of several decades, there has been a notable acceleration in global advancements across multiple domains that significantly impact human existence. This progress has given rise to an extraordinary information revolution, unparalleled in the annals of human history (Algrni, 2020). The

---

<sup>1</sup>Assistant Professor, Special Education Department, King Khalid University, Saudi Arabia. ORCIDID: <https://orcid.org/0000-0002-1390-3765>, Email: [mkhasawneh@kku.edu.sa](mailto:mkhasawneh@kku.edu.sa)

cognitive and technical advancements mentioned above have significant implications for educational systems worldwide, as they do for other societal elements. In order to remain aligned with these advancements and leverage their potential, educational institutions must undergo necessary adaptations and enhancements (Cosentino & Giannakos, 2023). The purpose of these efforts is to enhance the results of educational processes conducted and overseen by educational institutions. This is achieved through the implementation of contemporary teaching methods and strategies, which necessitate a stimulating educational environment. Educators aspire for this environment to facilitate the active engagement of students and transform them into active participants in the learning process, departing from the conventional passive role and the adverse effects of indoctrination (Unwin et al., 2021).

There has been a growing interest in the Kingdom of Saudi Arabia about the provision of education and support for students with learning challenges and special needs. The inaugural academic support program catering to individuals with learning difficulties in the Middle East was founded at Prince Sultan University in Riyadh, Kingdom of Saudi Arabia. This initiative was undertaken in collaboration with the Prince Salman Center for Disability Research and Landmark College, situated in Fairmont, United States of America. The purpose of the program is to give help to students with learning challenges at Prince Sultan University (Alenizi, 2019).

The senses are seen as the perceptual mechanisms by which an individual perceives and comprehends the external environment, acquires insights into the mysteries of the cosmos, and attains the information that is deemed important for fulfilling one's purpose in existence (Lee & Li, 2016). Consequently, nations shown considerable diligence in tending to these devices of perception, duly providing them with the recognition they merited, and embracing them as dependable channels and instruments. In the acquisition of human knowledge, the senses of hearing, sight, touch, smell, and taste serve as instrumental tools (Broadbent et al., 2018).

The significance of human senses in cognitive processes is also evident, since an individual's thoughts are influenced by the range of their sensory experiences. Each sense contributes distinct thoughts to the mind. One illustrative instance involves the formation of ideas in the mind through sensory perception (Gazioğlu & Karakuş, 2023). These ideas are generated from the senses and are specific to each sense. For instance, thoughts pertaining to colors are formed through the sense of sight, sounds are associated with the sense of hearing, flavors are linked to the sense of taste, and odors are connected to the sense of smell. This pertains to olfaction and related concepts that are cognitively constructed through a combination of sensory inputs, encompassing an individual's perceptions of location, dimension, form, motion, and immobility (Michael, 2019). These mental constructs are derived from sensory stimuli received by the human mind via two primary senses, namely vision and tactile sensation. Consequently, the plurality of senses serves as a fundamental foundation for enhancing the cognitive processes of human thinking (Itagi & D'Mello, 2019).

The incorporation of a multi-sensory environment represents a novel qualitative enhancement. The concept of its inception is rooted in the theory of sensory integration as a means of elucidating learning and behavioral difficulties (Al-Shahrani., 2023). This theory was formulated by occupational therapist Jean Ayres and is underpinned by five neurodevelopmental hypotheses. One of these hypotheses, known as the motivation assumption, posits that the successful acquisition of a skill fosters an increased motivation to further enhance one's learning capabilities (Lorusso & Bosch, 2018).

Multisensory environments (MSEs) have gained popularity in educational settings catering to children with severe disabilities in the United Kingdom, United States, and Australia. However, it is worth noting that the existing body of research does not provide compelling evidence on the beneficial impact of MSEs on learning outcomes and behavioral patterns (Cameron et al., 2020). Advocates of multi-sensory environments (MSEs) aim to provide alternate settings for sensory exploration, immersing students in supervised opportunities for both fun and instruction throughout their experiences. This dissertation

examines the implementation of small and micro projects in Manitoba K-12 schools, with the aim of facilitating meaningful discourse and advancing inclusive, effective, and best practices in the education of students with profound and multiple intellectual disabilities (PIMDs) (Novakovic et al., 2019).

The multisensory method is grounded in the fundamental principles of embodied perception and sensory integration theories. The theory of embodied cognition posits that the process of learning encompasses both cognitive and physical aspects, and highlights the influential role of embodiment in the development of cognitive abilities, including mental imagery, memory, reasoning, and problem-solving (Heesterbeek et al., 2019). Sensory integration theories propose that the processes of learning and the capacity to plan and coordinate suitable behaviors encompass the aptitude to assimilate, integrate, and regulate sensory input of diverse characteristics concurrently. Consequently, the diminished capacity to process stimuli has a significant impact on various fundamental cognitive and functional capabilities, leading to restricted focus, deficiencies in attention, insufficient self-regulation, and challenges in filtering out distractions, such as ambient noise or intense illumination (Clare et al., 2020).

Individuals with learning difficulties experience various inadequacies in the educational, social, economic, and psychological support they receive. This observation has been substantiated by numerous prior studies that have focused on investigating the experiences of students with learning difficulties (Barutchu et al., 2019). These studies commonly advocate for further research and exploration to identify evidence-based solutions to address these challenges. to investigate the various categories of student groups and their impact on the social skills development of students with learning difficulties (Suryaratri et al., 2019).

Therefore, it is crucial to emphasize the significance of employing efficient instructional approaches in addressing this issue. Students with learning difficulties encounter significant obstacles in mainstream classrooms, as the teaching methods and strategies employed are not tailored to their specific needs. These students often struggle with fundamental skills such as reading, arithmetic, and writing, necessitating the implementation of specialized instructional techniques. Teaching individuals who do not fit within the parameters of a conventional class and implementing alternate curricula is not considered the optimal approach for addressing their needs (Rostan et al., 2020). Hence, there exists a significant potential for these individuals to derive advantages from conventional curriculum, provided that it is delivered in a manner that is tailored to their specific deficiencies and is accompanied by a stimulating and supportive educational setting, such as a multi-sensory environment. Based on the aforementioned considerations, the research topic at hand is predicated upon the imperative to elucidate the significance of the multi-sensory environment in fostering the acquisition of learning abilities among individuals facing learning challenges.

### **Research Questions**

The objective of this study is to investigate the inquiries that were presented in the preceding discourse, as outlined below:

1. What is the role of the multi-sensory environment in developing the learning skills of people with learning difficulties in the Asir region from the point of view of their teachers?
2. To what degree do gender and qualification attributes impact the perspective of the study sample about the importance of the multi-sensory environment in fostering the acquisition of learning skills among students with learning difficulties?

### **Significance of the Study**

Based on the aforementioned considerations, the research topic at hand is predicated upon the imperative to elucidate the significance of the multi-sensory environment in fostering the acquisition of learning abilities among individuals facing learning challenges. The results of this study will benefit the

workers in the education sector on the importance of technology on education. The study might reveal important insights into the role of multi-sensory environment in helping students with learning disabilities to improve their learning.

## Literature Review

The definition of learning difficulties, as outlined in the Regulatory Guide for Special Education by the Ministry of Education in the Kingdom of Saudi Arabia, encompasses disorders affecting fundamental psychological processes related to the comprehension and utilization of written and spoken language. These disorders manifest in various areas such as listening, thinking, speech, reading, writing, and dictation. The domains of expression, calligraphy, and mathematics, as outlined by the Ministry of Education (2015), are not influenced by factors such as mental, hearing, visual impairments, learning difficulties, or familial responsibilities. The term "learning difficulties" encompasses the inability to acquire cognitive abilities in a sequential fashion, resulting in an academic disadvantage mostly observed in reading, writing, spelling, and numerical skills. These challenges are not attributed to mental or sensory impairments. Additionally, it addresses the disparity that exists between the child's academic performance and their cognitive capabilities (Volpe & Gori, 2019). According to Vedadi et al. (2019), the term refers to a broad category encompassing individuals of various ages who exhibit a lack of homogeneity in terms of their difficulties, both in terms of nature and appearance. These individuals demonstrate a notable discrepancy between their anticipated performance and their actual performance in one or more academic domains. Furthermore, their challenges may be attributed to disruptions in the functioning of both cerebral hemispheres. Individuals with intact cognitive and emotional functioning tend to thrive in environments characterized by a moderate level of cultural, social, and educational stimulation. Furthermore, they are not afflicted by any form of mental, emotional, physical, auditory, or visual impairments. Additionally, individuals in this group do not exhibit significant emotional issues or experience poor physical health. Certain prevalent behavioral features can be detected in individuals, including heightened motor activity, attention deficits, and a sense of inferiority (Garzotto et al., 2019).

