

## **Introduction**

Technology becomes an essential part of our lives and it is everywhere around us. Although it has a significant role in education in general, it is still not widely implied in our classrooms and the traditional methods dominate our educational system which deprive learners from discovering new learning chances specially in their early stages.

These early stages in education are considered the most important ones because it put the child on the basic standards not only to his education but his life as well. It has a major impact on successful learning experiences in school and personal development. It introduces opportunities for the child to learn many skills that affect his following years in education. And whereas children are now surrounded with technology, good planning for implying this technology would be so helpful for them to discover new learning chances.

Technology should be used in the right way to serve children needs at this age .The most important skills in kindergarten are visual perceptual skills because they help children interpret what they see through organizing and obtaining the visual information from the environment around them. Also, these skills are important in learning how to form letters, for copying, spacing, sizing, and orienting letters and words in a correct way (Swearingen, 2007, p. 1). Children even with good vision can struggle with recognizing that a shape is still the same regardless of its size ,or have difficulties with putting shapes or symbols together or remembering them ( Case, 2005, para.2).Thus, these skills should be developed as they are the basic skills and the initial process for any learning.

And as Mind Mapping appears to show as a great tool of technique in education, many mind-mapping software applications are introduced to facilitate structuring concepts and sharing ideas. At this point, mind mapping is certainly worthy of more attention in the research literature as its popularity is on the increase,( Tucker, Armstrong &Massad, 2010, p.12) .It is a spider web-like visual representation facilitate meaningful and cooperative learning ( Howitt, 2009, p.42). A good mind map helps in the teaching and learning process .it empowers students advance their own learning as it helps

them to devise hypotheses more quickly in the learning process than the traditional text based ( Ligiero, Romano&Douma, 2009, p.1) .Concerning the kindergarten, Mind Mapping is one strategy that helps children to improve comprehension, memory and imaging as they think in pictures and words .Therefore, using Mind Maps is one more tool that go beyond the chalk and talk as a traditional method and instructors should add to their portfolio of active learning activities as they seek to.(Budd, 2003, p.1)

Motivated by these twin goals of using electronic mind maps to imply technology in classes and develop the most initial skills in kindergarten, this research introduced an electronic Mind map based content that presents a rich visual presentation to develop some visual perceptual skills of kindergarteners.

### **Context and statement of the problem**

The problem was derived from the following resources:

#### **Researchers' observation**

Being a Specialist in Child Education and Soft Skills trainer at many centers and schools, the researchers have noticed that teachers use the same traditional methods in Kindergarten that don't suit children needs at all. Moreover, they are not aware of kids' initial skills they must develop to copy a letter or a word, to recognize shapes or to memorize in a certain sequence. They still use the same boring booklets which don't respect individual pace learning. Children experienced a dull learning atmosphere as they can't hop or run in class while lesson presentation which makes them really bored and stressed. Therefore, they must be taught in a new way that add fun and real meaning to their learning and the most important is to develop their skills for successful learning.

#### **• previous researches**

The researchers deduced throughout many researches that mind maps is a powerful tool in organizing information, draw relationships, and develop thinking. Concerning using mind maps in education, Khalaf ( 2011) has mentioned that mind map is an effective tool in developing linguistic skills before school stage. In addition, Aloufi (2011) proved that using electronic mind maps has a great role on achievement in English grammar. Whereas Ragheb (2013) assured that mind maps uses brain efficiently and it is an excellent way to develop thinking skills. Beside the study of Khalil (2013) which

recommended updating the training programs to kindergarten teachers and assessing their trends in using electronic mind maps in teaching kindergarten due its great effect in capturing information and enhancing memory. Finally, the study results of Zaki ( 2014)indicated that electronic mind mapping has an effective influence onpromoting EFL critical reading skills and it recommended thatcritical reading skills need to be developed in early stages using mind maps.

On the other hand, most of the current studies concerning the visual perceptual skills focused to introduce training programs to whom only suffers from learning disabilities. Starting from Elgarhy (2009) study which aimed to evaluate the effectiveness of a therapeutic program for the reading and writing disabilities in children by developing the skills of visual performance and visual perception. While the study of Saqr (2011) introduced a training program to develop visual perceptual skills to the third grade who have some writing disabilities. Besides, Salem (2012) study that assessed the impact of a training of visual perception program on improving reading and writing skills of students with learning disabilities in the first stage of elementary education. Finally the study of Rayan (2013) that investigated the effectiveness of an early Intervention Program for developing phonological awareness and visual perception skills among children at risk of reading and writing disabilities.

Based on all these findings of previous studies, the researchers realized that the early intervention of developing visual perceptual skills would prevent or reduce the risk of exposure to learning disabilities. Moreover, teaching with traditional method with kindergartners doesn't suit their characteristics or likings which could result later in some learning disabilities or distract learning as their initial skills such as visual perceptual ones are not developed in the right way. Therefore, this research introduced E-mind maps based content to suit their characteristics and develop their visual perceptual skills.

### **Research Questions and Hypotheses**

The researchers formulated the problem of the study in this main question:

- What is the effectiveness of E-mind maps based content on developing visual perceptual skills of kindergartners?

The research sub-questions could be stated as follows:

- 1- What are the most important visual perceptual skills for kindergartners?
- 2- What is the perspective of an electronic mind maps based content to develop visual perceptual skills for kindergartners?
- 3- What is the effectiveness of the electronic mind maps based content on developing visual perceptual skills of kindergartners?

