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Regular Article

The effect of Electronic stories on the level of visual-spatial intelligence for primary school pupils

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Abstract: *The study aimed to identify the effect of electronic stories on the level of visual-spatial intelligence as a whole, as well as sub-dimensions among the research sample students. The sample was (36) girl students from the 5th grade students. The software on storyjumper.com was used to produce E-Stories. The "visual-spatial intelligence" scale consists of 25 items. The quasi-experimental approach is used in implementing E-stories in one experimental group.*

The results revealed that the level of visual-spatial intelligence as a whole increased to "very good", as well as the level of the sub-dimensions of visual-spatial intelligence among the experimental group students which ranged between "very good - acceptable". The level of the dimensions was ranked respectively: visual expression, mental images, visual discrimination, visual recognition, finally spatial reasoning. The research recommended increasing interest in integrating electronic stories into the educational media for students in early education and training teachers to implement it.

Keywords: *Electronic stories; visual-spatial intelligence; interactive story; primary school students.*

1. Introduction

Electronic stories are a type of stories in which technological media are employed and are based on interaction and participation. It allows the learner to add and modify; offers all the advantages of interactive literature from presenting the open text, making the learner choose the right starting point for him, as well as, the path he wants, providing an opportunity for live direct dialogue, and addressing many other texts related to the story.

The electronic educational story, as demonstrated by many international and Arab researchers, is one of the elements of the educational process when technical and educational design standards are taken into account. Many scientific indicators and studies have recommended the importance of digital interactive stories such as the educational digital story plays a prominent role in the educational process, given its

superior learning potential. Therefore, has been used at various levels of education, as it has the potential to effectively teach reading and writing to young learners who have reading problems (Zahrani, 2012).

The role of education now is how to develop a certain type of intelligence for students, which can be done by preparing the educational activities necessary to develop the required intelligence. The role of the teacher is no longer; the transfer of knowledge materials as it was previously, clarification and interpretation in the traditional way, but it has become a guide on the side, and a facilitator for students in the process of acquiring knowledge. It is possible, with well-thought-out methods and tools, to develop the different types of intelligence or some of them, in a learner or a group of learners. According to this theory, it has become necessary to diversify the teaching methods, to develop the different types of intelligence among students (Obeid & Afana, 2003).

Given the individual differences between learners that have increased and expanded, the theory of multiple intelligences has become a necessity to be taken into account in learning environments. Gardner (1999) came up with the term Multiple Intelligences to describe an individual's multiple knowledge capability. It has been suggested that human beings possess at least seven areas of intelligence (linguistic/verbal, logical/mathematical, spatial/visual, personal, social, motor, and musical intelligence). Gardner believes there may be many other untested areas (Alkhafaf, 2011).

Spatial/Visual Intelligence is one of those intelligences that distinguish each individual "capable of perceiving the visual/spatial world, making transformations based on that perception, and also contains sensitivity to colours, lines, shapes, space and relationships between these elements. It includes the ability to visualize and geographically represent ideas of a visual or spatial nature" (Khawaldeh, 2004).

It requires a degree of sensitivity to shapes, nature, beauty and harmonious relationships between these elements, as well as an analytical vision, observational strength and sufficient imagination to reproduce the shapes. It requires a person's ability to guide oneself in an appropriate way in a spatial matrix and to act through it (Nofel, 2007).

The interactive story is in harmony with learning theories in terms of interaction, participation, sensing, taking into account individual differences among children, self-learning, and using past experiences and feedback. Several educational institutions in many countries have tended to produce programmed children's stories characterized by movement, sound, and colours through animation, and this type of story has been popular in kindergartens and primary schools; where children enjoy watching and listening to it eagerly, so they understand its educational contents."

2. Objectives, Questions & Hypotheses

There are certain characteristics of the early education stage that distinguish it from the rest of the stages. One of the most important characteristics of this stage is the fact that it is the period in which the child learns the foundations of social behaviour, as well as discovery and familiarization with the environment. The study of these characteristics helps parents and teachers, based on the appropriate stories, understand the nature of their children and their education and care for them. Early education is also equivalent to the stage of imagination, where children are predominant in sensory thinking and imagery. At this stage, children play realistic roles for themselves in which they find fun and use imagination to complement their personalities. Play, movement, and intense fast-transforming emotions characterize this stage.