Numerous individuals with a vested interest in and expertise in the realm of learning difficulties recognize the imperative nature of categorizing learning difficulties. This classification serves to streamline the investigation of this phenomenon and propose suitable diagnostic and therapeutic approaches, considering the diverse and distinct challenges that children with learning difficulties exhibit as a heterogeneous collective (Ponticorvo et al., 2019). There have been attempts to categorize learning challenges in order to enhance instructional approaches. The diagnosis and treatment strategies should be tailored to each specific group, as the approach that is effective for addressing a particular learning challenge in one situation may not be applicable to another case (Boardman, 2020). Consequently, based on extensive educational studies and research in the fields of psychology and neuroscience, experts have widely categorized learning challenges into two fundamental categories are:

**Developmental learning difficulties:** The challenges at hand are interconnected with the neurological processes and mental faculties that are essential for a child's academic performance, as well as their personal, social, and vocational adaptation. This particular challenge encompasses the prerequisite abilities that a youngster must possess in order to engage in academic activities (Alenizi, 2019). These cognitive processes or skills encompass attention, sensory perception, memory, language, and thinking. Developmental learning challenges manifest in three fundamental domains: linguistic development, cognitive development, and visual-motor skill development. It is important to acknowledge that deficiencies in one element are not confined solely to that particular component, but rather have implications for other interconnected aspects as well (Cahyana et al., 2021). The presence of deficiencies in the cognitive processes of attention, perception, memory, and reasoning can significantly impede the

development of reading, writing, and arithmetic skills. This is due to the tight association between attention and the reception of sensory stimuli, which is crucial for these cognitive activities (Matter, 2022). Conversely, a deficit in the attentional process diminishes the advantages derived from many stimuli, including auditory, visual, and tactile cues. Simultaneously, it impairs the ability to engage in effective conversation with others, which is closely associated with social adaptation (Manja et al., 2022).

**Academic learning difficulties:** Academic learning difficulties mostly stem from developmental learning challenges, which can be attributed to deficits in cognitive functions such as thinking, perception, attention, and memory. Hence, these conditions are associated with fundamental areas of study, including challenges in reading (dyslexia), writing (dysgraphia), completing mathematical operations (dyscalculia), as well as spelling difficulties (dysorthography) (Algrni, 2020). The aforementioned challenges arise from developmental obstacles. For instance, a kid may encounter challenges in recalling previously acquired words and letters as a result of deficits in visual memory, auditory memory, or the ability to organize physical sense. Hence, a correlation exists between the cognitive abilities of a child with learning disabilities and their proficiency in reading, writing, and mathematics (Cosentino & Giannakos, 2023).

There are many characteristics of students with learning difficulties, such as: Hyperactivity is a common characteristic observed in individuals with learning challenges since they frequently exhibit excessive and purposeless motor behaviors. Individuals with hyperactivity often exhibit a diminished capacity to promptly adapt to alterations in their surroundings, or alternatively, may exhibit delayed reactions to such changes. Attention deficit is characterized by a limited capacity for sustained focus, resulting in a propensity for distraction (Unwin et al., 2021). The category of synergy exhibits challenges in the synchronization of movement, as well as difficulties in visual, motor, and tactile discriminating. Visual discrimination refers to the impaired ability to differentiate between visual stimuli based on visual perception, as well as experiencing challenges in visual closure (Alenizi, 2019). The process of completing missing portions is not feasible when only a partial word or object is observed. Individuals may exhibit challenges in visual memory, visual recognition, and sequential memory recall. Auditory perceptual difficulties encompass a range of challenges, including limited auditory discrimination, the incapacity to differentiate between distinct sounds, deficiencies in auditory reception and comprehension, as well as an inability to derive meaning from sounds, words, and sentences (Lee & Li, 2016). Language difficulties encompass a range of challenges, including delayed or sluggish speech development, struggles in formulating and constructing sentences, and a limited capacity to effectively organize words into phrases, paragraphs, or sentences in a suitable manner (Broadbent et al., 2018). These traits can alternatively be categorized into groups as follows:

**Psychological and behavioral characteristics:** Individuals with learning difficulties exhibit a range of psychological and behavioral manifestations that reflect the challenges associated with their condition. These manifestations include disruptions in auditory processing, heightened levels of impulsive motor activity, a tendency towards risk-taking behavior, and displays of aggression (Gazioğlu & Karakuş, 2023). The student exhibiting learning challenges demonstrates heightened emotional reactivity, experiences diminished self-worth, and frequently displays incongruent conduct relative to the context, including fluctuations in mood (Michael, 2019).

**Cognitive characteristics:** Individuals with learning disabilities experience challenges in the acquisition, mastery, and application of fundamental knowledge and abilities for problem-solving purposes. Individuals with this particular group are additionally distinguished by a diminished level of desire, the utilization of unsuitable cognitive strategies in managing educational assignments, and an impairment in maintaining educational pursuits. These learners also have a deficiency in skills (Itagi & D'Mello, 2019). The individual exhibits challenges in reading and writing, struggles with comprehending and retaining



auditory information, demonstrates limited capacity for recalling previously memorized vocabulary, encounters difficulties in performing arithmetic operations, possesses ineffective study habits, lacks the ability to actively participate in discussions, and displays a lack of commitment towards fulfilling assigned responsibilities (Al-Shahrani., 2023).

**Mental characteristics:** Individuals with learning difficulties exhibit impairments in memory function, diminished levels of selective attention, academic underachievement in one or multiple subjects, cognitive distractibility and reduced concentration abilities. Additionally, they demonstrate challenges in abstract reasoning and problem-solving abilities, as well as deficiencies in organizational skills and difficulties in comprehending, organizing, and integrating ideas (Lorusso & Bosch, 2018).

**Linguistic characteristics:** Individuals with learning challenges may exhibit speech patterns characterized by incomprehensible phrases or grammatical structures that are wrong or inaccurate. Furthermore, individuals also encounter significant challenges when it comes to verbal communication. Individuals often encounter difficulties in selecting suitable vocabulary, resulting in the utilization of disjointed and nonsensical sentences. Consequently, their discourse may persist for an extended duration without attaining the intended resolution or conceptualization (Cameron et al., 2020).

**Social characteristics:** It is widely acknowledged that learning issues are intricately linked to academic performance and achievement. However, research has demonstrated that this issue also include elements associated with social interaction. Individuals with learning difficulties encounter challenges in establishing social connections, experiencing instances of rejection or neglect from their peers (Novakovic et al., 2019). They often display a tendency to withdraw from social situations and exhibit a preference for avoiding such interactions. Furthermore, they are commonly characterized by their susceptibility to the influence of their colleagues and peers, and may encounter difficulties in adapting to changes within their environment (Heesterbeek et al., 2019).

**Academic qualities:** The following features are indicative of the presence of learning difficulties. The association between a student's academic performance and their observable struggles in one or more areas, such as reading, writing, or arithmetic, is evident to those in their immediate environment (Clare et al., 2020).

The diverse definitions of learning difficulties encompass a range of explanatory theories, including the neurological theory. This theory posits that brain injury or dysfunction are prominent factors contributing to the development of learning difficulties. It is worth noting that the neurological theory was one of the initial frameworks to elucidate the occurrence of learning difficulties in individuals. The proponents of this theory employ a diagnostic approach for identifying instances of learning difficulties (Barutchu et al., 2019). This approach involves doing a battery of neurological tests, which encompass basic assessments of neurological functioning, as well as the utilization of checklists that evaluate the traits associated with individuals who have experienced brain injuries. Additionally, an electroencephalogram is employed as part of the diagnostic process. The behavioral theory posits that learning difficulties arise due to a range of external factors, including variables related to the social context, the child's learning history, parental attitudes towards achievement and attainment, environmental deprivation, malnutrition, the instructional strategies employed, and the child's cognitive style. Hence, the prevention of success difficulties is achieved through the modification of the educational environmental factors affecting the kid (Suryaratri et al., 2019). This theoretical framework centers on understanding the specific factors that contribute to the discrepancy between a child's observed academic performance and their anticipated performance, with a particular emphasis on the inherent challenges associated with the learning process (Rostan et al., 2020). According to developmental theory, learning challenges arise from the acceleration of cognitive growth, wherein learners are assigned tasks that are incongruent with their current developmental stage. Piaget

underscores this notion by asserting that the kid must effectively consolidate and stabilize their behavior and thinking at each developmental stage prior to progressing forward. The completion of activities at a higher level necessitates the attainment of maturity, as transitioning from one stage to another is contingent upon this developmental progression (Volpe & Gori, 2019). The cognitive theory posits that learning challenges arise from impairments in the various processes involved in organizing, analyzing, storing, retrieving, classifying, and utilizing knowledge, as well as the associated processes and fundamental functions. The learner experiencing learning challenges demonstrates limitations in the efficacy and efficiency of cognitive representation. Consequently, a significant proportion of the concepts acquired or learned within the cognitive framework exhibit deficiencies in both storage and memory (Vedadi et al., 2019).

