

# The Effectiveness of Smart Educational Programmes in Developing the Skills of Creative Thinking for People with Hearing Disabilities

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This research aims to identify the effectiveness of smart educational programs in developing the skills of creative thinking for people with hearing disabilities due to demographic variables. The researcher used a descriptive and analytical approach for its ability to describe the research variables with the required accuracy. The research sample included 216 male, and female students. The questionnaire was distributed to the respondents for completion. Subsequently, the data was collected and entered into the SPSS program. The arithmetic means and standard deviations were calculated for all the statements on the questionnaire. The research concluded with several results, the most important of which were the existence of a statistically significant effect at the level of significance ( $\alpha \leq 0.05$ ) for smart educational programs in developing the skills of creative thinking for people with hearing disabilities, and the presence of a statistically significant effect at the level of significance ( $\alpha \leq 0.05$ ) for problem-solving programmes in developing the skills of creative thinking for people with hearing disabilities. The research also produced several recommendations, the most important of which was training teachers to use smart education programs for people with hearing disabilities, as well as holding training

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courses for them continuously based upon everything new within this field.

**Keywords:** *Smart educational programs, Creative thinking skills, People with hearing disabilities, Jordan.*

## **Introduction**

The last two decades have witnessed major changes in the way educators view the learning and teaching process. Several changes are represented in the perception of learning as an active construction, where the learner performs through his interaction with the environment and the reorganisation of his mental structures. Others are represented in giving great importance to the social contexts in which learning occurs. These fundamental developments are related to constructivism theory, which was considered the most effective theory in learning during the last two decades of the twentieth century (Al-Zahrani, 2018).

As a result of the remarkable weakness in the outputs of scientific education, the interest of scientific educators has increased during the last two decades through Piaget's constructivist ideas. Moreover, constructivism theory has gained great attention in the educational community, especially in teaching scientific education. Although Piaget's theory of constructivism does not take into account a specific topic or content, the principles he developed were adapted to the teaching of science and were considered a basis for educational innovation in the various academic fields (Al-Anzi, Karasneh, & Tawalbeh, 2019).

Furthermore, educational literature indicates that when we teach, we often invoke the image that we bear of how we learned. Our personal history provides us with mental models for teaching that effectively shape our behaviour. Therefore, at present, many teachers are a similar version of the teachers who taught them, in terms of the way they teach and the ideas that they carry, even though many of them have been qualified to learn in more modern and effective ways than the traditional methods in which they were taught. Their ability to be drawn to what is possible in the classroom is more than their ability to be drawn to the teaching theories, and they believe that the quieter the class, the better the learning (Abu Shanab, Abu Al Basal, & Harb, 2019).

This traditional classroom image is no longer acceptable to educators nowadays, and many innovative ideas and opinions view the teaching-learning process in different ways. Among the most important educational theories that educators are currently adopting is the 'constructivist theory'. Constructivism is not a method of teaching, but rather a complete educational culture based on the belief that learners build knowledge and interpret it, each in their own way, by interacting with natural phenomena and with others around them. It is an educational environment with certain characteristics; it is based on a set of beliefs, standards, and practices that shape school life as a

whole, and it is also concerned with the way students interact together in the classroom, how they relate to the teacher, how they treat the course material, and how they are evaluated (Abu Bakir, Rahma, Sharif, & Jad Al-rab, 2015).

### **Research Problem**

The world is witnessing a great change in many economic, technological, and social fields because of the emergence of the novel Coronavirus. In turn, it has contributed to making great changes in concepts, methods, and even the activities that were carried out by the education system before the emergence of the Coronavirus, which forced school principals to update their administrative practices because traditional practices were no longer effective. Moreover, with the increasing interest in employing technology in the field of educational development, the need for smart educational programs has increased to take advantage and keep pace with the rapid development in the means of communication and all areas of modern technology. To create an effective educational environment, especially in developing the creativity skills of people with hearing disabilities, it has raised the researcher's desire for serious and continuous research upon identifying the effectiveness of smart educational programs (simulation programs, smart teaching programs, and educational games programs) in developing the creative thinking skills of people with hearing disabilities.

