

Interactive Infographic and the Development of Visual Perception Skills among Students with a Level Of Information Processing (shallow-deep)

Provided by

FatmaElzahraa Abdel Hady Ahmed

Researcher in Instructional Technology

Prof.Dr/ Zeinab Mohamed Amin

Professor, Head of Instructional Technology Department and Dean

Former Faculty of Specific Education - Minia University

prof. Dr/ Eman Zaki Mousa Mohamed

Professor of Instructional Technology and Vice Dean for Specific

Education Affairs Education and Students - Minia University



مجلة البحوث في مجالات التربية النوعية

معرف البحث الرقمي DOI: 10.21608/jedu.2022.143005.1684

المجلد التاسع العدد 44 . يناير 2023

الترقيم الدولي

P-ISSN: 1687-3424

E- ISSN: 2735-3346

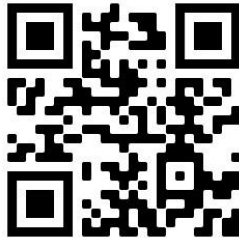
<https://jedu.journals.ekb.eg/>

موقع المجلة عبر بنك المعرفة المصري

<http://jrfse.minia.edu.eg/Hom>

موقع المجلة

العنوان: كلية التربية النوعية . جامعة المنيا . جمهورية مصر العربية



Interactive Infographic and the Development of Visual Perception Skills among Students with a Level Of Information Processing (shallow-deep)

Abstract:

The current research aims to develop visual perception skills of students with information processing level (shallow - deep) by using an interactive infographic-based learning environment. Students were classified by classifying students according to their level of information processing by a scale of information processing level, research was applied to a sample of students instructional technology division - Faculty of Specific Education - Minia University, consisted of (50) students, and the experimental treatment material was represented in an electronic learning environment based on interactive infographics, the measurement tools were represented in the scale of information processing level to classify students according to the level of processing (shallow-deep), a test of visual perception, results showed that that students of the research group (the second experimental one with the level of deep processing) increased their scores in the post-measurement of measurement tools to test visual perception. Compared to the shallow level (first experimental group)

Keywords:

Interactive Infographic, Information, Visual Perception

Introduction

The latest huge amount of data and information has developed in the ways of presenting and processing information; This prompted specialists to search for innovative ways to facilitate the assimilation of that huge amount of information to understand and exchange it, and accordingly there is one way to deal with large amounts of data and information through infographics. Infographics with the spread of social media as a means of visually displaying information.

(Abdel-Raouf Ismail, 2016; 114) indicated that the infographic has become one of the important tools in the production of effective electronic content that quickly attracts the attention of users, and can tell them a large amount of information in a quick and easy way. Watching instead of reading, and therefore there are many writings that do not receive much attention.

The infographic is one of those technological innovations that provide a visual representation of knowledge and ideas, which facilitates the learning process. The infographic is not only a tool for transferring knowledge, but a tool for building knowledge and ideas and understanding relationships and various phenomena through graphics, shapes, and fixed and interactive images, which helps to consolidate and embody various concepts and knowledge in the mind Learner makes it interesting and more effective. (Gebre, E. 2018,7-9), information processing has developed greatly since the beginning of the twenty-first century, and the main reason behind this is the huge amount of data and information that needs to be absorbed, which called on specialists to search for innovative ways of communication to facilitate the absorption of that huge amount Accordingly, there is one way to deal with large amounts of data and information, which is the infographic, through which the information can be processed in a visual form that makes it easier for the beneficiaries to absorb (John, et al., 2014, 2)

Visual perception passes through a set of stages that begin with receiving the stimulus, then transforming and transferring the visual stimulus to the centers of perception and processing of visual information in the brain, then analyzing and realizing the visual stimulus. Meaning with specific significance, and the

learner uses that information in different situations after storing it in visual memory and retrieval with the aim of using it again (Shaheen Raslan, 2010, 86).