#### **Research hypotheses**

- A. There are statistical significant differences at the level of ( $\alpha \leq 0.05$ ) using E-mind map based content between the post-test of both the control group and the experimental group on developing visual perceptual skills in favor of the experimental group.
- B. There is statistical significant difference at the level of ( $\alpha \leq 0.05$ ) between the pre-test and post-test of the experimental group on developing visual perceptual skills in favor of the post -test.
- C. There is a significant effectiveness of E-mind map based content on developing visual perceptual skills in favor of experimental group.

#### **Research Purpose**

The purpose of this research could be stated as follows:

- To identify the most important visual perceptual skills in kindergarten.
- To design an E-mind maps based content that is suggested to develop visual perceptual skills of kindergartners.
- To examine the effectiveness of E-mind map based content on developing visual perceptual skills of kindergartners in Smart Vision language school.

#### **Research Significance**

- This research is an outcome of the recommendations of recent studies that consider the mind maps is an innovative tool used for good achievement, brain storming ideas, organizing information, thinking analytically ,and creating new things.
- The importance of the target group also adds more significance to this study as Kindergarten is the base of child education. The

role of this stage is very crucial to a child's overall mental and academic growth.

- It is a scientific attempt to overcome the drawbacks in kindergarten that may happen if child visual perceptual skills have not been developed in the right way.
- It offers an electronic mind maps based content suits children needs and characteristics.

### **Research Methods**

The researchers employed a quasi-experimental method. The quantitative analysis of the data allowed the researcher to make comparison between the scores on pre-posttests. The research design will involve two groups of students. Teaching with E-mind map based content was the main independent variable as one group was taught by it while the other group experienced a traditional class. All key characteristics of a quasi-experiment were included on this study: (1) pre and post-test, and (2) assigned control and experimental groups. Statistical analysis was integrated in tables and figures throughout the research to provide a clearer and accurate reflection of the research findings.

### **Research Participants**

Two classes –K.G One at Smart vision School-6th October, Egypt served as the participants in this research. Approximately 50 students (two classes with 25 enrolled in each class) participated in the study and they were chosen randomly.

### **Delimitations and Limitations of the Research**

This research was applied on (50) children KG one from smart vision language school, 6th October in Egypt. The research was carried out during the second semester of the scholastic year 2014-2015 to develop visual perceptual skills through designing an English content using mind mapping application. The English content is alphabets and some group categories.

### **Research Variables**

The study contained the following variables:

The independent variable: Electronic mind maps based content.

The dependent variable: Visual perceptual skills.

### **Research Tools**

- Visual Perceptual Skills Test-Revised.
- Experimental treatment tools are:
- Mind Maps Specification check list.
  - Electronic mind map based content.

### **Review of Literature and Related Studies**

#### **Mind Maps**

Mind mapping origins date back to the third century. It was presented in different ways such as note taking, problem solving, brain storming, learning and visual thinking but it was patterned as a separated form and term that has its basic principles by Tony Buzan who make it popular and used everywhere.

Mind mapping is a revolutionary system for capturing ideas and a creative technique that improves learning. ( Mento, Martinelli& Jones, 1999, p. 391). It is based on radiant thinking which is a way of generating ideas and increase the range of possible associations arranging information , so it is very effective way of arranging information and recall (Chik, 2008, pp.1-2). Mind map is simply the best tool as it involves your whole brain during learning and it is a visual tool to generate ideas and develop concepts, teachers should use it at learning. Aljarf (2011,p. 4); Mohidin (2010, p. 4); And Urban (2006, p. 5) summarized its significance as it could help you to :

- Be more quick and efficient at your work.
- Think and solve challenges.
- Find solutions.
- Remember and make you more creative.

Further researches and studies have proven the its significance and explore the most prominent advantages and benefits to be summarized in the following points (Serrat, 2009,p. 1)

- Spread enthusiasm so learner more cooperative and willing to receive more knowledge.
- Make presentations and lessons more enjoyable both for the teacher or student.
- Provide flexibility to teacher materials

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- Allow student to get better grades in tests as it connect his ideas with the target material.
- Clarify not only the fact but the relations between these them unlike the written text so it provides deep understanding for the subject.
- Take less space than the written notes as learner could summaries about 10 to 1000 pages of traditional notes in just on big mind map.
- Help dyslexia students as it provide them with more integration and speed in self-expression.
- Give the mind a whole structure of any subject.
- Enhance understanding and recalling information.

Emerging literature in higher education recognizes mind mapping as a potential teaching and learning strategy which actively engages learners in integrating information in a meaningful non-linear ( D'Antoni, Pinto, Olson, Cahill, 2010 ; Farrand, Hussain, & Hennessy, 2002; Zipp, Maher, &D'Antoni, 2009; Wickramasinghe, Widanapathirana, Kuruppu&Liyanage , 2007).

Mind mapping has been proposed as a tool in education to encourage active learning. It reflected improvement in the accuracy of the student's recapitulation of information (Safran, 2009, p. 215)

While Polsen (2004) results revealed positive signs to the majority of students who emphasized that Mind Mapping with its innovative aspects offered a great flexibility in their learning and improved their confidence and add more positive attitudes towards learning.