Multi-sensory environments (MSEs) refer to designated areas or enclosed spaces that incorporate specialized equipment with the purpose of delivering sensory stimulation to individuals. Ideally, the sensory stimuli offered are customized to align with the perceived requirements of the user. The equipment comprises several objects, including projectors, effect wheels, bubble tubes, music equipment, fiber optics, vibrating devices, aroma diffusers, and audio equipment (Alenizi, 2019). According to Garzotto et al. (2020), a specialized interior space is described as an environment that offers a range of sensory experiences with the aim of enhancing motivation, interests, entertainment, and relaxation. The interactive installations under discussion are of considerable size, resembling rooms, and are equipped with a range of digital materials and embedded devices. These components possess the ability to detect the presence of users, as well as their gestures, movements, and manipulations. Consequently, they engage with users by offering subtle forms of stimulation, such as light, sound, projections, bubble generation, tactile sensations, and olfactory experiences, targeting multiple senses Cahyana et al., 2021.

The concept under consideration might be delineated as an encompassing milieu characterized by the presence of enjoyable sensory stimuli that are cultivated inside an environment fostering trust and relaxation. The Snoezelen room, alternatively referred to as a multi-sensory room, offers a comprehensive range of sensory stimuli encompassing sight, hearing, smell, taste, touch, and vestibular sensations (Matter, 2022). The notion of Snoezelen involves using an empowering approach, wherein the caregiver engages with the client in a non-directive manner, facilitating ample opportunity for exploration within the designated area. Interactive multi-sensory environments (IMSES) refer to expansive interactive installations that are outfitted with a variety of digitally enhanced physical elements and embedded electronics (Manja et al., 2022). The concept of "surrounding" refers to the immediate environment or context in which something These elements can detect the presence, gestures, motions, and manipulation of users, and respond by delivering subtle forms of stimulation such as light, sound projections, bubble generation, tactile sensations, and olfactory stimuli targeting different senses (Algrni, 2020). The majority of prior academic studies on interactive mobile sensory environments have focused on their application in individuals with disabilities, such as autism. Our research centers on the utilization of interactive multisensory environments within primary education settings, specifically for heterogeneous groups of young learners, encompassing both pupils with impairments and those without (Cosentino & Giannakos, 2023). This paper provides a description of the most recent iteration of the Interactive Multimedia Learning Environment (IMSE) software, referred to as Magic Room, which has been implemented into two educational institutions within the local community. In this paper, we provide the findings of two preliminary pilot investigations that were conducted with a specific focus. In order to get insight into the utilization of Magic Room within inclusive educational environments and to examine the potential advantages it offers, the study conducted by Unwin et al. (2020) is of particular relevance.

One significant advantage of multisensory learning is in its utilization of "dual coding," a process that effectively reduces cognitive load by enabling the breakdown of information from several modalities

into short-term memory, facilitating the construction of long-term representations (Alenizi, 2019). The utilization of multisensory notation facilitates the acquisition and retention of non-sensory information, enabling the integration of diverse media forms. The presentation of non-sensory stimuli subsequently triggers a more extensive network of brain regions associated with multisensory processing. The incorporation of multisensory techniques in educational settings facilitates increased student engagement during the learning process and seeks to address the inherent limitations of individual sensory processing capacities (Broadbent et al., 2018). Provide alternate environments for sensory discovery, immersing students in curated experiences that combine enjoyment and educational opportunities. This framework offers a contextualized approach to instructing a diverse array of talents, including but not limited to communication skills and the utilization of switch devices. Moreover, these proficiencies can be effectively imparted in many environments beyond the educational setting. In addition, prompts are used as a means to mitigate problematic conduct and diminish stereotypic behavior in children (Gazioğlu & Karakuş, 2023).

In a study conducted by Alenizi (2019), the efficacy of a program utilizing a multisensory approach was evaluated in terms of its impact on the development of visual perception among primary school students with learning difficulties. The research utilized a quasi-experimental design to investigate the effects of the intervention on the experimental group of participants. A training program utilizing a multi-sensory approach was implemented on a cohort of 30 third and fourth grade students. The objective of the program was to encourage the students to utilize their sensorimotor memories and familiarities in order to comprehend intellectually engaging texts. The control group, consisting of 30 learners, was subjected to conventional reading comprehension methods. The study analyzed the variations in visual perception among learners before and after the teaching intervention in order to assess the efficiency of the instructional approach. The findings demonstrate a disparity in the visual perception abilities between the two groups of learners. The observed disparities exhibited a preference for the implementation of the multi-sensory approach. The results of this study indicate that it is beneficial for learners to establish a connection between their sensory experiences and the text or reading materials they encounter.

The study conducted by Manja et al. (2022) investigated the perspectives of educators regarding the significance of incorporating multi-sensory activities in early childhood education. The perception of early childhood education teachers is contingent upon their overall understanding of the significance of multi-sensory activities in early childhood education, as well as their response to the necessity of implementing these activities based on their specific type. The present study employs a survey methodology, utilizing a questionnaire developed by Goodwin (2008), which explores the topic of Sensory Experiences in the Early Childhood Classroom. Specifically, the study investigates teachers' utilization of sensory activities, their perceptions regarding the significance of such activities, and the obstacles they encounter in implementing them. The participants in this study consist of educators specializing in early childhood education within the Proton City Area, Muallim District, Perak. The researcher has opted to employ intentional sampling as the sampling technique for this study. The overall sample size consists of 30 teachers who will participate in the research. The study's results indicated that a majority of respondents, specifically 90% or 27 individuals, expressed agreement regarding the significance of incorporating multi-sensory activities within the context of early childhood education. Among the participants, a significant majority of teachers (86.7%) expressed agreement with the importance of implementing visual stimulus activities and utilizing art materials and activities. This garnered the highest percentage score in terms of teachers' perspectives towards implementation. In contrast, the group with the lowest score consists of 21 participants, accounting for 70% of the total, who expressed agreement with the incorporation of multi-sensory activities within the context of Outdoor Play. Despite the existence of varying percentage ratings, the incorporation of multi-sensory activities remains widely regarded as significant in the context of early childhood education.



Matter (2022) employed a multisensory strategy to enhance the reading comprehension abilities of third-grade English as a Foreign Language (EFL) students. The study focused on developing skills in literal comprehension, inferential comprehension, and critical comprehension. The study included a cohort of sixty-four third-year primary students from Ezbet Abo Atts primary school, who were selected to participate during the academic year 2021-2022. The participants were allocated into two distinct groups: an experimental group consisting of 32 individuals and a control group also consisting of 32 individuals. The pupils in the experimental group were instructed utilizing a multimodal method, whereas the kids in the control group received conventional instruction. The study employed several instruments and materials, including an English as a Foreign Language (EFL) reading comprehension abilities checklist, an EFL reading comprehension skills test, and a teacher's guide. The participants underwent pre- and post-testing utilizing the reading skills assessment. Upon conducting statistical analysis on the data, the results indicated that the use of a multimodal strategy was successful in enhancing the reading comprehension abilities of third-grade English as a Foreign Language (EFL) students. The utilization of a multisensory approach is advised for English as a Foreign Language (EFL) programs in a broad sense, with a specific emphasis on its application in reading instruction.

In a study conducted by Al-Shahrani (2023), examined the impact of the multisensory environment on the development of learning abilities among individuals with learning challenges in the Kingdom of Saudi Arabia. The study specifically focused on gathering insights from teachers regarding this role. In order to achieve this objective, a descriptive methodology was employed, utilizing a questionnaire as the primary instrument for data collection. The research was conducted on a sample including 116 children who had challenges in studying within the school district of Riyadh in the Kingdom of Saudi Arabia. The individuals were classified based on three variables: gender (male/female), qualification (educational/non-educational), and stage (primary/preparatory/secondary). The findings of the study suggest that the multi-sensory educational environment has a significant influence in the development of cognitive, emotional, and behavioral learning skills. The findings of the study also revealed that there were no statistically significant disparities in the visual abilities of the participants based on the variables of type or educational stage. However, variations in their responses were observed based on the qualification variable, with individuals possessing educational qualifications exhibiting more favorable outcomes.

## Methodology

The current study employed a descriptive research approach and quantitative methods to provide a thorough, precise, and organized representation of the characteristics and data related to the population being examined. According to Saunders et al. (2016), the main aim of descriptive quantitative research is to systematically outline and clarify the various characteristics of the subject or setting being studied. Afterwards, the collected data is subjected to thorough analysis and subsequently presented.

## Population and Sample

During the second semester of the academic year 2023, a study was conducted with 374 instructors from special education schools in the Asir region. Based on the statistics presented by Krejcie and Morgan (1970), a sample size of 191 is considered sufficient for population representation. The primary objective of the study was to perform an extensive survey among instructors to ensure the sample adequately represented the entire community. Furthermore, the research aimed to collect a significant quantity of data from the participants while also mitigating any potential biases in the results (Blumberg et al., 2014). As a result, a digital distribution method was employed to disseminate the survey, ensuring its accessibility to all teachers. A total of 230 questions were discovered. Hair et al. (2010) reported that a subset of 9 surveys out of the original sample of 230 were omitted from the analysis because they contained above 50% unanswered questions. The research yielded a total of 221 questionnaires that were determined to be credible and valid.