Spatial/visual intelligence indicates an individual's ability to perceive the visual place and think through maps, images, drawings, shapes and charts, as well as an individual's ability to use colours and perceive connections between objects within drawings and shapes and form imaginary and mental images that help them in problem-solving. This type of intelligence requires sensitivity to colour, line, shape, nature, field and space. It can be identified to the learner through several indicators and characteristics.

This study aimed to identify the role of interactive digital stories in raising the level of visual/spatial intelligence as a whole, as well as the level of sub-skills: visual recognition, visual discrimination, visual

expression, mental images, and spatial inference on a sample of 30 female students.:

Due to the Lack of Arab research and studies that dealt with the use and implementation of electronic media for children this study explores the role of interactive digital stories in raising the students' level of visual/spatial intelligence. Therefore, this study will answer the research question: "What is the effect of electronic stories on the level of visual/spatial intelligence in elementary pupils?"

More specifically, the study aimed to answer the following questions:

RQ 1- What is the effect of electronic interactive stories on the level of visual-spatial intelligence as a whole for the research sample pupils?

RQ 2- What is the effect of electronic interactive stories on the level of sub-dimensions of visual-spatial intelligence as a whole for the research sample pupils?

3. Research Method, Design & Participants

The study followed the descriptive approach, which relied on the study of reality or phenomenon, as it exists in reality and was concerned with its accurate description, as well as the quasi-experimental approach used in the implementation of the sample's electronic stories.

Research tools:

Electronic Stories as experimental processing tools designed by software on storyjumper.com.

Visual/spatial intelligence scale as measuring tools included 5 sub-dimensions: (visual recognition, visual discrimination, visual expression, mental images, and spatial inference).

Participants:

The research sample was randomly selected (36) girl pupils from the fifth grade at the (elementary II school in Dhahran) affiliated to the Ministry of Education in the Eastern Province "Dammam" - Kingdom of Saudi Arabia during the first term of the academic year 2019/2020.

Procedures:

1- Preparation of electronic story processing tools as follows:

- All electronic stories have been prepared and ideas, values and skills were selected, taking into account the characteristics of primary students, the scenario has been drafted sequentially and designed through a program on the website storyjumper.com.
- During implementation sessions, the website is accessed, stories are reviewed directly for pupils and they are collectively instructed to comment on story events, describe where they take place and imagine their end.
- Pupils have been provided with videos of stories (30), so they are divided into five groups each exercising a skill (visual recognition, visual discrimination, visual expression, mental images, spatial reasoning) with a switch in group-skills encounters. The training takes place by presenting the expressive story while stopping the video, discussing the content and events of the story, expressing

the prevailing idea, and visually distinguishing between the significance of colours, places and characters to reach visual/spatial inferences (List of video clips of electronic stories, Appendix 1).

- Paper-printed stories have been prepared to encourage pupils to read individually (list of printed stories, Appendix 2).

2- Preparation of assessment tools, a questionnaire of visual/spatial intelligence, in the following steps:

- The objective is to measure the dimensions of the visual/spatial intelligence of primary school girls.
- The five-dimension visual/spatial intelligence scale covers (visual recognition, visual discrimination, visual expression, mental images, and spatial inference).

The scale of the visual/spatial intelligence consists of (25) statements, and the response to each of them is graded on the Triple Likert scale (applicable - applicable to the extent - not applicable), and thus we obtain scores (3-2-1) and the final score of the scale statements is (75) and the mean is (37.5). To explain the significance of the relative importance of each statement (excellent = 85-90), (v. good=80-84), (good=75-79), (satisfactory=70-74), (acceptable= 65-69), (poor=60-64):

- The data of the statement representation in the scale for the five dimensions of the visual/spatial intelligence, as well as the correlation coefficients between those statements are shown in Appendix- 3.
- The scale which turned out to be a suitable form of application was presented to some of the arbitrators and its statistical coefficients were calculated (final form of the scale, Appendix 4).

3- The teacher and assistant specialist were met and trained in how to guide the implementation of stories for school girls, and they were provided with all the research tools, such as electronic and paper stories, video clips, and the scale of visual-spatial intelligence.

4- The research sample was randomly selected from (36) female pupils from the fifth grade at the (elementary II school in Dhahran) a primary school affiliated with the Ministry of Education in the Eastern Province "Of Dammam".