(Abdel-Raouf Ismail, 2016; 114) indicated that the infographic has become one of the important tools in the production of effective electronic content that quickly attracts the attention of users, and can tell them a large amount of information in a quick and easy way. Watching instead of reading, and therefore there are many writings that do not receive much attention.

The infographic is one of those technological innovations that provide a visual representation of knowledge and ideas, which facilitates the learning process. The infographic is not only a tool for transferring knowledge, but a tool for building knowledge and ideas and understanding relationships and various phenomena through graphics, shapes, and fixed and interactive images, which helps to consolidate and embody various concepts and knowledge in the mind Learner makes it interesting and more effective. (Gebre, E. 2018,7-9), information processing has developed greatly since the beginning of the twenty-first century, and the main reason behind this is the huge amount of data and information that needs to be absorbed, which called on specialists to search for innovative ways of communication to facilitate the absorption of that huge amount Accordingly, there is one way to deal with large amounts of data and information, which is the infographic, through which the information can be processed in a visual form that makes it easier for the beneficiaries to absorb (John, et al., 2014, 2).

Visual perception passes through a set of stages that begin with receiving the stimulus, then transforming and transferring the visual stimulus to the centers of perception and processing of visual information in the brain, then analyzing and realizing the visual stimulus. Meaning with specific significance, and the learner uses that information in different situations after storing it in visual memory and retrieval with the aim of using it again (Shaheen Raslan, 2010, 86).

(Mohamed Khamis, 2015, 350-356) indicated that visual learning depends on the theory of visual perception. The theory of

visual perception includes the process of focusing attention and concentrating information in memory, where these processes begin after receiving information through the eye to reach the brain and depend on previous knowledge and experiences that It is the basis in the process of visual perception, but there are no studies - to the best of the researcher's knowledge - that have focused on employing interactive infographics in developing visual perception skills in order to overcome students' shortcomings in interpreting visual stimuli in the learning environment and difficulties in visual representation of information, and realizing the similarities and differences between stimuli. In terms of color, shape and size, although visual perception is one of the important pillars of the process of processing and processing information, the processing and processing of the learner for the learned material and how it receives it and the stability of the information stored in memory depends on the way in which that information was prepared in the effectiveness of remembering or recalling it, and helps understanding Visual perception and the factors associated with it provide the designer of visual educational materials with a set of principles, foundations, or guidelines that increase the quality of Produced materials of all kinds, and this also helped to increase his awareness of the processes, phenomena and factors that are related to and control the perceptual field, and then increase his ability to link visual design elements to achieve educational goals. Or the one who is determined to be aware of the concepts and information conveyed by pictures or drawings, i.e. the ability to distinguish similarities or differences and knowledge of their distinguishing features, matching them with others or separating them from it and distinguishing between the shape and its background, the ability to complete an idea, or to make an accurate judgment based on partial information, In addition to mixing similar shapes and words, and retaining visual information, and then recalling it later, any disturbance in the cognition process negatively affects the learner's ability to learn and reduces his efficiency in acquiring information, interpreting and visually representing it, as well as employing it and benefiting from it in various situations that require Dealing with different

visual forms, From the above, the research problem has been identified in that the current situation shows a deficiency in the visual perception skills of students with a shallow- deep level of information processing, The researcher identified the research problem from several sources, including:

Exploratory Study:

The researcher conducted an exploratory study on a group of first-year students Department of Educational Technology - Faculty of Specific Education - Minia University, which consisted of (80) male and female students.

This sample was chosen to be studied for a predetermined requirements that serve the research objective represented in the (basics of photography) course, which is part of their curriculum.

A survey was carried out to identify the extent to which students need modern methods of presenting content that differ from traditional methods and the extent to which students know what interactive infographics are, to ascertain the problem of the research.

The results of the questionnaire which were applied, were as follows:

- (99%) of the respondents agreed that adding illustrations helps make the information more understandable and memorable
- (85%) of the respondents agreed that the use of various colors when designing content makes the information more clear
- (94%) of the respondents agreed that interaction with the content increases its effectiveness
- (54%) of respondents agreed that they did not know what an interactive infographic is.