### **Research Questions**

The research problem revolved around a set of questions, as follows:

***The main question:*** what is the effectiveness of smart educational programs in developing the skills of creative thinking in people with hearing disabilities?

It is structured by a group of sub-questions, classified as follows:

- What is the effectiveness of simulation programs in developing the skills of creative thinking in people with hearing disabilities?
- What is the effectiveness of smart teaching programs in developing the skills of creative thinking in people with hearing disabilities?
- What is the effectiveness of educational games programs in developing the skills of creative thinking in people with hearing disabilities?

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## Research Significance

The importance of this research stems from the following matters:

- Its connection with the educational environment that effectively employs smart educational programs and invests in the latest modern technologies to improve the outputs of scientific education.
- The results of this research can provide field data that helps decision-makers to design effective learning and teaching environments for people with hearing disabilities and enhance their ability to face challenges.
- The results of this research may present field data that helps design smart educational programs for teachers to develop their abilities to prepare and manage schools in a way that enhances the skills and creativity of people with hearing disabilities and suits the orientations and preferences of their students.
- The results of this research could pave the way for other studies in this field, dealing with different research variables.

## Conventional and Procedural Definitions of the Study Concepts and Variables

### *Smart educational programs*

Smart educational programs are a system for managing the content of the learning process, in which various technologies — such as multimedia, and hypermedia — are available to fully manage the content of the learning process through the Internet, as the two parties of the learning process interact through text, voice, dialogue, video, and simulation forums, and students can read objectives, lectures, assignments, and access various educational programmes through synchronous and asynchronous technologies (Al-Atribi, 2019).

Procedurally smart educational programs are defined as an intelligent learning environment that aims to employ the ideas of interactive applications and methods related to the Internet and simulations by relying completely on computer technologies.

### *Creative thinking*

Creative thinking is a type of thinking characterised by the sophistication that appears in the behaviour of an individual when confronting problems or exciting situations. It consists of mental skills, including fluency, flexibility, originality, and elaboration, which a professional teacher can develop in students through modern learning strategies (Hammad, 2017).

Creative thinking is defined procedurally as a type of thinking characterised by individualism, excellence, and the ability to solve problems, generate the largest possible number of responses in a specific time, and come up with unfamiliar and distinct ideas. It consists of four main skills in this study, namely: fluency, flexibility, originality, and the elaboration, which teachers seek to develop through a strategy of teaching by playing, and an estimate of the degree obtained by the student in testing creative thinking skills.

## **Theoretical Framework**

### ***Smart Educational Programs***

After the development of what happened in the means of communication, efforts were directed towards finding an effective means of communicating and exchanging information, and communication between the various parties. Thus, the researchers have included distance learning to enhance the speed of obtaining information, expertise, and knowledge in the fastest time and with the least effort. Among the things that have pushed individuals to establish the concept of distance learning is the need for skill and mastery in performing work. Distance learning has also proven its effectiveness in finding solutions to learning problems, and to a large extent for those who face problems in communication skills, and developing cognitive skills (Al-Shannaq, 2011).

Particularly after the contemporary world witnessed changes in the structure of the total society, as well as the complexities in relations and all aspects of contemporary life — which came as a direct result of the industrial revolution, the advancement of science and technology, and the rapid increase in the volume of information — it became necessary to adopt modern concepts and theories to develop teaching and learning. Moreover, with the spread of smart devices in society and the availability of Internet communication technologies, these devices have become the most effective means of collecting and receiving information, as well as the contribution of Internet technologies to the development and promotion of learning, as a whole. However, its educational applications are still limited in the world, as it has not often exceeded its theoretical frameworks (Al-Zahrani, 2018).

Moreover, educational programmes contribute to raising the capacity for comprehension and creative thinking in their recipients. Researchers have made significant and clear contributions in this field, by focussing on how concept meanings are formed and the role of previous understanding in shaping these meanings, based in this direction upon previous research and scientific studies.