5- The research experiment was carried out during the first term in 2019/2020 and lasted for 5 weeks.

6- The visual/spatial intelligence scale was applied to schoolgirls with the help of the teacher.

7- Data collected, results analyzed and discussed to arrive at recommendations.

4. Literature Review:

. Individual Electronic Story

Hull and Nelson (2005) defined the interactive electronic story as one of the exciting and new applications in education technology, which became readily available for use in classrooms, as well as being well-designed, developed and displayed, and serves as the ultimate product of multimedia consisting of still images, animations, video footage, audio commentary and music backgrounds.

It can be defined procedurally as "a story that encompasses all the elements of a traditional story". It is characterized by the use of multimedia, and the positive participation of the child, as it allows him/her to choose the course of the story from among several different tracks. A kind of interaction occurs between the child and the events of the story itself; to develop his mental abilities and social skills, and encourage exploration and curiosity.

Electronic Story:

The electronic story represents a series of events that are unrestricted by a certain time or place. The development of these events depends on the child's choice and the extent of positive participation. The story depends on the child's positive participation in its events, allowing him or her to freely choose

the story path by choosing a particular one of several paths and directing him/her to the right path to develop his or her mental abilities, positive behaviours and build knowledge and educational trends beneficial to him/ her.

The story is an entry point for teaching pupils creative writing. Researchers have recognized the essential role of the story in a child's intellectual development; it satisfies his curiosity, nourishes his senses, opens up horizons of knowledge for him, develops his imagination, and saturates his love for imagination. This will expand his perceptions, increase his linguistic repertoire, and employ the vocabulary and structures he has acquired from the story in new situations (Al-Hawamdeh, 2015).

Hussein (2012) defined the electronic interactive story as one of the new and exciting tools in education technology, which has become available for use in classrooms. It is a multimedia product consisting of multiple segments of images, with the possibility of using any of the other multimedia elements, a long prose tale of images, derived from fiction, reality or both and based on certain rules in biblical art.

Duggan & Robyn (2009) have defined the digital story as the process of creating a short film that combines written screenplay or story text with various multimedia components: images, video, music, narrative and often the commentary accompanying storytelling is the voice of the story producer. Al-Hussari & Al-Anzi (2000) defined it as an attractive form by which information is provided that helps to attract the learners' attention, arouse their element of suspense, and push them to follow the course of the lesson.

The story is important in the education process.(Al Kubaisi & Awad, 2001); (Salama, Al-Ghazwa & Al-Sawa'i, 2010) & (Jaber 2003) all agreed on the same points: e.g. story is important in entertaining children, developing their self-confidence and their abilities to innovate, entrenching their religious values, and satisfying their imagination. It is also important in helping them to form their consciences, and their pride in their homeland, enriching their language, and their scientific, sporting, environmental and social concepts. In addition, it reinforces their positive attitudes towards authentic human values and familiarizes them with scientific thinking.

The difference between the interactive story and the traditional one is that the interactive story allows the learner to choose a particular path from several different paths before him/her, to select the end of the story from several endings, or to choose one of the characters. It allows the learner to make his/her decision contrary to the traditional - non-reactive - story in which he/she has no role, as it is a static story of a particular pattern.

The importance of the electronic interactive story:

An electronic interactive story is important because it depends on many aspects as it depends on interaction in multiple forms. It also takes into account the individual differences between children. It allows each child to learn or complete his/her story according to his/her abilities and capabilities. It also gives a picture of the reality in which its events occurred and enables the child to gain hard-to-obtain experiences and mental and behavioural skills that are important to him/her.

The interactive story contains non-traditional elements such as sound, movement, and characters sketched in a virtual environment. The child is a participant who impersonates a role to choose one of the options, which in turn decides the focus of the story. It also leads him to creative expression. In the traditional form, words build the setting of the story. While In the interactive story, the setting is built by using a computer and its design tools, dynamically telling the story. The interactive story is in harmony with education theories in terms of interaction, participation in learning, providing sensibilities and taking into account differences, self-learning, and use of past experiences and feedback. Many educational institutions in numerous Arab countries have tended to produce children's stories programmed on

compact CD-ROMs characterized by motion, sound and colour through animation. This kind of story has been popular in kindergartens and primary schools; where children passionately enjoy watching it, listening to it, and thus absorbing its educational content.