Mind mapping is also used in Higher Education to help students with dyslexia as Disability Office in university of Edinburg (2006) declared that Inspiration mind mapping software is a useful program for dyslexic students and others who suffer organizing ideas and written work difficulties. Most of recent researches use mind mapping in different subjects along with different stages have approved its magnificent success in Education such as Munim and Mahmud (2011) concluded that mind map is a powerful tool to improve research performance presentation and academic reading, while Mekled (2011) recommended developing social studies curriculums using electronic mind maps. In addition, D'Antoni and Pinto Zipp (2005) found that 10 out of 14 of their students agreed that

the Mind Map technique made them better to organize and integrate their course material.

According to several researches' recommendations, mind maps should be a part of learning process whether to design different training programs based on mind maps in higher education institutions or develop contents using mind maps. It is also necessary to provide teacher with training to use such tool in their daily lesson plans specially kindergarten teachers who should develop their methodologies and instructional tools using electronic mind maps (Agwan, 2013; Khalil, 2013; Mekled, 2011).

with a closer look, E-mind maps had been recommended as in study of Al-Jarf (2011) showed how the mind mapping software is used in grouping and classifying words on the basis of sound-symbol associations. It concluded that mind maps can be used in introducing phonics rules.

A study by Abi-El-Mona and Adb-El-Khalick (2008) revealed that science students who used mind mapping achieved higher achievement in conceptual understanding and practical reasoning than students using traditional study techniques Based on all these researches and its recommendations, the researcher used electronic mind maps with kindergarten stage as a tool developing teaching experience.

### **Visual perceptual skills**

Visual perception is the brain's ability to organize and interpret what is seen (Deiner, 2005, p. 233).while Erhardt and Duckman (2005, p. 138) define visual perception "as the process of obtaining and interpreting information from the environment". According to Gardner (1996, p. 8) the term visual perception is: "the ability of the brain to understand and interpret (make sense of) what the eyes see; and based on understanding and interpretation, it is the ability to express the meaning verbally or motorically". Modeling the human perception is challenging mainly because it involves not only the eye but also the brain. And as (Borsting, 2006, p. 36) pointed out that visual perception is part of the learner's visual information processing which involves a set of perceptual and cognitive aspects which is necessary to extract and organize visual information from the environment.



E.Gordon in his book theories of visual perception (2004, PP. 22-198) points out in depth the Six very different approaches to theorizing in perception as Gestalt theory, Brunswick's probabilistic functionalism, The neurophysiologic approach to visual perception, Empiricism: perception as a constructive process, Direct perception and ecological optics: the work of J. J. Gibson, Marr's computational approach to visual perception.

visual perception is closely linked to learning in early child development. Learning is based on sensory motor experiences as through movement children learn about themselves and objects or through reaching the child learns about space or crawling the child gains as an understanding of spatial relationships and through manipulation the child discovers meaning of objects, people, own body image and self-concept.( Fair, 2003, p. 1)

visual perception is useful for children in the development of reading, writing, and spelling skills, mathematics, and for the development of other skills which are essential for success at school. At the foundation of the concept of visual perception are the importance of such visual concepts that include visual reading/writing, visual experiences, visual language, and visual communication. ( Kurtulmuş&Temel, 2013, p. 43).

visual perceptual skills as (Brown, 2008, p. 2) defines them simply as visual perceptual skills as being made up of a number of sub-skills.while Martin (2006) summarized them according to The Test of Visual Perceptual Skills Revised (TVPS-R) by Gardner 1982, the test developer. Gardner views visual perceptual skills as several elements and, hence, the TVPS-R evaluates seven visual perceptual sub-skills as follows: (1) visual discrimination, (2) visual memory, (3) visual-spatial relationships, (4) visual form constancy, (5) visual sequential memory, (6) visual figure-ground, and (7) visual closure) and this research has been applied on these seven skills.

visual perceptual skills especially in children first years of life. kindergarten stage as it represents the first years in child's life consider the most important ones as they are a formative stage when the child acquire his habits and manners and exposes to new experiences and interactions that affect later his future (Eshra, 2011, p. 77). Attention must be paid for this stage because Children represent the most important segment of the society as they are the future

generations (Khalil, 2013, p. 2). That's all illustrating the main relation between visual perceptual skills and its importance especially in kindergarten. Teachers should use new visualized tools to enhance these skills which highlight the significance of the target group of this research along with using electronic mind maps as a rich visual presentation.

Occupational therapists and other practitioners often assess and treat visual perceptual problems occurring in school-aged children (Kalb&Warshowsky, 1991; Todd, 1993; Wright, Bowen & Zecker 2000). Difficulties in this skill area can have a negative impact on a number of occupational performance and functional skill areas for children that include problems in reading, spelling, cursive and manuscript written output, and math (Cornoldi, Venneri, Marconato, Molin., 2003; Schneck&Lemer, 1993; Solan&Ciner, 1989; Weil &Amundson, 1994).

Further studies as (Bruce,Green& Georgeson,1996; Burn& Watson,2000; Elsayed, 2003) demonstrate that most of learning disabilities related to deficiencies in visual perception as most of these children have many difficulties in visual discrimination ,figure-ground perception, form constancy, spatial relations. Beside that , more recent researches such Amer (2005), Elgabry (2005), Al-Haroub (2010) and El-Sayed (2003) agreed all that in early stages of formal education ,visual perception deficits is a main reason for learning disabilities and early intervention will be useful and serves as a sort of remedy for those who suffering and struggling in Academic performance.