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### *The Concept of Smart Educational Programs*

The smart educational programs are educational programs that integrate a group of services and applications and distribute them in a manner that suits the learner, and employs creative ideas using computer technologies, and this is done within the framework of the principles and requirements that must be considered when designing learning programmes (Al-Janabi, 2017). It is also the free use of a set of services, tools, technologies, and software over the Internet by the learner that enables him or her to manage the educational process and build knowledge in a social context by providing means of communication with other personal spaces for effective knowledge exchange (Abu Shanab, Abu Al Basal, & Harb, 2019).

The researcher agrees with Al-Janabi (2017), and others, that smart educational programs are just a tool that enables the learner to engage in a distributed environment consisting of a network of people, services, and resources to help enrich their information and learn about other experiences. The researcher believes that smart educational programs urge the exchange and sharing of information, experiences, and other elements instead of preserving them. It is an active interaction between the previous cognitive structure and the new cognitive structure in the learning social climate, and this interaction results in building new knowledge.

Many researchers have shown the importance of smart educational programs, as studies have revealed that there is a significant impact of these programs in developing students' research skills and capabilities. Furthermore, studies have shown a significant impact upon developing the skills of using the Internet to acquire the required amount of information (Radwan, 2016).

### *Advantages of Smart Educational Programs*

The importance of smart educational programs lies in the active role of the learner in learning and conducting many activities, so that meaningful learning takes place based upon understanding. Al-Atribi (2019) indicated the following:

- Considering the mental capabilities of the learners.
- Presenting the knowledge to the learner according to the investigative method from the part to the whole.
- It serves the learner to think.
- Interested in developing the thinking skills of learners.

Al-Ani and Hudhaifa (2019) added that their advantages are:

- The focus of the educational process works to activate the role of the learner through the discovery, research, and implementation of activities.
- It develops a positive attitude towards knowledge, scholars, and towards society and its various issues and problems.
- Provides the learner with the opportunity to practice basic and integrated science processes.
- Provides the learner with the opportunity to discuss and create dialogue with fellow learners or with the teacher, which helps in the growth of a sound dialogue language and makes it active.
- It also links the learning process with technology, allowing learners to see the importance of science for society and the role of science in solving society's problems.
- Makes learners think scientifically, which helps to develop their scientific thinking.
- It allows learners to think of as many solutions as possible to a single problem, which encourages the use of creative thinking, and thus, its development among students.
- Encourages group work and cooperative learning, which helps to develop the spirit of cooperation and working as a team among the learners.

### ***The Skill of Creative Thinking***

Creative thinking is one of the important thinking methods. As defined by Hashem (2018), it is a method through which one can work on creating new ideas or updating previous ideas whose results are distinct, applicable, and usable. It is one of the mental processes through which individuals can access distinctive visions and ideas, which in turn works upon merging ideas and thinking.

Thinking is divided into two types. The first type is vertical thinking. This thinking revolves around starting with a specific opinion, idea or suggestion and continuing to think about it until achieving what you desire. The second type is lateral thinking, which revolves around searching for all methods, alternatives, opinions, and suggestions on a specific topic. Creative thinking needs to develop a creative idea through a creative person. It is characterised by its multiple processes, which stimulates the transfer of the creative process between these different processes and through the creation of ideas and the determination of the intended goals.

Furthermore, Kharabsheh (2018) defined it as the ability of a person to create distinct ideas with qualities of flexibility, originality, and distant implications, which enable him or her to invent specific methods and solve specific problems. Creative thinking is based on several foundations represented by the ability to amend and change, the ability to carry out thinking and reflective processes, accept the opinions of others and the possibility of opposing them, maintain continuity in development, stop stagnation, and continue the process of writing and taking notes (Hashem, 2018).

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### *Creative thinking skills*

Al-Haddabi, Al-Felfili, and Al-Ali (2011) defined creative thinking skills as a set of mental skills represented by originality, flexibility, and fluency through which the individual can create new ideas with clear goals.