The story must have an objective to be achieved, as well as other sub-objectives. A story without a goal is of no value. Some studies have confirmed the effectiveness of interactive stories and children's preference for them over the traditional ones as a result of the spread of computers and electronic games. Among those is a study by Ali (2011) that used interactive stories to develop the life skills of a kindergarten child, Sameh's (2012), which demonstrated the effectiveness of sophisticated interactive stories in improving electronic reading skills in the Arabic language, and Abdelaty's (2013), which demonstrated the effectiveness of interactive stories in developing scientific concepts. Moreover, the results of Al-jurf's (2014) study showed the effectiveness of using digital stories in the development of technological concepts; the study by Abu Mughnim (2013) demonstrated the effectiveness of interactive digital stories in achieving and developing ethical values. While, the results of Shimi's (2009) study showed the effectiveness of the digital story's impact in developing and moving towards some critical thinking skills, Tatum's (2009) highlighted the positive impact of digital stories as historical cultural activities in understanding readable texts. Studies on digital stories have also shown that their employment during the educational process encourages learners to learn, understand and think.

Features of the electronic story as illustrated by (Musa, 2015):

1. Non-linear flexibility: where digital stories are produced in separate modules. The user selects one of its units and proceeds on the path that suits them, also based on public feedback, to answer their queries honestly.
2. Multiple participation: where the interactive story allows the participation of more than one user (assuming the role of a single-user interactive story and finding that this user interacts with smart virtual characters).
3. Interactivity: Interactivity is its most important feature, as it makes the learner (child) positive, active, and saturated with curiosity skills and social behaviour skills.
4. Its development and updating: Easiness of development comes when the users' freedom is greater, as in open-ended interactive stories, and dialogues are the basis for building the structure of the interactive story. The story with users' interaction and experiences evolves the interactive story as the elements of re-production within it are renewed, while in the stories with great control and structure that limits the character's behaviour, here we find them difficult to develop.
5. The interactive story is connected with multimedia: it uses many means such as audio, 3D graphic characters, video and cartoon films.

Characteristics of child development in early education and its relationship to electronic stories:

There are certain characteristics of early education that distinguish them from the rest of the stages. One of the most important characteristics of this stage is that it is the period in which the child learns the foundations of social behaviour as well as discovery and familiarization with the environment. The study of these characteristics helps parents and teachers, based on the appropriate stories, understand the nature of their children, their education, and care for them. Early education is also equivalent to the stage of imagination, where children are predominant in sensory thinking and imagery. At this stage, children play realistic roles for themselves in which they find fun and use imagination to complement their personalities. This stage is characterized by playing, movement, and intense fast-transforming emotions. The child's imagination is limited but acute in the context of his/her experience and environment. It is this kind of

fancy imagination that makes him/her passionately accept the stories in which animals, birds, and the inanimate speak (Najib, 2000).

At this point, children love stories that depict good and compassionate fathers who do the best and the right things, because at this stage one of their most important needs is safety. Among the most beloved stories for children at this stage are humorous, absurd, mothers' stories with all their household activities, fathers' stories outside the house with all their skilled activities, and then the events in which children take on certain roles, whether at home or outside, such as parties, picnics and trips. They love the stories of naughty boys and girls, provided that they eventually receive their respective penalties (Huda Genawy, 1994).

Therefore, At this stage, it is important to avoid everything that leads to raising children's fears, such as elves, goblins, witches and stories of violence and criminality, because the reflection of distressing or tragic situations gives children pain and concern. In addition, early education children have special needs that must be taken into account when choosing stories, the need for safety, self-confidence, self-acceptance, the need attainment and achievement, curiosity, and the need for belonging and participation.

Spatial/Visual Intelligence:

Spatial/Visual Intelligence is one of those intelligences that distinguish each individual "capable of perceiving the visual/spatial world, making transformations based on that perception, and also contains sensitivity to colors, lines, shapes, space and relationships between these elements. It includes the ability to visualize and geographically represent ideas of a visual or spatial nature "(Khawaldeh, 2004).

It also requires a degree of sensitivity to shapes, nature, beauty and harmonious relationships between these elements. It also requires an analytical vision, observational strength and sufficient imagination to reproduce the shapes. As well as, a person's ability to guide oneself appropriately in a spatial matrix and to act through it (Nofel, 2007).