Associated Studies:

- **Studies related to visual perception:** where the results of the study of (Sahar Abdel Hamid, 2015; Maher Saleh, 2014; Havva, 2012) indicated that the process of visual perception is the first pillar of knowledge for the learner, and that the learner depends on perception in the learning process more than his reliance on understanding and thinking. So, studies recommended the need to pay attention to the development of visual perception through the use of images, shapes,

similarities and models for the learners to help him receive various stimuli and experiences in the learning process and build his own experiences and concepts.

- **Studies related to the level of information processing:** where the results of the study of (Manal Mubariz, 2017; Howaida Abdel Hamid, 2016; Amal Al-Sharida, 2012) indicated that the interest in studying the levels of information processing determines the stages of the learner's intake of information and has a significant impact on the processes of memorization and remembering and affects the level learning outcomes and understanding.
- **Studies related to interactive infographics:** There have been many researches that have proven the effectiveness of infographics in their various forms in the educational process for providing courses as a study (Rehab Abdel Wahab, 2017), and that the presentation of visual information and the way it is organized in the infographic is one of the factors affecting the learner's acquisition and retrieval of information. I compared the infographic patterns (fixed - mobile - interactive) to reach a result to prove which one is more effective than the study (Amal El-Sayed, 2016) to identify the effectiveness of the infographic patterns (fixed - mobile –
- interactive) and the results indicated that all infographic patterns have the ability to develop achievement among Students with learning difficulties in geography in the first year of middle school, and the results of (Hassan Farouk and Walid Al-Sayyad, 2016) differed, the results of which indicated the effectiveness of interactive infographics in academic achievement and learning efficiency among students with learning difficulties in mathematics, and a study (Amal Khalil, 2016), whose results showed the effectiveness of Interactive infographic, which has an effective role in attracting the attention of students with mild intellectual disabilities in the ease of learning mathematics and reducing the time spent on working Ley of learning.

Therefore, the current research aims to answer the following main question:

What is the impact of interactive infographics on developing visual perception skills among students with different level of with information processing level shallow-deep?

Research aim:

The aim of the current research is to develop students' visual perception skills with different level of information processing (shallow - deep) by using an interactive infographic.

Research importance :

- 1.Provides a learning environment based on interactive infographics.
- 2.Building a scale for visual perception that is compatible with university learners, and this is not available in Arabic studies - as far as the researcher knows.
- 3.Directing attention to the need to search for practices and applications in the field of learning that correspond to the individual differences that lie in the levels of information processing (shallow - deep) among students of educational technology
- 4.Presenting modern methods to improve the degree and level of depth of learning in the Fundamentals of Photography course.
- 5.Directing the attention of educational designers to the necessity of integrating infographics into educational design .
- 6.links basic approaches in cognitive psychology represented in visual perception
- 7.Considering Between infographic and some mental abilities such as visual perception skills
- 8.Preparing and developing courses according to the interactive infographic technology as a new approach that focuses on creating an attractive visual learning environment for learners to develop the skills of visual perception

Research hypohese :

There is a statistically significant difference at the 0.05 level between the mean scores of the first experimental groups students (with the shallow-deep processing level), before and after the visual perception test

Research limits:

The research adheres to the following limits:

Contents limits: The current research relied on some topics:

Visual perception skills (visual memory, visual closure, perception of spatial relationships, visual identification, shape and ground).

Sample limits: The research is applied to a voluntary sample of (50) students of the first year at Department of instructional Technology - Computer Division - Faculty of Specific Education - Minia University.

Time limits: The research was applied in the first semester of the academic year 2021/2022.

Spatial limits: The research is applied in the Scientific Research Laboratory, Department of Educational Technology, Faculty of Specific Education, Minia University, to apply measurement tools before and after, and to conduct preliminary meetings.

Research and Measurement Tools:

1- Information processing level scale - prepared by Iman Zaki Musa Muhammad Al-Sharif.