Kharabsheh (2018) highlighted the most important creative thinking skills as follows:

- *Fluency*: the person can create and find a large group of diverse and rich ideas and synonyms based on previous experiences and information at a specific time. Fluency is divided into five forms represented by ideational fluency, expressional fluency, word fluency, shapes fluency, and associational fluency.
- *Flexibility*: the ability of the individual to adapt the state of mind according to the situations in which he or she is placed and is represented by the ability to produce different and varied ideas according to the skill given. In addition to not being bound by one intellectual direction and the use of multiple intellectual trends, the flexibility is divided into automatic flexibility, and adaptive flexibility.
- *Originality*: the ability of the individual to create ideas out of the ordinary and his or her ability to think outside the traditional intellectual framework, where the person is distinguished by the ability and uniqueness in the process of creating ideas in a specific time and place.
- *Elaboration*: the individual can modify by adding innovative and new details of a situation or idea, in addition to explaining the ideas in detail to make them more beautiful and useful.
- *Sensitivity to the problem*: it is the person's possession of conscious sensory capabilities that enable him or her to sense problems or weaknesses in the situation and to perceive gaps or needs.

### **Research Scope**

The scope of this research is as follows:

***Spatial scope***: the research was carried out in public schools related to people with hearing disabilities, totaling ten schools; and private schools and training centres for people with hearing disabilities, which reached more than 56 centres.

***Time scope***: this research was implemented in 2020.

***Human scope***: this research will be limited to a sample of teachers, both male and female.

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## **Research Methodology**

The research is considered a descriptive study. At the same time, it is considered an analytical study that aims to identify the effectiveness of smart educational programs in developing creative thinking skills in people with hearing disabilities.

To make a comprehensive description of the data and information used in this research, and to convert it from a qualitative to a measurable quantity, this research was conducted in ten government schools related to people with hearing disabilities, and more than 56 private schools and training centres.

### ***Data Collection***

To prepare this research and achieve its objectives, the researcher is asked to refer to two types of information sources, which are secondary sources and primary sources, explained as follows:

#### ***Secondary Sources***

In preparing this research, the researcher relied on many sources of available information and data, which were collected for research purposes, through reviewing literature and previous studies, reviewing books and references related to the research topic, and considering the scientific materials and reports related to a topic therein, and the available information on the various approved websites.

#### ***Primary Sources***

The researcher relied on the data and information available to him in preparing the questionnaire for this research. It also covered all aspects related to it, on which the hypotheses were based, and were covered in the research. In addition to that, the researcher distributed the questionnaire to the research sample.

### ***Study Tool***

To achieve the research objectives, the study relied on an descriptive and analytical approach to collect data and answer the study questions.

The researcher relied on the questionnaire as a basic method for collecting data related to the subject of the study, which was designed to cover all its variables and data, so that it consisted of three main dimensions:

*The First Dimension:* is from the demographic variables of the research sample, including gender, and number of years of experience.

*The Second Dimension:* consists of the statements indicating the effectiveness of smart educational programs for people with hearing disabilities.

*The Third Dimension:* consists of expressions indicating the development of creative thinking skills for people with hearing disabilities. The researcher used a five-point Likert scale to answer the research questions, through the following grading: score '1' expresses 'very low', score '2' expresses 'low', score '3' expresses 'medium', score '4' expresses 'high', and a score of '5' expresses 'very high'.

To interpret the arithmetic means of the responses of the research sample on each item of the questionnaire and each of its dimensions, the five-point Likert scale was used with the following classification to judge the arithmetic means. Thus, the scores are as follows: from 1.00–2.33 were low, from 2.34–3.67 were medium, and from 3.68–5.00 were high.

### ***Data Analysis***

#### *Characteristics of members of the study population and sample*

The study population consists of all employees in public schools and private schools. The number of public schools related to people with hearing disabilities reached ten schools, and private schools and training centres for people with hearing disabilities exceeded 56 centres. The study sample consisted of 216 teachers of the subject of the study. The questionnaire was created in an electronic format and was distributed according to the characteristics of the sample. The tables below show the results obtained pertaining to the characteristics of the individuals of the study sample:

#### *Gender variable*

The frequencies and percentages of the demographic variable of gender were calculated as shown in the table 1 below:

**Table 1:** Distribution of the sample according to the demographic variable of gender

Variable		Frequency	Percentage
Gender	Male	171	79.2
	Female	45	20.8
	<b>Total</b>	<b>216</b>	<b>100</b>

It is evident from the above table that the number of males who teach people with hearing disabilities was 171, at a rate of 79.2 per cent, while the percentage of females reached 45, at a rate of 20.8 per cent.