Majid, 2009) stated that an individual with spatial/visual intelligence can be evaluated and described with special characteristics as he/she:

- Describes and analyzes visual images clearly and easily.
- Finds it easier and more comfortable in dealing with maps, paintings and graphs than reading a written text.
- Can extract more meanings from pictures than from words.
- Tends to daydream more than his/her peers do.
- Enjoys art activities, and draws advanced figures for his/her age. S/He draws free drawings on the margins of his/her books.
- Has a strong love for watching cartoons or visual presentations.
- Finds the most fun in solving puzzles, mazes and similar activities.

This type of intelligence is represented by the saying (a picture is worth a thousand words), as those who possess this type of intelligence tend to use shapes, images, designs, drawings and maps and have a high ability in tasks that require eye/ mind vision such as visualization, imagination and shaping of mental images. Careers that match this type of intelligence include artists, designers and architects (Gardner,1983).

Several indicators and characteristics identify the learner's spatial (visual) intelligence. These including:

- The owner of this type of intelligence responds quickly to colours, shapes, and images.
- Likes to visualize and classify things.

- Prefers books with shapes, charts and images.
- Checks shapes, drawings and charts and looks for relationships between them. (Adass, 1997)
- The members of this group learn with sensors and abstractions together by sight and organizing things somewhere.
- Likes to see the things they talk about so he can understand them.
- Enjoys colours, shapes, maps, drawings, tables, art, puzzles, and everything that draws attention.
- Spatial intelligence is the ability to perceive properly the spatial/visual world, thinking and meditation.

Spatial/Visual Intelligence Development Strategies:

Certain teaching methods are commensurate and harmonious with students with spatial/visual intelligence and develop such intelligence, as described in Youssef (2010) as follows:

Visualization: It is based on converting written text into an imaginary painting. That is, the book contains images and drawings of the same amount, if not more than the written text. The teacher asks pupils to close their eyes and visualize what has been studied in class. The practical aspect of this method has the pupils storing images and shapes within their minds that resemble a "mental screen" or a "mental board", so they can display what is written on this board for any subject they want to remember: such as alphabetical words, mathematical formulas, scientific facts, or any other information.

Colour Cues: High sensitivity to colour is one of the characteristics of pupils with high visual-spatial intelligence. This method encourages students to use colours to paint the study material, such as certain texts that represent a language base, a mathematical equation, specific definitions, or the like. It may also serve on one hand in stimulating and developing spatial/visual intelligence, and on the other hand, help the pupil to simplify the process of reviewing materials and remembering information, and reduce boredom and routine in the process of reading and studying.

Picture Metaphors: Using metaphorical images from literary texts can be useful for the development of this kind of intelligence. The figurative picture expresses an idea in a visual form. It allows pupils to imagine strange and new images to them and opens the way to unleash their imagination, which helps to stimulate pupils' imagination and stimulate and develop their spatial/visual intelligence.

Graphic Symbols: This method requires drawing at least part of the lesson. The image and drawings in this case are important in the understanding of the pupils with spatial/visual intelligence. For example, rock layers can be drawn in the Earth's subsoil, and examples like this are abundant.

Idea Sketching: Students use simple drawings that help them identify and clarify ideas, key concepts, and the most important points of a lesson. This method is used to evaluate students' understanding of an idea, emphasize a particular concept, and ensure that information is acquired.

A successful teacher is the one who monitors the tendencies and interests of his/her pupils so that s/he can deal and understand with them. The teacher can use a special record in which s/he records all his/her notes about his/her pupils, their tendencies, hobbies, and the things they like to do to learn. The results of educational and psychological research have confirmed that learning is better when the word is accompanied by an image that represents it. This helps to entrench learning in the mind of the learner through multimedia. The story's relationship with learning and education is very strong. The story is an attractive and beloved teacher from which children take a lot of culture and knowledge and gain vital experiences, and it is one of the best factors to entice children to education and the most successful means of providing them with concepts. The current research intended to use all of these strategies together and integrate them into electronic interactive stories that provide a distinct mix of these strategies.