## Research Instrument

To achieve the research aims, the researcher employed the utilization of prior studies conducted by Alenizi (2019) and Al-Shahrani (2023) to aid in the development of the questionnaire as the principal research tool. The survey was partitioned into two distinct sections. The initial segment of the survey gathers information pertaining to the respondents' "gender" and "educational background." Section 2 consisted of a thorough collection of 24 tasks that were specifically designed to evaluate three distinct aspects of learning skills. The aforementioned categories encompass the scope of cognitive skills, as demonstrated by things 1-8, emotional skills, as evidenced by items 9-16, and performance skills, as illustrated by items 17-24.

## Instrument Validity

A group of ten special education professionals, who are affiliated with universities in Saudi Arabia and possess expertise in language development, scientific precision, and clarity, were assigned the responsibility of assessing the validity of the research instrument. Based on assessments undertaken by specialists, it has been ascertained that all elements have been judged acceptable, but with minor linguistic alterations.

## Instrument Reliability

One approach utilized to ascertain the reliability of measurement entails evaluating the consistency of results through the use of similar samples and devices, while keeping all other variables constant. The evaluation of answer consistency was performed using Cronbach's alpha coefficient. According to Saunders et al. (2016), the evaluation of a survey's reliability is dependent on its trustworthiness, which is considered to be achieved when it meets or surpasses a minimum threshold of 60%.

**Table 1:** Cronbach Alpha Test.

Variables	Value
Cognitive skills	0.852
Emotional skills	0.835
Performance skills	0.813
Total	0.840

The measurements presented in Table 1 demonstrate a high degree of coherence in the study, as evidenced by their alignment within the range of 0.813 to 0.852. Furthermore, it is important to acknowledge that each section of the questionnaire yielded a Cronbach's alpha coefficient exceeding 0.60, indicating a significant degree of reliability. Consequently, no inconsistencies were detected across the different components of the research instrument.

## Data Analysis

In order to comprehensively address the research questions, the statistical analyses were conducted utilizing the SPSS program. The procedures employed in this study involved the implementation of the independent sample t-test and the computation of means. According to Cuevas et al. (2004), the independent sample t-test is recommended as an appropriate statistical technique for comparing the means of two groups. Within this section, a comprehensive elucidation is presented regarding the outcomes derived from the use of various research methodologies employed for the purpose of analyzing and describing these outcomes. If the average score is 2.33 or lower, the item is classified as having a low grade. The item's grade is classified as moderate, with the mean score ranging from 2.34 to 3.67. The item exhibits a high level, as evidenced by a mean score that is greater than or equal to 3.68.

## Findings and Discussion

The application of descriptive analysis was employed to provide a comprehensive depiction of the

attributes of the participants, with a specific emphasis on their "gender" and "level of qualification." The survey results revealed that a significant proportion of participants, specifically 58.8%, identified as male. In contrast, 41.2% of respondents identified as female, showing that the male respondents formed the majority of the sample. Regarding the classification of participants' level of qualification, it is noteworthy that 78.3% of the respondents achieved an undergraduate degree, whilst 21.7% attained a postgraduate degree, as indicated by the statistical information provided in Table 2.

**Table 2:** The Respondents Profile.

The variable	Categories	N	%
Gender	Male	130	58.8
	Female	91	41.2
level of qualification	Undergraduate degree	173	78.3
	Postgraduate degree	48	21.7

In order to address the first study question, the mean and standard deviations of all variables pertaining to the degree of the multi-sensory environment in enhancing the learning skills of individuals with learning difficulties in the Asir region, as perceived by their teachers.

**Table 3:** Means and Standard Deviation.

N	Items	Means	St.devs	Results
Cognitive skills				
1	A multi-sensory educational environment helps people with learning difficulties memorize a large amount of information	4.70	0.44	A
2	The educational environment facilitates the process of retrieving information for students with learning difficulties	4.35	0.58	A
3	The educational environment helps students with learning disabilities make greater use of information aids	4.15	0.65	A
4	The educational environment facilitates students with learning disabilities to have a greater understanding of learning topics	4.33	0.44	A
5	The multi-sensory educational environment diversifies the sources of knowledge available to people with learning difficulties	4.50	0.50	A
6	A multisensory learning environment facilitates students with learning disabilities organizing learned information	4.45	0.56	A
7	The multi-sensory educational environment diversifies the sources of knowledge available to people with learning difficulties	4.60	0.46	A
8	A multi-sensory learning environment facilitates students with learning disabilities to connect learned knowledge and understand the relationships between them.	4.65	0.49	A
Total		4.47	0.39	A
Emotional skills				
9	A multi-sensory learning environment enhances the self-confidence of people with learning disabilities	4.30	0.48	A
10	A multi-sensory educational environment increases the motivation of people with learning disabilities towards learning	4.45	0.43	A
11	A multi-sensory learning environment makes people with learning disabilities feel important about what they are learning	4.56	0.40	A
12	A multi-sensory learning environment makes people with learning disabilities feel happy while they learn	4.39	0.52	A
13	A multi-sensory educational environment increases the commitment and regularity of people with learning disabilities at school	4.41	0.42	A

14	The educational environment achieves emotional stability for people with learning difficulties	<b>4.66</b>	<b>0.38</b>	A
15	A multi-sensory educational environment increases the belief of people with learning disabilities in their ability to learn	<b>4.25</b>	<b>0.55</b>	A
16	The educational environment reduces the negative feelings that people with learning disabilities may experience, such as anxiety, stress, and isolation	<b>4.10</b>	<b>0.58</b>	A
	Total	<b>4.39</b>	<b>0.35</b>	A
	Performance skills			
17	The multi-sensory educational environment increases the focus and attention of people with learning disabilities in the classroom	<b>4.65</b>	<b>0.53</b>	A
18	The multi-sensory educational environment trains people with learning difficulties to acquire the skill of applying the educational experiences included in their lessons	<b>4.68</b>	<b>0.51</b>	A
19	The multi-sensory educational environment facilitates people with learning disabilities to acquire the skill of analyzing the educational experiences included in their lessons	<b>4.43</b>	<b>0.58</b>	A
20	A multi-sensory educational environment helps people with learning difficulties acquire the skill of synthesizing the educational experiences included in their lessons	<b>4.38</b>	<b>0.59</b>	A
21	The multi-sensory educational environment trains people with learning disabilities to perform classroom tasks with ease	<b>4.58</b>	<b>0.57</b>	A
22	The educational environment provides students with learning difficulties with positive interaction skills within the classroom	<b>4.33</b>	<b>0.62</b>	A
23	The multi-sensory educational environment trains people with learning disabilities to perform home tasks easily	<b>4.53</b>	<b>0.56</b>	A
24	The multi-sensory educational environment facilitates the use of their learning experiences in practical life for people with learning disabilities	<b>4.48</b>	<b>0.56</b>	A
	Total	<b>4.51</b>	<b>0.35</b>	A
	All instrument	<b>4.46</b>	<b>0.37</b>	A

According to the data provided in Table 3, the mean score for the role of the multi-sensory environment in developing learning skills among students with learning difficulties in the Asir region was determined to be 4.46, accompanied by a standard deviation of 0.37.

While the role of the multi-sensory environment in developing cognitive skills among students with learning difficulties in the Asir region was determined to be 4.47, accompanied by a standard deviation of 0.39. The item labeled "A multi-sensory educational environment helps people with learning difficulties memorize a large amount of information" (item 1) exhibits the highest mean value among all the elements pertaining to cognitive skills, with a score of 4.70. The item 3 mean score, which corresponds to "The educational environment helps students with learning disabilities make greater use of information aids", exhibits the lowest value among all items, measuring at 4.15.

The aforementioned findings suggest that the utilization of a multi-sensory setting is beneficial for enhancing cognitive teaching abilities in individuals with learning disabilities. The researcher posits that the preceding outcome is rational and can be ascribed to the multi-sensory educational setting, which is distinguished by its diverse approach to imparting knowledge to pupils, as well as the stimulating and captivating features it encompasses. However, their focus on the information provided to them is noteworthy. Furthermore, the multi-sensory environment encompasses stimulating and engaging elements that foster a delightful learning experience for pupils, so immediately enhancing their acquisition of the cognitive abilities incorporated within it. The aforementioned discovery validates the assertions made in educational literature regarding the significant advantages of multisensory learning. One such advantage is the utilization of "dual coding," which effectively reduces cognitive burden by enabling the division of information from various modalities into short-term memory. Consequently,

this facilitates the construction of long-term representations. The utilization of multisensory environments in learning has been shown to have positive effects on the acquisition and retention of information that is not directly related to the senses. This is due to the ability of interconnected representations across various media to encode non-sensory data in a multisensory manner. Furthermore, the presentation of stimuli that are not sensory in nature can activate a wider network of brain regions involved in multisensory processing. This result aligns with the studies conducted by Alenizi (2019), Manja et al. (2022), Matter (2022), and Al-Shahrani (2023).

Moreover, Table 3 exhibits a mean value of 4.39 and a standard deviation of 0.35 for the domain of emotional skills. The item that demonstrates the highest average value is item 14, which is related to "The educational environment achieves emotional stability for people with learning difficulties." The aforementioned item obtained a score of 4.66. The item labeled 16, which addresses "The educational environment reduces the negative feelings that people with learning disabilities may experience, such as anxiety, stress, and isolation", demonstrated the lowest mean score (4.10) compared to all other items.