*Age group variable*

The frequencies and percentages of the demographic variable of age group were calculated as shown in the table 2 below:

**Table 2:** Distribution of the sample according to the demographic variable of age group

Variable	Level	Frequency	Percentage
Age group	Less than 30 years	44	20.4
	30–40 years	145	67.1
	41–50 years	27	12.5
	Above 50 years	0	0
	<b>Total</b>	<b>216</b>	<b>100</b>

In Table 2 it was found that the number of those aged between 30–40 years was 145 respondents, at a percentage of 67.1 per cent, while those between the ages of 41–50 years was 27, with a percentage of 12.5 per cent. Those under the age of 30 comprises 44 respondents, at a rate of 20.4 per cent.

### *Academic Qualification*

The frequencies and percentages of the demographic variable of educational level were calculated as shown in the table below:

**Table 3:** Distribution of the sample according to the demographic variable of educational level

Variable	Level	Frequency	Percentage
Educational level	Bachelor's	121	56.0
	Graduate studies	95	44.0
	<b>Total</b>	<b>216</b>	<b>100</b>

It is evident from the above table that those who hold a bachelor's degree formed a majority of 121 respondents and at a rate of 56 per cent. The number of those who possessed a higher education level qualification totalled 95 respondents with a percentage of 44 per cent.

### *Years of Experience*

The frequencies and percentages of the demographic variable of the number of years of experience were calculated as shown in the table 4 below:

**Table 4:** Distribution of the sample members according to the demographic variable of the number of years of experience

Variable	Level	Frequency	Percentage
Number of years of experience	Less than 5 years	29	13.4
	5–10 years	143	66.2
	11–15 years	42	19.4
	More than 15 years	2	0.9
	<b>Total</b>	<b>216</b>	<b>100</b>

It is evident from the above table that those with experience ranging from 5–10 years formed a majority of 143 respondents with a percentage of 66.2 per cent. The number of those with experience ranging from 11–15 years was 42 people, at a rate of 19.4 per cent. As for those with less than five years of experience, was a percentage of 13.4 per cent of respondents with a

frequency of 29. Finally, those with experience of more than 15 years were two respondents at a rate of just 0.9 percent.

## Results and discussion

- results related to the dimension of the independent variable, smart educational programs.

First: the results related to the ‘problem-solving programmes’ dimension.

In order to answer the first question, the arithmetic means of the responses of the study sample individuals were calculated for the statements of the ‘problem-solving programmes’ dimension. Table 5 below explain this.

**Table 5:** The arithmetic means and standard deviations for problem-solving programmes

No.	Statements	Arithmetic mean	SD
1	The teacher has the skills required to employ smart educational programmes to contribute to increasing the academic achievement of people with hearing disabilities.	3.7963	1.05882
2	The study plan includes employing programmes that increase the enjoyment of people with hearing disabilities in receiving educational material.	3.5046	1.19689
3	The teacher encourages people with hearing disabilities to use computers in learning and try to remove confusion when dealing with computer programmes.	3.4537	1.41016
4	The teacher uses smart computer techniques to manage classroom affairs and adjust the level of understanding of people with hearing disabilities.	3.2037	1.62400
5	The teacher reviews the scientific content in a manner that considers the characteristics of people with hearing disabilities.	3.7454	1.37586
<b>Total</b>		<b>3.5407</b>	<b>Medium</b>

Table 5 indicates that the arithmetic means for problem-solving programmes were at the intermediate level. The item which states: “The teacher has the skills required to employ smart educational programs to contribute to increasing the academic achievement of the people with hearing disabilities”, was in first place, with an arithmetic mean of 3.7963. Meanwhile, the item which states that: “The teacher uses smart computer techniques to manage classroom affairs and adjust the level of understanding of the people with hearing disabilities”, was in last place, with an arithmetic mean of 3.2037. The general result indicates the existence of a medium degree from the point of view of the study sample, where the arithmetic means of the total was 3.5407. This

indicates that the responses of the study sample were positive, with high and medium degrees distributed over the items of this dimension.