2- A scale of visual perception - prepared by the researcher

Experimental treatment material: The experimental treatment material was E-learning environment based on interactive infographics considering the level of information processing to develop visual perception skills among educational technology students, using Adobe Flash Player cs6 program to design the interactive infographic and then Upload them to google classroom e-learning platform .

Research Methodology :

The current research relied on the descriptive analytical approach in preparing the theoretical framework, study tools, analyzing and interpreting the results, and providing recommendations and suggested research.

The research also used the quasi-experimental approach, which is specialized in applying the independent variable (E- learning environment based on interactive infographics considering the level of information processing) on the research sample students and studying its impact on the dependent variable (visual

perception skills) in order to verify the validity of the research hypotheses.

search variables:

The research included the following variables:

First - the independent variable:

a learning environment based on interactive infographics considering the level of information processing Second - the dependent variable: visual perception skills, Experimental design: In light of the research objectives, an experimental design with two experimental groups were selected, as shown in the following table :

Table (1) The experimental design of the research

group	Pre test	Treatment	post
The experimental group with the shallow preparation level	visual perception skills test	environment based on interactive infographics	visual perception skills test
The experimental group with the deep preparation level			

Research Concepts:

Level of Information Processing

It is the space that can be employed from the network of meanings associations within the memory in light of information processing processes (Fathi El-Zayat, 2006, 243).

It is procedurally defined in the current research as: The level of first-year students in the Department of Educational Technology in dealing with information and processing it, and it is determined by the number of vocabulary that can be remembered and the realization of the relationship between them based on cognitive processes such as coding, thinking, attention and problem solving in the information processing level test presented to him and includes a level (shallow- Deep) and it is measured in the current research through the scale of faith Zaki Musa Muhammad Al-Sharif, which is based on the interactive infographic.

Interactive Infographic

It is procedurally defined in the current research as: a learning environment in which the content of the basics of photography is presented after transforming difficult information and concepts into interactive graphics and images in the form of an interactive infographic where learners can understand and comprehend them clearly while achieving the element of interaction between learners and the content presented to them and then presenting it through a platform e-learning google classroom.

Visual Perception skills

The process of interpreting and interpreting visual stimuli, giving them meanings and connotations, and transforming the visual stimulus from its raw image into the gestalt of perception that differs in its meaning and content from the elements involved in it (Abdul Wahid al-Kubaisi, Haider al-Khatib, 2014, 30).

Procedurally defined in the current research as: the ability to understand and interpret the vocabulary presented in the visual perception test and to give them meanings and connotations, and it is measured procedurally by the total score of the visual perception test used in this research.

Theoretical framework and previous studies:

The first axis - the interactive infographic:

Graphics have been used since the early beginnings of human existence, as a language of communication by expressing oneself through a number of drawings, and in light of the recent boom in the fields of visual communication in the twentieth and twenty-first centuries, to meet the challenges imposed by the nature of the era characterized by the rapid flow of information and technological development. The tremendous and the emergence of modern communication technologies, and the radical change in traditional learning approaches that do not take into account the individual differences between learners and make them feel bored and apathy, compared to their interaction with web applications without boredom or apathy, which confirms the need to employ modern applications in order to improve the outcomes of the learning

process, the infographic technology has appeared with its various designs It works to change the way of thinking towards complex data and information, and gives a new visual form to collect and display information or transfer data in an attractive image to the learner, and this is indicated by the principles of Merrill's theory (Li, Z. & Merrill, M.D. 1991,55-56), to display The elements that organizing the presentation of the content require defining the style of its presentation, the level of performance expected of the learner to show it after the learning process, and the conversion of the content from the stereotyped form to the religious form Mickey to ensure the element of attraction, fun and suspense during the learning process, so it is necessary to search for a new way to apply this technology in the service of the educational process and to integrate it into the curricula.