The previous findings suggest that the utilization of a multi-sensory environment can have a positive impact on the emotional development of individuals with learning difficulties. This can be attributed to the engaging and stimulating aspects of the multi-sensory environment, which foster favorable attitudes towards the learning environment, cultivate a sense of contentment, and consequently enhance motivation towards the learning process. Furthermore, the development of emotional abilities is an essential aspect to consider. The aforementioned assertion is corroborated by several studies which have suggested that the incorporation of a multisensory environment facilitates increased student engagement in the learning process and seeks to address the inherent limitations of individual sensory processing capacities. This result aligns with the studies conducted by Alenizi (2019), Manja et al. (2022), Matter (2022), and Al-Shahrani (2023).

Furthermore, the data provided in Table 3 illustrates that performance skills have a mean value of 4.51 and a standard deviation of 0.53. One of the components encompassed by the construct of performance skills that demonstrates the most elevated average score is item 18. This particular item asserts "The multi-sensory educational environment trains people with learning difficulties to acquire the skill of applying the educational experiences included in their lessons", and it has received a mean score of 4.68. Among all the questions, Item 18, which pertains to "The educational environment provides students with learning difficulties with positive interaction skills within the classroom", received the lowest mean score of 4.33.

The preceding findings suggest that the utilization of a multi-sensory environment has a positive impact on the development of performance skills in individuals with learning difficulties. This conclusion is deemed reasonable by the researcher, as it can be attributed to the inherent nature of the multi-sensory educational environment. Specifically, this environment facilitates the actual embodiment of the necessary performance skills and provides practical training opportunities. Additionally, the presence of an audio-visual teaching component further enhances the acquisition of these skills. The aforementioned assertion is corroborated by several investigations which have indicated that the utilization of a multisensory environment facilitates and establishes a framework for instructing a range of abilities that may likewise be imparted in alternative settings, such as communication and adaptability capabilities. In addition, prompts are offered as a means to mitigate problematic behavior and restrict its occurrence in children. This result aligns with the studies conducted by Alenizi (2019), Manja et al. (2022), Matter (2022), and Al-Shahrani (2023).

The study utilized an independent sample t-test to assess the statistical effectiveness of the role of the multi-sensory environment in developing learning skills among students with learning difficulties in the Asir region based on the factors of gender and level of qualification, addressing the second research question.



**Table 4:** Independent Samples T- Test.

Variables	N	Mean	St.dev	df	t	Sig
Female	91	4.05	0.41	219	1.005	0.071
Male	130	4.10	0.37			
Undergraduate degree	173	4.07	0.37	219	1.0155	0.062
Postgraduate degree	48	4.11	0.36			

Based on the data shown in Table 4, it can be observed that the mean of male responses for the role of the multi-sensory environment in developing learning skills among students with learning difficulties in the Asir region was 4.10, whereas the mean of female responses was 4.05. Additionally, the table presented the mean score for the role of the multi-sensory environment in developing learning skills among students with learning difficulties in the Asir region in the undergraduate degree as 4.07, while the mean score for the postgraduate degree was 4.11. The statistical significance (Sig) values for the comparison of two groups divided by gender (0.071) and two groups divided by level of qualification (0.062) suggest that neither gender nor level of qualification had a significant impact on the role of the multi-sensory environment in developing learning skills among students with learning difficulties in the Asir region. This result aligns with the research conducted by Al-Shahrani (2023).

## Conclusion

The primary aim of this research endeavor was to examine the role of the multi-sensory environment in developing learning skills among students with learning difficulties in the Asir region. The study's findings indicate the role of the multi-sensory environment in developing learning skills among students with learning difficulties in the Asir region for cognitive skills, emotional skills, and performance skills. Based on the results, it was seen that The implementation of a multi-sensory environment has been found to have advantageous effects on the enhancement of cognitive instructional capabilities in individuals diagnosed with learning difficulties. The researcher suggests that the observed result is logical and may be attributed to the multi-sensory educational environment, characterized by its varied approach to teaching students and the engaging and fascinating elements it incorporates. Nevertheless, it is worth noting their emphasis on the information that has been presented to them. Also, the multi-sensory setting possesses engaging and exciting qualities that promote positive attitudes towards the learning environment, nurture a sense of contentment, and thus boost motivation towards the learning process. Moreover, it is vital to take into account the advancement of emotional competencies. Furthermore, the application of a multi-sensory setting has been found to have a beneficial effect on the enhancement of performance skills in those who have learning challenges. The researcher considers this result to be reasonable, as it may be ascribed to the intrinsic characteristics of the multi-sensory educational setting.

## Acknowledgements

The authors extend their appreciation to the Deanship of Scientific Research at King Khalid University for funding this work through Small Research Groups under grant number (RGP.1 / 271 /44).

## References

- Alenizi, M. A. (2019). Effectiveness of a Program Based on A Multi-Sensory Strategy in Developing Visual Perception of Primary School Learners with Learning Disabilities: A Contextual Study of Arabic Learners. *International Journal of Educational Psychology*, 8(1), 72. <https://doi.org/10.17583/ijep.2019.3346>
- Algrni, N. S. (2020). The effectiveness of using multisensory approach in enhancing achievement and retention of English vocabulary amongst intermediate female students with EFL learning disabilities. *Journal of Education and Practice*, 11(9). <https://doi.org/10.7176/jep/11-9-17>

- Al-Shahrani, O. (2023). The role of the multisensory environment in developing the learning skills of those with learning difficulties in Saudi Arabia from the point of view of their teachers. *Journal of Special Education and Rehabilitation*, 15(54), 87-137.
- Barutchu, A., Toohey, S., Shivdasani, M. N., Fifer, J. M., Crewther, S. G., Grayden, D. B., & Paolini, A. G. (2019). Multisensory perception and attention in school-age children. *Journal of experimental child psychology*, 180, 141-155. <http://dx.doi.org/10.1016/j.jecp.2018.11.021>
- Boardman, K. (2020). An exploration of teachers' perceptions and the value of multisensory teaching and learning: a perspective on the influence of Specialist Dyslexia Training in England. *Education 3-13*, 48(7), 795-806. <http://dx.doi.org/10.1080/03004279.2019.1653349>
- Broadbent, H. J., Osborne, T., Rea, M., Peng, A., Mareschal, D., & Kirkham, N. Z. (2018). Incidental category learning and cognitive load in a multisensory environment across childhood. *Developmental Psychology*, 54(6), 1020-1028. <https://doi.org/10.1037/dev0000472>
- Cahyana, C., Hidayati, H., Sanjaya, M. B., Pangestu, A. S., Sundawa, A. A., & Aritakalam, A. (2021). Ledy: A Multisensory Approach in Mobile Application for Dyslexic Children. *CommIT (Communication and Information Technology) Journal*, 15(1), 31-39. <https://doi.org/10.21512/commit.v15i1.6661>
- Cameron, A., Burns, P., Garner, A., Lau, S., Dixon, R., Pascoe, C., & Szafraniec, M. (2020). Making sense of multi-sensory environments: A scoping review. *International Journal of Disability, Development and Education*, 67(6), 630-656. <http://dx.doi.org/10.1080/1034912x.2019.1634247>
- Clare, A., Camic, P. M., Crutch, S. J., West, J., Harding, E., & Brotherhood, E. (2020). Using music to develop a multisensory communicative environment for people with late-stage dementia. *The Gerontologist*, 60(6), 1115-1125.
- Cosentino, G., & Giannakos, M. (2023). Multisensory Interaction and Analytics to Enhance Smart Learning Environments: A Systematic Literature Review. *IEEE Transactions on Learning Technologies*, 1-18. <https://doi.org/10.1109/tlt.2023.3243210>
- Garzotto, F., Gelsomini, M., Gianotti, M., & Riccardi, F. (2019). Engaging children with neurodevelopmental disorder through multisensory interactive experiences in a smart space. *Social Internet of Things*, 167-184. [http://dx.doi.org/10.1007/978-3-319-94659-7\\_9](http://dx.doi.org/10.1007/978-3-319-94659-7_9)
- Gazioğlu, M., & Karakuş, N. (2023). The impact of multisensory learning model-based tale-telling on listening skills and student opinions about it. *Frontiers in Education*, 8. <https://doi.org/10.3389/feduc.2023.1137042>
- Heesterbeek, M., van Der Zee, E. A., & van Heuvelen, M. J. G. (2019). Feasibility of three novel forms of passive exercise in a multisensory environment in vulnerable institutionalized older adults with dementia. *Journal of Alzheimer's Disease*, 70(3), 681-690. <http://dx.doi.org/10.3233/jad-190309>
- Itagi, G., & D'Mello, L. (2019). Academic Excellence through Multi-Sensory Approach: A Model for Classroom Teaching. *International Journal of Management, Technology, and Social Sciences*, 74-86. <https://doi.org/10.47992/ijmts.2581.6012.0073>
- Khasawneh, M.A.S., & Arabia, S. (2016). The Impact of a Training Program Based on the Visual Words Composition Techniques on the Development of Reading Comprehension Skills among the Students of Primary Stage. *Advances in BioResearch*, 7(2). <https://www.researchgate.net/publication/329091984> *International Journal of Academic Research*
- Khasawneh, A. J., Khasawneh, M. A. S., & Al-Sarhan, K. E. (2023). Unveiling the Role of Ict In Social Science Research: An Examination of Ict Applications In The Saudi Arabian And Jordanian Context. *Journal of Southwest Jiaotong University*, 58(5).
- Khasawneh, A. J., Khasawneh, M. A. S., Al-Sarhan, K. E., & Alkhawaldeh, M. A. (2023). Assessment of the Perspectives of Experts on the Evolution of Translation Education in the 21ST Century. *Migration Letters*, 20(S2), 894-908.
- Khasawneh, M. A. S. (2021). An electronic Training Program on Developing the Written Expression Skills among a Sample of foreign language learners EFL who are at-risk for Learning disabilities during the emerging Covid-19. *Academy of Social Science Journal*, 7(10), 1974-1982. DOI: <https://doi.org/10.15520/ASSJ.V7I10.2713>