As for the values of the standard deviation, they are high, and this indicates that the answers to the study sample are varying and diverging in this area to some extent.

Second, are the results related to the ‘playing programs’ dimension:

To answer the first question, the arithmetic means of the responses of the study sample individuals were calculated for the items of the ‘playing programs’ dimension. Table 6 explain this:

**Table 6:** The arithmetic means and standard deviations for playing programs

No.	Statements	Arithmetic mean	SD
1	The teacher uses a smart programming style based on play programs to build their mental models and motivate people with hearing disabilities towards thinking.	3.0648	1.32084
2	Playing programs contributes to stimulating people with hearing disabilities and stimulating their drive to learn, which enhances their perception.	3.4028	1.54913
3	The teacher uses smart programs as an educational tool in educational situations that are difficult for people with hearing disabilities to perceive.	3.5231	1.27203
4	The education process for students with a hearing disability using smart programs is easier than teaching by traditional methods.	3.6019	1.06914
<b>Total</b>		<b>3.39815</b>	<b>Medium</b>

Table 6 indicates that the arithmetic means of the playing programs were at the medium level. The item which states: “the education process for students with hearing disabilities using smart programs is easier than teaching by traditional methods”, came first, with an arithmetic mean of 3.6019. Meanwhile, the statement which states: “The teacher uses a smart programming style based on play programs to build their mental models and motivate people with hearing disabilities towards thinking”, was in last place, with a mathematical mean of 3.0648.

The total result indicates the presence of a medium level from the point of view of the study sample, where the arithmetic mean of the total was 3.39815. This indicates that the responses of

the study sample were positive, with high and medium degrees distributed over the items of this dimension.

As for the values of the standard deviation, they are high, and this indicates that the answers to the study sample are varying and diverging in this area to some extent.

Third, are the results related to the ‘simulation software’ dimension:

In order to answer the first question, the arithmetic means of the answers of the study sample individuals were calculated for the items of the dimension of “simulation programs”. Table 7 below explains this:

**Table 7:** The arithmetic means and standard deviations for simulation programs

No.	Statements	Arithmetic mean	SD
1	The teacher uses simulation programs to present various educational resources and media in a way that enhances the level of understanding of students with hearing disabilities.	3.7500	1.08799
2	Simulation programs help the teacher implement experiments that were previously difficult to perform with students with hearing disabilities.	3.5741	1.64078
3	The teacher develops the educational units included in the school curriculum through electronic simulations, in line with the needs of people with hearing disabilities.	3.3981	1.32903
4	The teacher provides presentations of the educational units in a smooth manner that increases the level of understanding and achievement of the hearing impaired.	3.6111	1.08120
5	The teacher helps students with hearing disabilities to prepare brochures related to study units.	3.5787	1.36171
6	The teacher uses the electronic educational system in preparing exams to make it easier for people with hearing disabilities to solve and understand them.	2.4444	1.56314
<b>Total</b>		<b>3.39275</b>	<b>Medium</b>

Table 7 indicates that the arithmetic means of the playing programs were at a medium level. The item that states: “The teacher uses simulation programs to present various educational resources and media in a way that enhances the level of understanding of students with hearing disabilities”,

came first, with an arithmetic mean of 3.7500. Meanwhile, the item which states: “The teacher uses the electronic educational system in preparing the exams to make it easier for people with hearing disabilities to solve and understand them”, was in last place, with a mean of 2.4444.

The total result indicates the existence of a medium level from the point of view of the study sample, where the arithmetic mean of the total was 3.39275. This indicates that the responses of the study sample were positive, with high and medium degrees distributed over the statements of this field. As for the values of the standard deviation, they are high, and this indicates that the answers to the study sample are varying and diverging in this area to some extent.

The following results are related to the dimensions of the dependent variable, ‘creative thinking skills’.