Previous studies that use the same research variables, such as Li-Ming's study (Li-Ming, 2007) on

children in Taiwan and examined the relationship between creativity and the ability to draw, and spatial/visual intelligence. The research sample was (121) of a primary school. The study tool was the students' teaching of a traditional picture story (two-dimensional). Pre- and post-tests of spatial/visual intelligence were administered. The study showed that the statistical, descriptive and inferential results were significantly in favour of the experimental group. It showed positive relationships between creativity and the ability to draw in children, and visual/spatial intelligence, while the two-dimensional story had a positive impact. However, according to the researcher, some determinants may have influenced, directly or indirectly, the study's findings such as gender, society and age.

Hindal (2014) investigated an important feature of talented students: spatial/visual intelligence and its impact on the higher achievement of 121 of middle school pupils. A new test of spatial/visual intelligence was used as a study tool. The results showed a significant positive correlation between the pupil's spatial/visual intelligence and high achievement. That is, the higher the pupil's level of spatial/visual intelligence, the higher his/her achievement will be.

Similarly, the study by Yenilmez & Kakmaci (2015) examined the extent of the success of spatial perception in terms of some variables, and the relationship between spatial perception and the level of intelligence. (Saleh, 2004) investigated the effectiveness of using multiple-intelligence theory as a way and a learning method for the development of logical intelligence and visual/spatial intelligence in (36) kindergarten children. While the study by Amin (2006) sought to build a program for the development of both mathematical and spatial intelligence to prepare a scale to measure them among 60 pre-kindergarten children.

5. Results

To answer the Q1 questions, the following statistical methods were used: calculating the mean, percentages, and range. The descriptive results for these findings are presented in Table1.

RQ1: what is the effect electronic interactive story on the level of visual/spatial intelligence as a whole for the pupils in the research sample?

Table (1) shows the values of the pupils' response after treatment with electronic stories for the statements of the visual/spatial intelligence scale as a whole as follows:

Table (1)

The significance of pupils' responses of the research sample to the scale of visual/spatial intelligence, arranged in descending order.

no	***statements***	***applicable***	***To some extent***	***Not applicable***	***mean***	***%***	***significance***
6	*I remember the information more if I wrote it or commented on it*	*24*	*11*	*1*	*32*	*88.0*	*excellent*
8	*I like professions such as (photographer, decorator, painter, and artist)*	*28*	*3*	*5*	*32*	*88.0*	*excellent*
13	*I like observing the beautiful things around me like the sky, birds and flowers*	*24*	*11*	*1*	*32*	*88.0*	*excellent*

no	statements	applicable	To some extent	Not applicable	mean	%	significance
24	I need a quiet, orderly place that is harmonious in colours to get my work done with focus	25	9	2	32	88.0	excellent
18	I like to take a camera with me to shoot things I like.	25	8	3	31	87.0	excellent
12	I enjoy visual puzzles such as mazes, puzzles and differences between images	25	7	4	31	86.1	excellent
10	I use pictures and illustrations in my reading or explaining an idea	22	9	5	30	82.4	v. good
21	I have a good colour distinction and enjoy watching paintings.	19	14	3	29	81.5	v. good
1	I care about the colours of my clothes and that worn by others	21	9	6	29	80.6	v. good
11	I prefer acquiring colourful newspapers and magazines containing drawings and shapes	19	13	4	29	80.6	v. good
9	I love playing with blocks, puzzles, jigsaws, and building games	20	10	6	29	79.6	good
17	I remember my night dreams in detail	18	14	4	29	79.6	good
3	I like to draw and design some advertisements or graphics.	22	5	9	28	78.7	good
23	I make some ideas better when I draw them than in writing	18	13	5	28	78.7	good
14	I like geometry classes more than other subjects	19	10	7	28	77.8	good
19	I can visualize geometric shapes very quickly	20	9	6	28	77.8	good
2	I rely on touching the displayed objects to identify them	16	15	5	28	76.9	good
5	I like to read textbooks where there are pictures, shapes and drawings.	19	9	8	28	76.9	good
20	I can visualize clear images when I close my eyes	16	12	8	27	74.1	satisfactory
4	I learn information better using stickers, shapes and pictures	16	10	10	26	72.2	satisfactory
16	I am good at observing distances, sizes, and areas of objects accurately	11	15	10	24	67.6	acceptable
25	I remember the way to somewhere pretty good just by going to it once.	11	14	11	24	66.7	acceptable

no	***statements***	***applicable***	***To some extent***	***Not applicable***	***mean***	***%***	***significance***
7	*I find my way easily even in unfamiliar cities*	*10*	*13*	*13*	*23*	*63.9*	*poor*
22	*I remember exactly the size and actual shape of things after leaving them for a while.*	*9*	*15*	*12*	*23*	*63.9*	*poor*
15	*I notice the conditions of people and the way they sit when I enter a place*	*9*	*13*	*14*	*22*	*62.0*	*poor*
Total of scale statements		***28***	***80***				***v. good***