The researchers conclude the importance of visual perception specially its' maturing at early stages and assumed that using mind maps would provide learners with rich visualization including colors, font sizes, shapes, images that stimulate their minds to understand new meanings easily .children can struggle specially in academic performance if they have poor visual processing skills. This research aimed to be as a kind of early intervention to develop these skills using the suitable teaching tool that present various rich stimuli ( excluding any defect from the organic side that's need a vision therapy).

## **Research procedures**

### **Design E-mind maps Based Content**

The researchers made use of Kemp's model which is also known as Morrison, Ross and Kemp's model (MRK) in building up the E-mind map based content as studies like (Herridge Group (2004); Kruse (2009); Obizoba (2015); Twilley (2014)) clarified its advantages as a classroom oriented model, could be applied easily by teachers, require minimal resources, and extremely flexible. The following is how Kemp's model was applied:

**1-Identify instructional problems and specify goals**

The main instructional problem is that kindergarten curriculums should be developed and presented in a way that meets children's characteristics along with developing their main initial skills that are needed for this stage. The researchers referred back to literature related to the main problem and find that visual perceptual skills are the most important skills that are needed in kindergarten stage. Therefore, this research introduced something as an early intervention for developing these skills for kindergartners. Being certified in a mind mapping course and trained many kids to draw a manual mind maps, the researchers believe in using the mind map as a powerful tool that could be designed according to kindergartener's needs and characteristics. So, the main goal of this research is to recognize the effectiveness of this electronic mind map based content to develop some visual perceptual skills of kindergartners.

**2-Examine learner characteristics**

Kindergartners averaged 4-6 and this stage of childhood is characterized by the rapid development at all levels: physical, cognitive, social and emotional. The main characteristics of preschool learner is summarized according to (Child and Adolescent Health service 2013; College Board (2012); Aschraft (2009); National Resource Center(2009) ) as follows:

- They enjoy copying designs, shapes, letters and numbers.
- They have a short attention span, only about 20 minutes.
- They may reverse printed letters (b/d).
- They sort objects by size, and by what sort of thing they are such as animals. Colors or shapes.
- They develop eye-hand coordination.
- They develop fine motor skills.
- They are very active and likes to do things like climb, hop, skip and do stunt.

The current research respected these characteristics and introduces the suitable rich visual content which helped them developing their visual perceptual skills.

### **3- Stating instructional objectives for learner**

The main goal of the research is focusing on some visual perceptual skills not measuring achievement the English content so the learner by the end of the program, should show improving in the following visual perceptual skills for kindergartners: Form Constancy, Visual Discrimination, Figure-Ground, Visual Closure, Visual Memory, Visual Sequential Memory and visual spatial relationships.

### **4- Identify subject content**

K.G one English curriculum: alphabets and some basic group categories has been selected as it is the main content trough this stage so it needs to be introduced in an interesting and organized way.

### **5-Design instructional strategies so that each learner could master the objectives**

Mind maps not only considered as a tool that develop a content but an instructional strategy as well that motivate and help kids focus attention and organize information for understanding and remembering and some researchers considered it as advanced graphic organizers approach. The researchers alsoused the direct instruction and modeling strategy as simple instructional one with kindergartners.

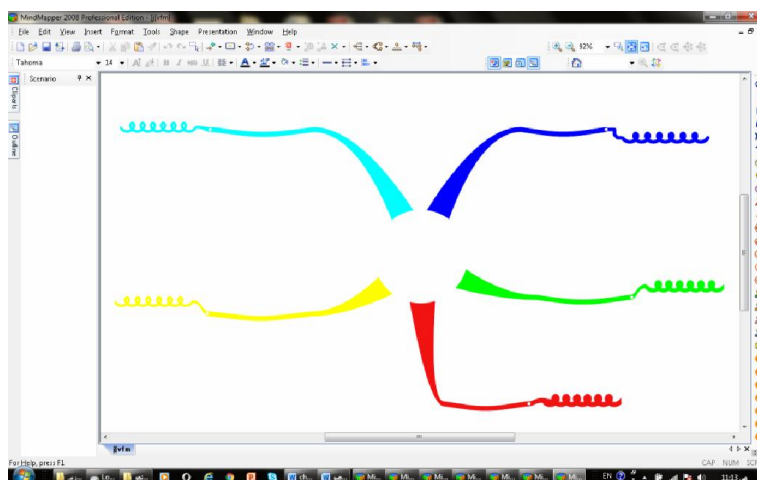
What is important here is to use various strategies to remain flexible and observant and as Copple and Bredekamp (2006) summed up the most important steps with kids such as Encourage, give specific feedback model, create or add challenge, give a cue, hint, or other assistance and provide information. The following paragraph reflects a little hint on how these steps have been used in the classroom along with displaying the electronic mind maps .Kids were encouraged by saying ( “yes, keep trying”, “wow, you say it in an accurate way”) rather than giving evaluative praise. moreover, using specific feed back to them “yes, this is true direction of the letter “D d” they looks like talking to each other, not like “Bb”. ) ,and as kids learning through modeling, the researchers were displaying the desirable way of behaving for example, the researchers whispered when want them to low their voice or when imitating an animal etc. Besides that, The researcher used the simple direct instruction to provide a specific information such as pointing to the mind map and read it with them “this is letter p” and its word “penguin”, notice the sound /P/”). The

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researcher run, hop and sing with kids while the electronic mind maps display a song or a video to meet their characteristics.