To answer the first question, the arithmetic means were calculated for the answers of the study sample individuals for the items of the dimension of ‘creative thinking skills’. Table 8 below explains this:

**Table 8:** The arithmetic means and standard deviations for the skill of creative thinking

No.	Statements	Arithmetic mean	SD
1	Among the behavioural verbs used in formulating the goals of the level of perception with the hearing impaired are determine, define, distinguish, and discover.	2.9259	1.70473
2	The emotional aspect represents one of the important aspects of the personality of the learner, which calls for focusing on it in the educational process.	1.9213	1.11577
3	People with hearing disabilities notice a typical performance by watching and trying to imitate them.	2.3565	1.29319
4	People with hearing disabilities can do something new and unfamiliar by training them.	3.0000	1.20850
5	Students with hearing disabilities perform the skill in little time and effort.	2.5648	1.19513
6	I focus on the diversity of teaching methods in providing information to people with hearing disabilities.	2.8472	1.29032
7	I postpone my opinion on the presented topic after the opinion of students with hearing disabilities.	2.5093	1.63676
8	I help students with hearing disabilities to clarify their ideas and distinguish the distinguished ones.	2.9491	1.38504
9	I encourage students with hearing disabilities to generate multiple ideas about a single topic.	3.6991	1.01027
10	I encourage students with hearing disabilities to reach the correct answer.	4.0093	1.12886

11	I approach students with hearing disabilities to discover multiple patterns about the studied phenomenon.	1.7222	1.17203
12	I help students with a hearing disability to access the information by themselves.	3.4352	1.42583
<b>Total</b>		<b>2.8283</b>	<b>Medium</b>

Table 8 indicates that the arithmetic means of the creative thinking skill were at the medium level. The item that states: “I encourage students with hearing disabilities to reach the correct answer”, came first, with an arithmetic mean of 4.0093. Meanwhile, the item that states: “I approach students with hearing disabilities to discover multiple patterns about the studied phenomenon”, was in last place, with an arithmetic mean of 1.722. The total result indicates the presence of a medium level from the point of view of the study sample, where the arithmetic mean of the total was 2.8283. This indicates that the responses of the study sample were positive, with high and medium degrees distributed over the items of this dimension.

As for the values of the standard deviation, they are high, and this indicates that the answers to the study sample are varying and diverging in this area to some extent.

### Results of The Study Hypothesis Testing

A multiple linear regression analysis was used to study the effect of several independent variables upon a dependent variable. The explanatory independent variables may be continuous or categorical. The following are the results of multiple regression, testing the main hypothesis and sub-hypotheses:

**Table 9:** Results of one-sample T-test of the main hypothesis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.993 <sup>a</sup>	0.985	0.985	1.31840

It appears from the table that the value of R was 0.993, and R Square was 0.985. The value of the adjusted R square was 0.985, which represents the correlation coefficient of the overall model. Also, the value of the standard error of the estimate was 1.31840, which represents the ratio of the influence or correlation of all independent variables on the dependent variable. This indicates the existence of statistically significant effect at the level of significance ( $\alpha \leq 0.05$ ) for smart educational programs in developing the skill of creative thinking for people with hearing disabilities. Thus, accepting the first main hypothesis of the study and accepting the alternative hypothesis. Accordingly, the Analysis of variance (ANOVA) test was as follows:

**Table 10:** ANOVA test results.

Model	Sum of squares	Degrees of freedom	Mean squares	F value	F level of significance
Regression	24550.318	3	8183.439	4708.01	0.000
Residual	368.497	212	1.738		
Total	24918.815	215			

It appears from table 10 that the value of F was 4708.01, and the statistical significance of ‘F’ was 0.000. This indicates the consistency of the independent variable represented by the effectiveness of smart educational programs, with the dependent variable represented in the skill of creative thinking, which indicates that the hypothesis test was sound.

**Table 11:** Results of applying the multiple regression equation to study the effect of independent variables on the dependent variable

Independent variable	Unstandardized Coefficients		Standardized coefficients	t	Sig
	B	Std. Error	$\beta$		
(Constant)	8.279	0.456	-	18.139	0.000
First dimension	1.033	0.022	0.462	46.527	0.000
Second dimension	0.936	0.032	0.356	29.456	0.000
Third dimension	0.941	0.023	0.425	40.167	0.000

Table 11 shows that the value of the coefficient of determination is 64 per cent, meaning that approximately 64 per cent of the changes in the effectiveness of smart educational programs in developing the skill of creative thinking for people with hearing disabilities are due to each of the problem-solving programmes, playing programs, and simulation programs, and all of them contribute to the development of the creative thinking skill for people with hearing disabilities.