- Khasawneh, M. A. S. (2021). Attitudes of teachers of learning disabilities in English language towards the use of information technology in Irbid from their point of view. *Journal of Advances in Social Science and Humanities*, 7(10), 1957-1966. DOI:10.15520/jassh.v7i10.661
- Khasawneh, M. A. S. (2021). Auditory memory among a sample of students with learning disabilities in English in Irbid Governorate. *Science and Education*, 2(11), 609-621. <https://openscience.uz/index.php/sciedu/article/view/2040>
- Khasawneh, M. A. S. (2021). Challenges resulting from simultaneous online education during the "Covid-19" pandemic: the case of King Khalid University, Saudi Arabia. *Science and Education*, 2(8), 414-430. <https://openscience.uz/index.php/sciedu/article/view/1774/1696>
- Khasawneh, M. A. S. (2021). Cognitive Flexibility of Students with Learning Disabilities in English Language and Its Relationship to Some Variables. *Shanlax International Journal of Education*, 9(3), 49-56. DOI: 10.34293/education.v9i3.4003
- Khasawneh, M. A. S. (2021). Developing the Imagination Skills among Students with Learning Disabilities in English Language. *Journal of Asian Multicultural Research for Social Sciences Study*, 2(4), 1-8. DOI: <https://doi.org/10.47616/jamrsss.v2i4.187>
- Khasawneh, M. A. S. (2021). Emotional intelligence of teachers of Learning Disabilities in English language from their point of view. *Investigación educativa actual*, 4(4), 1101-1109. DOI: <https://doi.org/10.52845/CER/2021-4-4-1>
- Khasawneh, M. A. S. (2021). Language skills and their relationship to learning difficulties in English language from the students' point of view. *Science and Education*, 2(9), 261-272. DOI: 10.34293/education.v9i4.4082
- Khasawneh, M. A. S. (2021). Methods of resource room management for teachers of learning disabilities in English language in light of some variables. *Science and Education*, 2(9), 240-249. DOI: 10.30659/e.6.2.213-221
- Khasawneh, M. A. S. (2021). Obstacles to using e-learning in teaching English for students with learning disabilities during the Covid-19 pandemic from teachers' point of view. *Science and Education*, 2(5), 470-483. <https://openscience.uz/index.php/sciedu/article/view/1406/1350>
- Khasawneh, M. A. S. (2021). Problems of Teaching Phonological Awareness to Learning Disabilities Students. *GISt-Education and Learning Research Journal*, 23, 135-149. DOI: <https://doi.org/10.26817/16925777.961>
- Khasawneh, M. A. S. (2021). Problems Teaching English to Deaf Students. *Indonesian Journal of Creative Counseling*, 1(2), 32-42. DOI: <https://doi.org/10.47679/ijcc.v1i2.107>
- Khasawneh, M. A. S. (2021). Programa de formación para el desarrollo de habilidades de lectura en inglés para estudiantes con dificultades de aprendizaje. *Revista EDUCARE-UPEL-IPB-Segunda Nueva Etapa* 2.0, 25(1), 84-101. <https://doi.org/10.46498/reduipb.v25i1.1445>
- Khasawneh, M. A. S. (2021). Self-Regulation among students with learning disabilities in English language and its relationship to some variables. <https://socialscienceresearch.org/index.php/GJHSS/article/view/3660/3549>
- Khasawneh, M. A. S. (2021). Social competence for students with learning disabilities in English. *Technium Social Sciences Journal*, 23(1), 16-27. Retrieved from <https://techniumscience.com/index.php/socialsciences/article/view/4439>
- Khasawneh, M. A. S. (2021). Sources of work stress of English language teachers in secondary government schools in Saudi Arabia. *Science and Education*, 2(10), 249-254. <https://doi.org/10.37899/journallaeducsci.v2i4.450>
- Khasawneh, M. A. S. (2021). Teacher Perspective on Language Competences Relation to Learning Difficulties in English Learning. *Journal Educational Verkenning*, 2(1), 29-37. Retrieved from <http://hdpublication.com/index.php/jev/article/view/125>
- Khasawneh, M. A. S. (2021). The attitudes of Teachers of Learning Disabilities in English Language Toward Using Virtual classes to Teach English Writing. *Journal of Asian Multicultural Research for Social Sciences Study*, 2(4), 9-18. <https://doi.org/10.47616/jamrsss.v2i4.189>
- Khasawneh, M. A. S. (2021). The degree of practicing effective communication skills among teachers of learning disabilities in English language from their point of view. *Journal Educational Verkenning*, 2(2), 1-9. DOI: 10.47616/jamres.v2i2.175

- Khasawneh, M. A. S. (2021). The difficulties facing students with learning disabilities in English language skills from the point of view of their parents. *Science and Education*, 2(11), 592-608. <https://openscience.uz/index.php/sciedu/article/view/2039>
- Khasawneh, M. A. S. (2021). The Effect of Using a Language Games-Based Electronic Program on Acquiring Oral Expression Skills among People with Learning Difficulties in English Language during Covid-19 Pandemic. *MANAZHIM*, 3(2), 136-150. <https://doi.org/10.36088/manazhim.v3i2.1109>
- Khasawneh, M. A. S. (2021). The effectiveness of a training program based on Erikson's theory in developing independence skills among students with learning disabilities in Jordan. *Science and Education*, 2(8), 457-471. <https://openscience.uz/index.php/sciedu/article/view/1776/1698>
- Khasawneh, M. A. S. (2021). The effectiveness of a training program based on Erikson's theory in developing initiation skills among students with learning disabilities in Jordan.
- Khasawneh, M. A. S. (2021). The effectiveness of using multimedia in the developing the concepts of the English language grammar concepts for people with learning difficulties. *Science and Education*, 2(6), 373-384. <https://openscience.uz/index.php/sciedu/article/view/1571/1505>
- Khasawneh, M. A. S. (2021). The extra-curricular environmental activities as practiced by English language students with learning difficulties from their teachers' point of view. *Science and Education*, 2(4), 275-287. <https://openscience.uz/index.php/sciedu/article/view/1226/1177>
- Khasawneh, M. A. S. (2021). The Impact of Phonological Awareness in Improving Sequential Memory among Students with Learning Disabilities. *International Journal of Disability, Development and Education*, 1-13. <https://doi.org/10.1080/1034912X.2021.1995853>
- Khasawneh, M. A. S. (2021). The level of cognitive dissonance among students with learning disabilities in English from the point of view of their teachers. *Science and Education*, 2(11), 577-591. <https://openscience.uz/index.php/sciedu/article/view/2038>
- Khasawneh, M. A. S. (2021). The Level of Emotional Intelligence of English Language Students with Learning Disabilities from the Point of View of Their Parents. *Science and Education*, 2(7), 264-275. <https://openscience.uz/index.php/sciedu/article/view/1706/1635>
- Khasawneh, M. A. S. (2021). The Level of Job Performance among Teachers of Learning Disabilities in English Language During The COVID-19 Pandemic from Their Point of View. *International Journal of Contemporary Research and Review*, 12(10), 20449-20457. <https://doi.org/http://ijcr.info/index.php/ijcr/article/view/924/947>
- Khasawneh, M. A. S. (2021). The level of moral dependence among a sample of students with learning disabilities in English from the point of view of their teachers. *Science and Education*, 2(11), 528-538. <https://openscience.uz/index.php/sciedu/article/view/2034>
- Khasawneh, M. A. S. (2021). The level of motivation among teachers of learning disabilities in English language in light of the COVID-19 pandemic. *Social Science Learning Education Journal*, 6(11), 642-651 DOI: <https://doi.org/10.15520/sslej.v6i11.2871>
- Khasawneh, M. A. S. (2021). The level of stuttering severity among students with learning disabilities in English language. *Science and Education*, 2(9), 215-226. <https://openscience.uz/index.php/sciedu/article/view/1842/1747>
- Khasawneh, M. A. S. (2021). The perceptions of teachers of Learning Disabilities in English language on the level of their psychological burnout. *Journal of Research and Opinion*, 8(10), 3048-3057. [doi:10.15520/jro.v8i10.130](https://doi.org/10.15520/jro.v8i10.130)
- Khasawneh, M. A. S. (2021). The reality of extra-curricular educational activities from the viewpoint of students with learning difficulties in English language. [6-2-13-161 \(2\).pdf](#)
- Khasawneh, M. A. S. (2021). The relationship between the acquisition of language patterns and oral expression skills among students with learning difficulties in the English language during the Covid-19 pandemic. *Science and Education*, 2(5), 490-499. <https://openscience.uz/index.php/sciedu/article/view/1408/1352>
- Khasawneh, M. A. S. (2021). The use of autocratic style by teachers of learning disabilities in English language according to some variables. *Science and Education*, 2(10), 255-265.