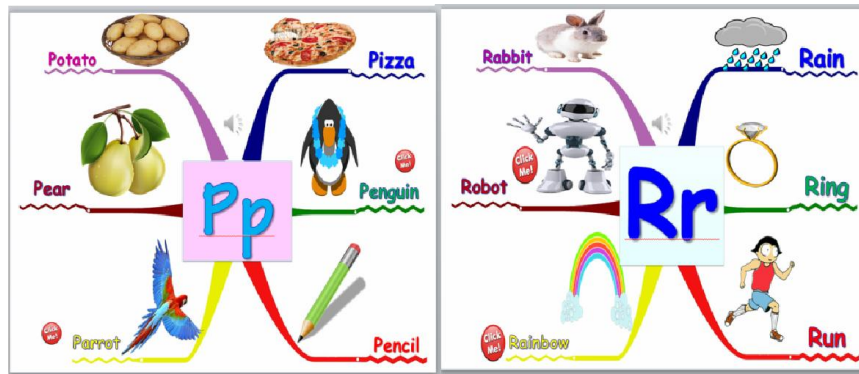
### 6- Designing the message (planning instructional delivery)

The content has been designed using electronic mind map application which is mind mapper professional edition 2008. These Mind maps were designed according to mind maps specifications check list that have been designed according to mind maps laws. Appendix (1). Then, it was reviewed by experts in various fields such as education technology, Kindergarten and E-learning. The required modifications were made by the researcher to make the final pattern of the E-mind maps ready to be conducted Appendix (2). E-Mind maps based content was designed according to these specifications. For example, choosing central image that represents the topic, use different colors and various shapes of branches whether curved, angled, merged and cornered.



*“figure.(1)” Curved and waves up branches*

Moreover, a rich elements have been added to the E-mind maps such as real and animated pictures, hyperlinks with symbol : ( click me) that displays songs ,pictures and videos, Adding a voice button that display the articulation of the alphabets which make it interactive maps not a static ones.



"Figure.(2)" Samples of final E-mind maps

### 7- Developing evaluation instruments to assess objectives

Visual perceptual skills test (pre-posttest) has been conducted to investigate the effectiveness of using E-mind maps on developing some visual perceptual skills. The researchers chose to apply mainly most integrated test of TVPS-R (Test of Visual Perceptual Skills-Revised). It was designed and developed by Morrison F. Gardner and its advantages as (Brown & Gaboury, 2006, pp 182-193) mentioned lies in: The test assesses all sub-skills of visual perception: Visual Discrimination, Visual Memory, Visual-Spatial Relationships, Visual Form-Constancy, Visual Sequential-Memory, Visual Closure and Visual Figure-Ground. It was designed for use by psychologists, education diagnosticians, teaching specialists, developmental optometrists, occupational therapists, and even by kindergarten and elementary teachers which add more practicality to the test. It is designed for use with school age children between 4 and 12 years of age. They responded by selecting the correct choice from a multiple choice format that does not require motor responses such as drawing or copying shapes. It takes approximately 30-45 min to administer the TVPS-R depending on the age of the child and 5-10 min to score so scoring is quick and not complex.

Being so easy to apply and could be introduced in all languages and cultures, Sayed Ibrahim Elsamadony prepared the test to be applied in Egypt 2005. Test materials are: TVPS examiner's manual, 2 test booklets, score sheet. The manual contains an updated review of literature pertaining to the importance of visual perceptual ability and all instructions needed for the examiner.

### Selecting resources to support instruction and learning activities

The current research needs: computer, a classroom with good ventilation, mind mapping software and a projector.

### Summary of Research Implementation

- Reviewing previous researchers and studies concerning mind maps and visual perceptual skills.
- Preparing E-mind map specifications check list to design the content.
- Designing the E-mind maps based content according to kindergarten characteristics.
- Selecting a proper visual perceptual skills test to be applied
- A formal letter from The Egyptian ELearning University (EELU) was prepared to facilitate the research procedures. Smart Vision Schools at 6th October-Egypt has agreed to host the researchers to apply the research.
- Two classes were selected randomly to serve as a research sample and each is 25 students.
- A warm up meeting was held with the kids and played with them to create an atmosphere of intimacy and fun.
- The researchers practice carefully all test instructions.
- The pretest was applied to both groups and there was statically non-significant.

“Table. (1)” Total results (Mean values± SDs) for both control and experimental groups pre-test

Variables	Pre-test		Statistics P value
	Mean ± SD		
	Control	Experimental	
<b>VD</b>	5.28±1.43	5.32±1.37	0.9349 ns
<b>VM</b>	5.6±1.98	5.72±1.8	0.8590 ns
<b>VSR</b>	5.18±1.72	5.88±1.58	0.7356 ns
<b>VFC</b>	5.32±1.78	5.76±1.6	0.8059 ns
<b>VSM</b>	3.04±1.89	4.2±2.3	0.1249 ns
<b>VFG</b>	4.8±1.2	5.48±1.5	0.166 ns
<b>VC</b>	5.76±1.6	5.32±1.37	0.3955 ns
<b>Total</b>	34.981±5.912	37.68±8.75	0.5426 ns