## Results

Based on the above table, a set of results related to the study variables are revealed, as follows:

1. The presence of a statistically significant effect at the significance level ( $\alpha \leq 0.05$ ) for smart educational programs in developing the skill of creative thinking for people with hearing disabilities.



2. The presence of a statistically significant effect at the significance level ( $\alpha \leq 0.05$ ) for problem-solving programs in developing the skill of creative thinking for those with hearing disabilities.
3. The presence of a statistically significant effect at the significance level ( $\alpha \leq 0.05$ ) for learning by playing programs in developing the skill of creative thinking for people with hearing disabilities.
4. The presence of a statistically significant effect at the significance level ( $\alpha \leq 0.05$ ) for simulation programs in developing the creative thinking skill for people with hearing disabilities.

### **Recommendations**

Based on the results obtained by the researcher, a set of recommendations that emphasise the importance of smart educational programs and their effectiveness in developing the skill of creative thinking for people with hearing disabilities were reached, as follows:

- Training teachers to use smart education programs for people with hearing disabilities and holding training courses for them on an ongoing basis that are focused upon everything new within the field.
- Using smart education programs in the programmes of the Ministry of Education to develop the skill of using computers and extracting information from information networks.
- Commitment to implementing smart software plans and providing teachers with periodic bulletins in the area of their applications.

## References

- Akram Salem Al-Janabi. (2017). Strategic Management and the Challenges of the Twenty-first Century: Concepts, Theories. Amman: Amjad House for Publishing and Distribution.
- Shaima Salem Al-Anzi, Samih Mahmoud Al-Karasneh, and Hadi Muhammad Tawalbeh. (2019). The impact of school electronic platforms in promoting citizenship values for Saudi high school students. *The Palestinian Journal of Open Learning and E-learning*, 51-71.
- Insaf Ishaq Ibrahim Abu Bakr, Ghaida Muhammad Babakir and Rahma, Maryam Yusuf Adam and Sharif, and Hoda Hassan Bilal Jad al-Rab. (2015). The role of e-learning in developing the educational process in the basic stage. *The Palestinian Journal of Open and E-Learning*, 1-14.
- Eman Hashem. (2018). The role of creative thinking techniques in the overall design process. 132-143: *Journal of Architecture, Arts and Human Sciences*, Arab Society for Islamic Civilization and Arts.
- Hamza Abdul Karim Hammad. (2017). Incorporating thinking skills in the teaching of the personal status course: Thinking skills. Amman: Debono Center for Publishing and Distribution.
- Hanan Saeed Ahmed Al-Zahrani. (2018). The effect of using an educational platform in developing some sports communication skills among high school students in Al-Baha city. *International Journal of Educational and Psychological Sciences*, 1-29.
- Dawood Al-Haddabi, Hana Al-Felfili, and Taghreed Al-Ali. (2011). The level of creative thinking skills of student teachers in the scientific departments of the College of Education and Applied Sciences. *Arab Journal of Development*, 34-57.
- Sherif Al-Atribi. (2019). E-Learning Strategy: Learning with Imagination. Amman: Dar Al-Orabi for Publishing and Distribution.
- Imad Abu Shanab, Wijdan Abu Al-Basal, and Yusra Harb. (2019). electronic services. Irbid: House of Cultural Books for Publishing and Distribution.
- Muhammad Qasim Al-Shannaq. (2011). The reality of using electronic multimedia in science education in the United Arab Emirates from the teachers' point of view. *International Journal of Educational Research*, 1--29.
- Mazhar Shaban Al-Ani and Mazen Abdul Majeed Hudhaifa. (2019). Interactive electronic learning. Amman: Academic Book Center.
- Nancy Muhammad Jamil Kharabsheh. (2018). The effect of using some creative thinking skills on third-grade students' achievement and retention of information in teaching science subjects in private schools in the capital Amman. Amman: Master Thesis, Middle East University.