It is noted from Table (1) that six statements received a significant response of "excellent". The highest of these statements "I remember the information more if I write or comment on it", which is considered one of the most visual intelligence skills where the information is converted from verbal to comic and then processed. While most phrases received a significant response "very good" the highest "I use pictures and illustrations in my reading or explaining an idea". Many school girls begin planning, drawing or even using physical cues to explain an idea, eight phrases have a "Good", the top of which is " I love playing with blocks, puzzles, jigsaws, and building games", which is certainly a favourite work for children in general and develops intelligence, especially visual/spatial.

Two statements have a "satisfactory" scale. The top of which is " I can visualize clear images when I close my eyes". Which is this process may be difficult at this stage where it needs mental maturity. Two statements acquired the "acceptable" scale " I am good at observing distances, sizes, and areas of objects accurately", which is also a process that needs accuracy and constant training to master, so it came in late order. While three statements acquired "weak" scale and need to train children on them, including " I find my way easily even in unfamiliar cities", “ I remember exactly the size and actual shape of things after leaving them for a while" and " I notice the conditions of people and the way they sit when I enter a place". It is noted that all statements are related to spatial intelligence, which often comes after visual intelligence and is a logical result of a high level and continuous training on it. It is obvious that children of this age group lack these simple skills and need training on them.

It is clear from Table (1), that the average level of visual/spatial intelligence as a whole among the pupils of the research sample that used electronic stories is (28) which represents (80%). This percentage falls at a level of (very good), which may indicate that the level of visual/spatial intelligence of the pupils has reached a very good level when using electronic interactive stories, which is a very appropriate level.

RQ2: what is the effect of electronic interactive stories on the level of the sub-dimensions of visual/spatial intelligence among the pupils of the research sample?

The means and percentages for each statement and each of the dimensions were calculated as follows**:**

Table (2*):*

Averages and percentages of responses to statements according to the scale dimensions.

Dimension	***No in scale***	***statement***	***Mean***	***%***
visual discrimination	*1*	*I care about the colours of my clothes and that worn by others*	*29*	*80.6*
	2	*I rely on touching the displayed objects to identify them*	*28*	*76.9*
	6	*I remember the information more if I wrote it or commented on it*	*32*	*88.0*
	14	*I like geometry classes more than other subjects*	*28*	*77.8*
	21	*I have a good colour distinction and enjoy watching paintings.*	*29*	*81.5*
Mean			*29*	*80.9*
visual expression	*3*	*I like to draw and design some advertisements or graphics.*	*28*	*78.7*
	8	*I like professions such as (photographer, decorator, painter, and artist)*	*32*	*88.0*
	10	*I use pictures and illustrations in my reading or explaining an idea*	*30*	*82.4*
	18	*I like to take a camera with me to shoot things I like.*	*31*	*86.1*
	23	*I make some ideas better when I draw them than in writing*	*28*	*77.8*
Mean			*30*	*82.6*
visual recognition	*4*	*I learn information better using stickers, shapes and pictures*	*26*	*72.2*
	5	*I like to read textbooks where there are pictures, shapes and drawings.*	*28*	*76.9*
	9	*I love playing with blocks, puzzles, jigsaws, and building games*	*29*	*80.6*
	9	*I love playing with blocks, puzzles, jigsaws, and building games*	*29*	*79.6*
	11	*I prefer acquiring colourful newspapers and magazines containing drawings and shapes*	*29*	*80.6*
	12	*I enjoy visual puzzles such as mazes, puzzles and differences between images*	*31*	*86.1*
Mean			*29*	*79.3*
spatial inference	*7*	*I find my way easily even in unfamiliar cities*	*23*	*63.9*
	15	*I notice the conditions of people and the way they sit when I enter a place*	*22*	*62.0*
	16	*I am good at observing distances, sizes, and areas of objects accurately*	*24*	*67.6*
	22	*I remember exactly the size and actual shape of things after*	*23*	*63.9*