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\*; significant ( $p < 0.05$ ) ns; non-significant ( $p > 0.05$ ). VD for Visual Discrimination, VM for Visual Memory VSR for Visual-Spatial Relationships, VFC for Visual Form-Constancy, VSM for Visual Sequential- memory, VFG for Visual Figure-Ground Memory, VC for Visual Closure

\*Degree of freedom 48

- The experimental group learnt by electronic mind maps, while the control one learnt using the traditional method.
- Posttest was applied for the two groups and scored.
- Descriptive statics were calculated for all TVPS variables using Assistat 7.6 statistics software for Windows (Campina Grande, Paraiba state, Brazil). P values  $\leq 0.05$  are considered to be statistically significant in all tests. to have results and research recommendations

## Results and Discussion

In general the results shows that there were significant effects in using E-mind map based content on developing kindergarteners' visual perceptual skills and the following explains in details the findings related to the research questions.

### Findings related to Question (1):

#### Question (1): What are the most important visual perceptual skills for kindergartners?

To answer this question, the researchers summarized them in seven skills according to literature review they are: visual discrimination, visual constancy, visual memory, visual figure-ground, visual closure, visual spatial skills and visual sequential memory. Moreover, any skill has a relation with a motor skill has been excluded so that results are not affected by child ability to write or draw to evaluate his/her visual perceptual skills.

### Findings related to Question (2):

#### Question (2): What are the perspectives of an electronic min maps based content to develop visual perceptual skills for kindergartners?

To answer the second question, the researchers determined the main perspective to design E-mind map based content according to literature review and a specifications mind maps check list was prepared to design the E-mind maps and evaluated by the specialists and the degree of specifications' availability was ranging from



76.19 % to 100% and all modifications were conducted. Furthermore, Kemp's model was used too to build the E-mind map based content as an overall instructional strategy. Some Samples of the final pattern of E-mind maps Appendix(2).

**Findings related to Question (3):**

**Question (3): what is the effectiveness of an Electronic based content on developing some visual perceptual skills of kindergartners?**

To answer the third question - which is the main question of this research- the researchers examined the three research hypothesis as the following:

The mean values for each sub-skill is presented to have more accurate results and to be sure that each skill is developed individually and not affected by the total score of the test as was recommend in Brown (2008) that summing the whole subscale may not evaluate in accurate way children's overall visual perceptual skills.

**Hypothesis (A)**

**There are statistical significant differences at the level of ( $\alpha \leq 0.05$ ) using E-mind map based content between the post-test of both the control group and the experimental group on developing visual perceptual skills in favor of the experimental group.**

The researchers used (Independent Samples t-test) to investigate the significance of the differences according to the total average score of the tool of the research by measuring the mean of the children scores on the post test of the two groups. The total mean values and standard deviation for both control and experimental group posttest are summarized in table (2) .

“Table.(2)” Total results (Mean values±SDs) for both control and experimental groups post test

Variables	Post-test		Statistics P value
	Mean ± SD		
	Control	Experimental	
<i>VD</i>	5.28±1.19	10.68±1.64	<0.0001*
<i>VM</i>	5.44±1.7	11.48±1.98	<0.0001*
<i>VSR</i>	5.6±1.47	11.00±2.16	<0.0001*
<i>VFC</i>	5.68±1.3	9.64±1.57	<0.0001*
<i>VSM</i>	2.96±1.7	7 ±1.84	<0.0001*
<i>VGF</i>	4.64±1.1	9.72 ±1.25	<0.0001*
<i>VC</i>	5.4±1.38	8.64 ±1.36	<0.0001*
<i>Total</i>	35±6.24	68.16±8.61	<0.0001*

\*; significant ( $p < 0.05$ ) ns; non-significant ( $p > 0.05$ ) VD for Visual Discrimination, VM for Visual Memory VSR for Visual-Spatial Relationships, VFC for Visual Form-Constancy, VSM for Visual Sequential- memory, VFG for Visual Figure-Ground Memory, VC for Visual Closure.

As have been illustrated in the previous table, the total mean value of the experimental group was higher than that of control group. The difference between both control and experimental group value was statistically significant ( $P < 0.05$ ) as indicated by independent sample t-test which indicated that children of the experimental group achieved better results than children of the control group. This finding revealed that using E-mind map based content had an effect to improve these visual perceptual skills.

#### **Hypothesis (B)**

**There is statistical significant difference at the level of ( $\alpha \leq 0.05$ ) between the pre-test and post-test of the experimental group on developing visual perceptual skills in favor of the post -test.**

The researchers used (paired Sample T-Test) to investigate the significance of the differences according to the total average score for the tool of the research by measuring the mean of children scores on the pre-test and the post-test of the experimental group. The results are illustrated in table (3)

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“Table.(3) “Total results (Mean values±SDs) for experimental groups pre - post test

<i>Variables</i>	<i>Experimental</i>		<i>Statistics P value</i>
	<i>Pre-test Mean ± SD</i>	<i>Post-test Mean ± SD</i>	
<i>VD</i>	5.32±1.37	10.68±1.64	<0.0001*
<i>VM</i>	5.72±1.8	11.48±1.98	<0.0001*
<i>VSR</i>	5.88±1.58	11.00±2.16	<0.0001*
<i>VFC</i>	5.76±1.6	9.64±1.57	<0.0001*
<i>VSM</i>	4.2±2.3	7 ±1.84	<0.0001*
<i>VGF</i>	5.48±1.5	9.72 ±1.25	<0.0001*
<i>VC</i>	5.32±1.37	8.64 ±1.36	<0.0001*
<i>Total</i>	37.68±8.75	68.16±8.61	<0.0001*

\*; significant (p < 0.05) ns; non-significant (p>0.05) VD for Visual Discrimination, VM for Visual Memory VSR for Visual-Spatial Relationships, VFC for Visual Form-Constancy, VSM for Visual Sequential- memory, VFG for Visual Figure-Ground Memory, VC for Visual Closure.