- Khasawneh, M. A. S. (2021). The Use of Democratic Style by Teachers of Learning Disabilities In English Language According To Some Variables. *language*, 4(05). [https://ijehss.com/uploads2021/EHS\\_4\\_305.pdf](https://ijehss.com/uploads2021/EHS_4_305.pdf)
- Khasawneh, M. A. S. (2021). The use of Laissez-faire style by teachers of Learning Disabilities in English language according to some variables. *Science and Education*, 2(9), 250-260. <https://openscience.uz/index.php/sciedu/article/view/1845/1750>
- Khasawneh, M. A. S. (2021). The Use of Reading Speed Strategy in Promoting Reading Comprehension among EFL Students with Learning Disabilities. *Al-Lisan: Jurnal Bahasa (e-Journal)*, 6(2), 225-235. <https://doi.org/10.30603/al.v7i2.2135>.
- Khasawneh, M. A. S. (2021). Training program on developing reading skills in the english language among students with learning difficulties. *Revista Educare-Upel-Ipb-Segunda Nueva Etapa 2.0*, 25(1), 84-101. DOI: 10.46498/reduipb.v25i1.1466
- Khasawneh, M. A. S. (2022). Developing the imagination skills among students with learning disabilities in English language. *Science and Education*, 3(4), 627-641.
- Khasawneh, M. A. S. (2022). Language Skills and Their Relationship to Learning Difficulties in English Language from the 'Teachers' Point of View. *The Journal of Quality in Education*, 12(19), 104-113. <https://doi.org/10.37870/joqie.v12i19.308>
- Khasawneh, M. A. S. (2022). The degree of practicing effective communication skills among teachers of learning disabilities in English language from their point of view. *Science and Education*, 3(2), 492-509. <https://orcid.org/0000-0002-1390-3765>
- Khasawneh, M. A. S. (2022). The level of motivation among teachers of learning disabilities in English language in light of the COVID-19 pandemic. *Science and Education*, 3(4), 664-677. <https://openscience.uz/index.php/sciedu/article/view/3026>
- Khasawneh, M. A. S. (2022). The level of practicing organizational trust among teachers of learning disabilities in English language from their point of view. *Science and Education*, 3(2), 481-491. <https://orcid.org/0000-0002-1390-3765>
- Khasawneh, M. A. S. (2022). Work pressures among teachers of learning disabilities in English language from their point of view. *Science and Education*, 3(2), 510-529. <https://orcid.org/0000-0002-1390-3765>
- Khasawneh, M. A. S. (2023). Analysis of Critical Thinking Ability of Students with Asd in Mathematics Learning. *Journal of Southwest Jiaotong University*, 58(2).
- Khasawneh, M. A. S. (2023). Analysis of the Influence of Flipped Teaching on Student Learning and Knowledge Retention. *Journal of Southwest Jiaotong University*, 58(4).
- Khasawneh, M. A. S. (2023). Communication In Children with Autism Spectrum Disorder. *Onomázein hosts unpublished articles derived from scientific research*, 69-82.
- Khasawneh, M. A. S. (2023). Data-Driven Social Informatics: Applying Analytics Techniques in Analyzing Social Data in Saudi Arabian Organizations. *Onomázein hosts unpublished articles derived from scientific research*, 22-34.
- Khasawneh, M. A. S. (2023). Exploring the Benefits and Challenges of Blended Learning Models in Higher Education. *Onomázein*, (62 (2023): December), 81-91.
- Khasawneh, M. A. S. (2023). Exploring The Role of Culture in Shaping Communication Practices in Saudi Arabian Organizations: A Qualitative Study. *Journal of Southwest Jiaotong University*, 58(5).
- Khasawneh, M. A. S. (2023). Exploring Virtual Reality as A Transformative Tool to Enhance Learning Abilities in Students with Disabilities. *Journal of Southwest Jiaotong University*, 58(4).
- Khasawneh, M. A. S. (2023). Factors Affecting the Improvement of Speaking Skills Among Jordanian EFL Learners. *Journal of Language Teaching and Research*, 14(6), 1559-1568.
- Khasawneh, M. A. S. (2023). Impact Of Applying Evidence-Based Practices to Reduce Stereotyped Behavior in Children with Autism Spectrum Disorder. *Journal of Southwest Jiaotong University*, 58(5).
- Khasawneh, M. A. S. (2023). Impact Of ICT On Social Science Research Process: Evidence from Saudi Arabia and Jordan. *Journal of Namibian Studies: History Politics Culture*, 35, 2094-2114.



- Khasawneh, M. A. S. (2023). Insights From Lecturers and University Administrators on The Correlation Between Integrating Simulated Learning Strategies and Increasing the Performance of Undergraduates in Foreign Language Education. *Journal of Namibian Studies: History Politics Culture*, 37, 86-106.
- Khasawneh, M. A. S. (2023). Integrating Ai-Based Virtual Conversation Partners in Enhancing Speaking Skills In Foreign Languages: Insights From University Students. *Journal of Southwest Jiaotong University*, 58(5).
- Khasawneh, M. A. S. (2023). Interpersonal Communication Model for Children with Special Needs. <https://doi.org/10.18576/isl/120623>
- Khasawneh, M. A. S. (2023). Promoting Translation Competence in Language Teacher Training: Strategies for Equipping Lecturers with Translation Skills for Language Instruction. *Journal of Namibian Studies: History Politics Culture*, 37, 131-149.
- Khasawneh, M. A. S. (2023). Saudi Universities Students' Point of View on the Evolution Theory. *Migration Letters*, 20(S2), 303-309.
- Khasawneh, M. A. S. (2023). The Effectiveness of Adaptive Media Techniques in Enhancing Academic Performance of Secondary School Students. *Migration Letters*, 20(S1), 875-888.
- Khasawneh, M. A. S. (2023). The Effectiveness of Barman's Model in Improving the Reading Skills of Eighth Grade Students. *Onomazein hosts unpublished articles derived from scientific research*, 49-68.
- Khasawneh, M. A. S. (2023). The Effectiveness of The Flipped Classroom Strategy in Developing the Critical Thinking Skills of Secondary School Students in Abha Governorate. *Journal of Namibian Studies: History Politics Culture*, 35, 2143-2169.
- Khasawneh, M. A. S. (2023). The Impact of Including an Interactive Educational Video on Enhancing Academic Achievement. *Journal of Namibian Studies: History Politics Culture*, 37, 150-176.
- Khasawneh, M. A. S. (2023). The Potential of Ai in Facilitating Cross-Cultural Communication Through Translation. *Journal of Namibian Studies: History Politics Culture*, 37, 107-130.
- Khasawneh, M. A. S., & Al-Amrat, M. G. R. (2023). Evaluating the Role of Artificial Intelligence in Advancing Translation Studies: Insights from Experts. *Migration Letters*, 20(S2), 932-943.
- Khasawneh, M. A. S., & Alatoom, E. K. T. (2022). Developing writing skills among students with learning disabilities in English language. *Journal of Social Studies (JSS)*, 18(1), 63-80.
- Khasawneh, M. A. S., & Alkhawaldeh, M. A. (2018). The Relationship between Successful Intelligence and School-Social Growth among Learning Disability Students in Aseer Area. *Basic Education College Magazine for Educational and Humanities Sciences*, (39).
- Khasawneh, M. A. S., & Alkhawaldeh, M. A. (2020). The Effectiveness of Phonological Awareness Training in Treating Deficiencies in Auditory Processing Among Children with Learning Disabilities Among Elementary Cycle Students in Saudi Arabia. *International Journal of Language Education*, 4(3). <https://doi.org/10.26858/ijole.v4i3.14758>
- Khasawneh, M. A. S., & Alkhawaldeh, M. A. H. (2017). The attitudes of King Khalid's students who are affiliated with Special Education bachelor's degree toward Blackboard Software in their learning. *International Journal of Humanities and Cultural Studies (IJHCS)* ISSN 2356-5926, 2(4), 2789-2798. <https://www.ijhcs.com/index.php/ijhcs/article/view/3061/2888>
- Khasawneh, M. A. S., & Al-Rub, M. O. A. (2020). Development of Reading Comprehension Skills among the Students of Learning Disabilities. *Universal Journal of Educational Research*, 8(11), 5335-5341. DOI: [10.13189/ujer.2020.081135](https://doi.org/10.13189/ujer.2020.081135)
- Khasawneh, M. A. S., & Khasawneh, Y. J. A. (2023). Analyzing the Effectiveness of Mobile Devices and Apps in Supporting Learning. *Migration Letters*, 20(S1), 901-910.
- Khasawneh, M. A. S., Alkhawaldeh, M. A., & Hamad, H. A. A. B. (2018). Building a training program based on the theory of voice awareness and measuring its effectiveness in developing the skills of auditory analysis of students with difficulties in synergy, developmental and verbal Verbal Dyspraxia. *Basic Education College Magazine for Educational and Humanities Sciences*, (41).