Dimension	***No in scale***	***statement***	***Mean***	***%***
		leaving them for a while.		
	25	*I remember the way to somewhere pretty good just by going to it once.*	*24*	*66.7*
Mean			*24*	*67.3*
Dimension	*No in scale*	*statement*	*Mean*	*%*
Mental Images	*17*	*I remember my night dreams in detail*	*29*	*79.6*
	19	*I can visualize geometric shapes very quickly*	*28*	*77.8*
	20	*I can visualize clear images when I close my eyes*	*27*	*74.1*
	13	*I like observing the beautiful things around me like the sky, birds and flowers*	*32*	*88.0*
	24	*I need a quiet, orderly place that is harmonious in colours to get my work done with focus*	*32*	*88.0*
Mean			***29***	***81.5***

Table (3)

means, percentages, and ranks of the dimensions of visual/spatial intelligence.

Dimension	**Mean**	**%**	**Rank**	**significance**
visual expression	30	82.6	First	v. good
Mental Images	29	81.5	Second	v. good
visual discrimination	29	80.9	Third	v. good
visual recognition	29	79.3	Fourth	good
spatial inference	24	67.3	Fifth	acceptable

The data in Table (2) and Table (3) revealed that the level of spatial visual intelligence sub-dimensions of pupils of the research sample that used electronic stories is as follows:

(Visual expression, with a mean of 30, percentage 82.6, and significance (very good), (mental images, mean 29, percentage 81.5, and significance (very good), (Visual discrimination, mean 29, percentage 80.9, and significance (very good) (Visual recognition, mean 29, percentage of 79.3, and significance (good) (spatial inference, with a mean of 24, a percentage of 67.3, and significance (acceptable).

The level of five dimensions rose, respectively: visual expression, mental images, visual discrimination, then visual recognition, and finally spatial inference. This arrangement makes sense.

6. Discussion

The results of the study indicated that:

- The level of visual/spatial intelligence as a whole increased to ‘’v. good’’ among the pupils of the research sample that used electronic interactive stories.

- the level of visual/spatial intelligence sub-dimensions increased among the students of the research sample that used electronic interactive stories and ranged from" very good – to acceptable", and the five-dimensional level was graded respectively as visual expression, mental images, visual discrimination, visual recognition, and finally spatial inference.

It is evident that stories have achieved a high level for these pupils, helped by the features of electronic stories that are suitable for visual/spatial intelligence as well as children in the early stages where visual/spatial intelligence requires a degree of sensitivity to shapes, nature, beauty and harmonious relationships between these elements. It also relates to the visual discrimination of the surrounding environment, the ability to create and control mental images, colour sensitivity, lines, shapes, bodies, place, and the relationship between those elements. It also includes the ability to imagine and where a child's imagination is acute but limited within his/her experience and environment. This kind of fancy imagination makes him/her passionately receptive to stories. The result of the research is consistent with the study by Li-Ming (2007), who indicated the effect of two-dimensional stories on the development of spatial/ visual intelligence. Furthermore, the study (Abdelaty, 2013) demonstrated positive changes in social skills using electronic interactive stories where children participate in group activities as a result of providing an atmosphere of fun and investigated the effectiveness of interactive stories in the development of scientific concepts.

All this provided by the interactive story, which contains unconventional elements such as sound, movement and characters drawn in a virtual environment, together with the use of computers and design tools contributed to telling the story dynamically and the presentation of abstracts in the form of graphic sensors, which led to children to watch and listen to them with great passion.

7. Conclusion:

This study focused on the effect of electronic stories on the level of visual-spatial intelligence and its sub-dimensions: visual recognition, visual discrimination, visual expression, mental images, and spatial inference among school students. The results showed that the level of visual-spatial intelligence as a whole increased among the students when using electronic stories as well as the level of the sub-dimensions of visual-spatial intelligence. Thus, the introduction of technological media into children's sources of information through images, colours, sounds and animated characters and the integration of stories in education modes especially for the basic education stage, gives an atmosphere of fun and enjoyment.

8. Implications

- The attention must be given to the development of aspects of learning that are concerned with visual/spatial intelligence in its various dimensions because of its importance in daily life and not only cognitive aspects.
- Implementation of the research experiment on children with special needs.
- Conducting a research experience to learn the impact of e-interactive stories on social skills.

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