As have been illustrated in table (3 ) there was a significant difference at the level of (a<=0.05) in using E-mind map based content on developing visual perceptual skills between the pre-test and posttest of the experimental group in favor of the post-test which validate this hypothesis and to measure the extent of this effectiveness ,the researcher examined the third hypothesis as the following :

**Hypothesis (C)**

**There is a significant effectiveness of E-mind map based content on developing visual perceptual skills in favor of experimental group.**

For testing this hypothesis Constant Black was used to the score means for both the control and experimental group in the post test to recognize the effectiveness of E-mind map based content in developing visual perceptual skills for kindergartners and its’ results as follows:

*"Table.(4)" Value of Constant Black for the effectiveness of E-mind map based content*

Score means for Cont. Group	Score means for Exp. Group	Total Score	Black Value	Significance
35	68.16	112	1.352	Accepted

And as have been shown in table (4) the Black value is 1.352 which is an accepted value and proved the positive effectiveness of using E-mind map based content on developing visual perceptual skills of kindergartners.

Finally, the results of this research are consistent with all previous studies that used electronic mind maps as powerful tool in education at different levels as (Aloufi(2011); Khalil (2013); Mekled,(2011); Munim& Mahmud, (2011); Ragheb (2013); Zaki (2014) ).Moreover, it assured the importance of introducing rich visual presentation to develop visual perceptual skills as in ( Elgarhy, (2009); Rayan (2013); Saqr (2011) ).

In this research, visual perceptual skills of kindergartners has been developed using electronic mind maps because the whole design of the electronic mind maps simply is consistent with brain and fully utilizes both of the left and right brain which made children more engaged in the learning experience and information structured in a way that mirrors exactly how the brain function in a radiant rather than linear way.

During classes, the researchers noticed that children were so excited and waiting daily for mind maps session. Moreover, most of children who were trouble makers or distracted easily became more concentrated and that is so consistent with the study of Good and Woods (2002) indicated that students perceived mind mapping as fun, interesting and motivating approach in learning while a study conducted by new church community primary schools in Warrington declared that students improved concentration and staying on tasks for longer time when using mind maps. So mind maps as a whole approach is more interesting and keep children more them concentrated and focused instead of their boring booklets.

Closer look to the sub-skills of visual perception, we could find the relation between theses sub skills and the design elements of

### **The Effectiveness of E-mind maps Based Content on Developing Visual Perceptual Skills of Kindergartners**

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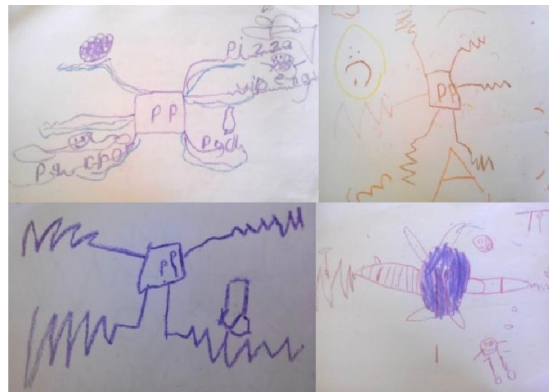
electronic mind maps. The starting point to explain a mind map for children is to read it clock wise which provide them with continuous sequence which could help in improving their visual sequential memory. Concerning visual memory, E-mind maps uses images which considered an excellent memory aids as our ability to remember image is more better than remembering words as in Anglin, Hossein, Cunningham (2004) assures pictures superiority effect on our memory which supports the value of imagery. What's more, study of Toi (2009) shows that using mind maps help children to recall words more effectively than using a list with improvement memory up to 32% whereas the study of Ferrand, Hussain, and Hennessey (2002) showed improving on the long memory of factual information by 10%.

All these findings are a clear interpretation of the results that electronic mind maps developed the visual memory and visual sequential memory. Furthermore, electronic mind maps uses symbols , branches with many different shapes connected to the central image to show connection between the topic and its words and brain works by association and like things to be together .Moreover, one word or picture per branch make it simple and not crowded background so children easily differentiate between images and letters. And being designed with many colors, font sizes, various shapes of branches, it improved their visual discrimination, visual closure, form consistency, Spatial Relations and figure ground as Elgabry (2005) and Amer (2005) that showed the development of visual perceptual skills through using colors and shapes and identified simple elements for the background not a crowded one to make it clear to differentiate figure-ground. Mind mapping to both verbal linguistics and visual-spatial intelligence through its combination of graphics, symbols, and text as Goodnough and Woods (2002) has been mentioned in their study.

Also, using icons such: click me and sound button, add clarity and contextual meaning to the topic and could be understood easily by children.

After only 3 sessions, they became so familiar with the E-mind maps and easily recognized the functions of each sign, for example, (click me) would display a video.