- Khasawneh, M. A. S., Khasawneh, A. J., & Al-Sarhan, K. E. (2023). Ethical Considerations in Ict-Enabled Social Science Research: Perspectives from Saudi Arabia and Jordan. *Journal of Southwest Jiaotong University*, 58(5).
- Khasawneh, M. A.S. (2012). Spatial ability for children with learning disabilities in hail and its relationship with some variables. *European Scientific Journal*, 8(22). DOI: <https://doi.org/10.19044/esj.2012.v8n22p%25p>
- Khasawneh, M.A.S., Al Ahmad, F. A., & Al Khawaldeh, M. A. (2018). the Effects of Training Program based on Auditory Perception Skills in Enhancing Phonological Awareness among Learning Disability Students in Aseer Region. *Journal of Educational and Psychological Studies [JEPS]*, 12(3), 591-604. <https://doi.org/10.24200/jeps.vol12iss3pp591-604>
- Khasawneh, M.A.S (2021). Training program for the development of reading skills in English for students with learning difficulties. *Educare-Upel-Ipb-Second New Stage 2.0 Magazine*, 25 (1), 84-101. DOI: [10.46498/reduipb.v25i1.1445](https://doi.org/10.46498/reduipb.v25i1.1445)
- Khasawneh, M.A.S. (2022). The Relationship of Curriculum, Teaching Methods, Assessment Methods, and School and Home Environment with Learning Difficulties in English Language from the Studetns' Perspectives. *Journal of Innovation in Educational and Cultural Research*, 3(1), 41-48. <https://doi.org/10.46843/jiecr.v3i1.51>
- Khasawneh, M.A.S., Alkhawaldeh, M., & Al-Khasawneh, F. (2020). The Level of Metacognitive Thinking Among Students with Learning Disabilities. *International Journal of English Linguistics*, 10(5). doi:10.5539/ijel.v10n5p343
- Khasawneh, N. A. S., Khasawneh, A. J., & Khasawneh, M. A.S. (2024). Improving Arabic Content Delivery on Cloud Computing Platforms for Jordanian E-learning Environments. *Migration Letters*, 21(S1), 575-585.
- Khasawneh, Y. J. A., & Khasawneh, M. A. S. (2023). The Effectiveness of a Ubiquitous Learning Program on Development of Learning Outcomes among Students of the College of Education at Ajloun National University. *Migration Letters*, 20(6), 1011-1024.
- Khasawneh, Y. J. A., Alanazi, A. S., Almulla, A. A., & Khasawneh, M. A. S. (2023). Employing technology inside and outside the classroom by special education teachers in primary schools. *Humanities and S Mohammad Abedrabbu Alkhawaldeh, M. A. S. K. (2023). Insights on the Use of Ai-Powered Game-Based Learning in Translation Education. Journal of Southwest Jiaotong University*, 58(5). *ocial Sciences Letters*, 12(1), 1-9.
- Khasawneh, M. A.S. (2023). Analysis of the application of pedagogical technology to the learning of children with ASD. *International Journal of Special Education (IJSE)*, 38(1), 82-89. <https://doi.org/10.52291/ijse.2023.38.8>
- Khasawneh, M. A.S. (2023). Digital inclusion: Analyzing social media accessibility features for students with visual impairments. *Studies in Media and Communication*, 12(1), 71. <https://doi.org/10.11114/smc.v12i1.6559>
- Khasawneh, M. A.S. (2023). Mutual relationships: Saudi universities and the private sector for economic Developmen. *Information Sciences Letters*, 12(8), 2643-2652. <https://doi.org/10.18576/isl/120818>
- Khasawneh, M. A.S. (2023). The use of video as media in distance learning for deaf students. *Contemporary Educational Technology*, 15(2), ep418. <https://doi.org/10.30935/cedtech/13012>
- Khasawneh, M. A.S. (2024). Beyond digital platforms: Gamified skill development in real-world scenarios and environmental variables. *International Journal of Data and Network Science*, 8(1), 213-220. <https://doi.org/10.5267/j.ijdns.2023.10.002>
- Khasawneh, M. A.S., & Khasawneh, Y. J. (2023). Achieving assessment equity and fairness: Identifying and eliminating bias in assessment tools and practices. <https://doi.org/10.20944/preprints202306.0730.v1>
- Khasawneh, M.A.S. (2023). Social attitude of children with special needs in the learning process. *Medical Archives*, 77(2), 149. <https://doi.org/10.5455/medarh.2023.77.149-153>
- Khasawneh, Y. J., & Khasawneh, M. A.S. (2023). Availability of voice-recognition devices to support visually impaired students in Saudi Arabian universities. *Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications*, 14(3), 186-193. <https://doi.org/10.58346/jowua.2023.i3.014>
- Khasawneh, Y. J., & Khasawneh, M. A.S. (2023). The effectiveness of using infographics on the academic achievement of elementary students. *Migration Letters*, 20(5), 1258-1271. <https://doi.org/10.59670/ml.v20i5.4968>
- Khasawneh, Y. J., Khasawneh, N., & Khasawneh, M. A.S. (2024). Exploring the long-term effects: Retention and transfer of skills in gamified learning environment. *International Journal of Data and Network Science*, 8(1), 195-200. <https://doi.org/10.5267/j.ijdns.2023.10.004>

- Lee, L., & Li, T. Y. (2016). The impact of music activities in a multi-sensory room for children with multiple disabilities on developing positive emotions: A case study. *Journal of the European Teacher Education Network*, 11(1), 1-12.
- Lorusso, L. N., & Bosch, S. J. (2018). Impact of multisensory environments on behavior for people with dementia: a systematic literature review. *The Gerontologist*, 58(3), e168-e179. <http://dx.doi.org/10.1093/geront/gnw168>
- Manja, S. A., Masnan, A. H., Che Mustafa, M., & Abdullah, N. (2022). Multi-Sensory Activity in Early Childhood Education: Teachers' Perception on The Importance of Activity Implementation. *Jurnal Penyelidikan Sains Sosial (JOSSR)*, 5(16), 9-17.
- Matter, Y. A. A. (2022). *Using Multisensory Approach to Develop Primary Stage Pupils' Reading Comprehension* (Doctoral dissertation, Sadat City University).
- Michael, B. (2019). *Multi-sensory environments: a qualitative exploration* (Master's thesis).
- Novakovic, N., Milovancevic, M. P., Dejanovic, S. D., & Aleksic, B. (2019). Effects of Snoezelen—Multisensory environment on CARS scale in adolescents and adults with autism spectrum disorder. *Research in developmental disabilities*, 89, 51-58. <http://dx.doi.org/10.1016/j.ridd.2019.03.007>
- Ponticorvo, M., Di Fuccio, R., Ferrara, F., Rega, A., & Miglino, O. (2019). Multisensory educational materials: five senses to learn. In *Methodologies and Intelligent Systems for Technology Enhanced Learning, 8th International Conference 8* (pp. 45-52). Springer International Publishing. [http://dx.doi.org/10.1007/978-3-319-98872-6\\_6](http://dx.doi.org/10.1007/978-3-319-98872-6_6)
- Rostan, N. N. A., Ismail, H., & Jaafar, A. N. M. (2020). The use of multisensory technique in the teaching open syllables reading skill for preschoolers from a teacher's perspective. *Southeast Asia Early Childhood Journal*, 9(2), 155-165. <http://dx.doi.org/10.17762/turcomat.v12i3.789>
- Saunders, M, Lewis, P. and Thornhill, A. (2016). *Research Methods for Business Students* (7th edition) Harlow: Pearson.
- Suryaratri, R. D., Prayitno, E. H., & Wuryani, W. (2019). The implementation of multi-sensory learning at elementary schools in Jakarta. *Jurnal Pendidikan Usia Dini*, 13(1), 100-113. <http://dx.doi.org/10.21009/10.21009/jpud.131.08>
- Unwin, K. L., Powell, G., & Jones, C. R. (2021). The use of Multi-Sensory Environments with autistic children: Exploring the effect of having control of sensory changes. *Autism*, 136236132110501. <https://doi.org/10.1177/13623613211050176>
- Vedadi, S., Abdullah, Z. B., & Cheok, A. D. (2019, April). The effects of multi-sensory augmented reality on students' motivation in English language learning. In *2019 IEEE Global Engineering Education Conference (EDUCON)* (pp. 1079-1086). IEEE. <http://dx.doi.org/10.1109/educon.2019.8725096>
- Volpe, G., & Gori, M. (2019). Multisensory interactive technologies for primary education: From science to technology. *Frontiers in psychology*, 10, 1076. <http://dx.doi.org/10.3389/fpsyg.2019.01076>