Many kids started to copy the mind maps in their sheets - although they are so young and still practice pre-writing activities, which is a clear proof that they could easily copy, paste and interpret what they see, and a clear indication of developing their visual perceptual skills.



*“Figure.(5)” Sample of children hand-drawn mind maps*

The findings suggested that children demonstrated an improvement in their scores on the visual perceptual skills test due to learning with E-mind map based content; moreover, they enjoying lessons and having a great fun. Children showed more attention and concentration to the syllabus more than the children who learnt with the traditional method.

## **Recommendations and Suggestions for Further Research**

Based on the results of the research, the following points are suggested:

- Developing kindergartencurriculum in way that could be designed using electronic mind maps.
- Introducing training course for kindergarten teachers concerning design electronic mind maps according to its specifications and their audience characteristics.
- Focusing on teachers' lesson planning to develop their techniques in planning their syllabus and presentation using E-mind maps.

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- Raising the level of awareness of teachers about the skills of visual perception, especially in the early stages of education
- Providing courses for teachers to study the psychological, physical and cognitive development of the learner stage.
- Designing ready-made E-mind maps that are designed according to its specifications to be a reference for teachers.

Finally, the researchers would like to suggest the following issues for further research:

- The effectiveness of E-mind map based content on developing reading skills of kindergartners.
- The effectiveness of E-mind map based content on developing spelling skills.
- The effectiveness of E-mind map based content on improving English phonics of kindergartners.
- The effectiveness of E-mind map based content on improving concentration of ADHD children.
- The effectiveness of E-mind map based content on developing children court skills.

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## Appendices

### Appendix 1 : Specification E-mind maps check list

ملاحظات	درجة توافر الموصفات			المعيار
	يتوفر بدرجة ضعيفة	يتوفر بدرجة متوسطة	يتوفر بدرجة كبيرة	
	١	٢	٣	
<b>1- General structure:</b>				
				1. Each map is Artistic تتسم كل خريطة بلمسة فنية
				2. Each map is Colorful كل خريطة مفعمة بالألوان
				3. Each map is Hierarchical كل خريطة هيكلية
				4. Each map is Radiant كل خريطة مشعة تنطلق من الوسط فقط
				5. Present simple and clear subjects تعرض كل خريطة موضوع بسيط وواضح لأطفال
				6. All images are relevant to the main topic (theme) كل الصور تتفق مع الموضوع الرئيسي
				7. Free repeated words لا تحتوى على كلمات مكررة
				8. Landscape orientation مصممة بعرض الورقة وليس بطولها
<b>2- Basic elements</b>				
<b>2-1 Words</b>				

ملاحظات	درجة توافر الموصفات			المعيار
	يتوفر بدرجة ضعيفة	يتوفر بدرجة متوسطة	يتوفر بدرجة كبيرة	
	١	٢	٣	
				9. Main words (themes) are emphasized تتسم الكلمات الرئيسية بالوضوح والتميز
				10. Single key words for the central branches. كلمة واحدة مفتاحية على كل فرع
				11. Each word printed along the branch. كل كلمة مناسبة لطول الفرع
				12. Each word sit on its own branch. كل كلمة قريبة من الفرع غير ملتصقة به (تعرض فوق الفرع وليس عليه)
				13. Biggest size font used for the central word. تكتب الكلمة الرئيسية في المنتصف بأكبر خط
				14. Smaller font size used for the main words. الكلمات المحورية بحجم خط اقل من الكلمة الرئيسية.
				15. Words are in a clear readable font types. الخطوط المستخدمة للكلمات واضحة وسهلة القراءة
				16. Words presented in different colors تعرض الكلمات بألوان مختلفة
<b>2-2 Images</b>				
				17. The central image is unframed and colorful. الصورة المركزية ملونة وبلا إطار
				18. The central image relevant to the main theme. الصورة المركزية تتوافق مع المحتوى الرئيسي
				19. Each image sit on its own branch. تعرض كل صورة على الفرع الخاص بها

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ملاحظات	درجة توافر الموصفات			المعيار
	يتوفر بدرجة ضعيفة	يتوفر بدرجة متوسطة	يتوفر بدرجة كبيرة	
	١	٢	٣	
				20. Different forms of images between still , animated and three-dimensional . التنوع الصور ما بين صور ثابتة ومتحركة و ثلاثية الأبعاد
				21. Different forms of images between real and clipart التنوع بين استخدام صور واقعية وصور كرتونية (مرسومة)
				22. High definition images- not pixel الصور المستخدمة عالية الدقة
<b>2-3 Branches (connected lines)</b>				
				23. Main central branches are curved and flowing. الفروع الرئيسية مموجة وانسيابية
				24. Main central branches designed in more than 3 colors. صممت الفروع الرئيسية بأكثر من ٣ ألوان
				25. Each branch is same length of the word. يتناسب طول الفرع طول الكلمة التي يحملها
				26. Each branch is same length of the image. يتناسب طول الفرع مع طول الصورة التي يحملها
				27. Central branches are the thickset الفروع الرئيسية هي أكثر الفروع سماكة
				28. Central branches are connected to the central theme. الفروع الرئيسية ملصقة بالموضوع الرئيسي
				29. Sub-branches are thinner الفروع الثانوية اقل سمكا من الفروع الرئيسية
				30. Sub-branches connected to the central ones الفروع الثانوية ملصقة بالفروع الرئيسية

Appendix 2 : sample of the final E-mind maps