The concept of infographics, including:

(Won, 2019, 24; yildirim, 2016, 12; Ismail Omar Hassouna, 2017. 553; Beegel, 2014, 283,284; Abdel Raouf Muhammad Ismail, 2016, 121), and they are unanimously agreed that:

1. The visual representation of information and designs that the learner interacts with, and requires specific responses by controlling the displayed information.
2. Contribute to the concentration of information and make it controllable so that the working memory can deal with it.
3. Use line drawings and pictorial graphics to display information.
4. An interactive visual display that allows the learner to control the displayed information through some control tools such as buttons and programming.
5. An image that combines information, design, and efficiently conveys the message to the audience, and includes ideas and concepts.
6. Increase the ability to think critically and improve information retention
7. Depends on visual perception.
8. Graphical visual displays of information designed to display complex information.

9. The interactive infographic style allows displaying large amounts of information in an organized and fragmented manner based on the learner's response, as he is in control of the amount of information to be obtained by himself
10. It allows the learner to display and sequence information through special tools such as buttons and icons.
11. This style is characterized by information repurposing, allowing more information to be presented.

Reasons for turning to interactive infographics:

By reviewing the research and studies of (Rana Ali - Zainab Ismail, 2019, 120; Locoro, A., et al., 2017, 240-242; Alshehri, M & Ebaid, M, 2016, 1-8); Akram Ali, 2016, 85; Justin Beegel, 2014, 31-33; Krafte, G., 2014, p2-3; Dur, B, U., 2014, p9-12) The reasons for the tendency to use interactive infographics can be summarized as the learner's interaction with the content is the process through which the information presented to him is tested and processed during the educational process. Each learner builds his new knowledge through a process of adaptation Personal with the information in his previous cognitive structure, and the interaction of the learner with this content is what leads to a change in his ability to understand, that the learner does not only need to see and read the information, but needs to adapt the content according to his interests and tendencies, and introduce interaction into the world of data representation through a communication method Learners with designs, while traditional representation is built in a linear fashion, interactive infographics allow users to craft their own experience. Designing information during production, this interaction allows the learner to form his own experiences, defines his own ways to access the information he wants inside, governs the process of obtaining information and discovers the information. In contrast, the infographic, whether static or mobile, is limited to viewing and reading only. In interactive infographics, the user can interact with the content of himself such as choosing information, searching for content, and he can also carry a lot of information.

Interactive infographic features:

(Rana Al-Bishi, Zainab Al-Arabi, 2019, 120-121 Ayed Hussein - Naglaa Al-Mahlawi, 2017, 420-421; Abdel Raouf

Ismail, 2016, 127) cited several The characteristics of infographics are as follows: organizing information, creativity in the purpose of content, simplicity, design elements, clarifying cause-and-effect relationships, integration between the elements contained in the design, coding and abbreviation, visual communication, ability to share, enrichment ability, attractive design, attracting attention, scalability To enrich, display complex information clearly.

Advantages of Interactive Infographics:

The idea of the interactive infographic is based on simplifying ideas and visually clarifying facts, concepts and relationships between them, as it contributes to a qualitative shift in education by creating an educational learning environment that attracts the interest of learners and achieves educational advantages and benefits like other different learning methods mentioned by (Suha Hamdi Mohamed Zwain, 2016, 161); (vanichvasin, 2013, 135); (Wedad Aseer, Ayed Al-Otaibi, 2018, 34); (Matrix & Hodson, 2014, 19); (Nahla Al-Metwally Ibrahim Salem, 2017, 259):

- Enhance the ability to think, relate and organize information.
- Help to assimilate information and ideas and retain them for a longer time and concepts.
- Applicability to many different disciplines and fields.
- Clarify unfamiliar information and routine presentation of information using simple symbols and symbols
- Attracts the learner's attention and creates motivation towards the subject of learning.
- Enhance the ability to think critically, and develop the process of organizing ideas and information.

Interactive infographic design criteria:

(Salah Muhammad Abu Zaid, 2016 151-152; Muhammad Shaltout, 2016, 142) stated that the efficiency of the infographic depends on following the design conditions and standards recommended in many relevant studies, which should be followed accurately in order for us to produce an effective infographic, It is divided into:

Design criteria:

- **Visual persuasion:** The message to be communicated is expressed in an effective manner using real and attractive colors related to the topic of the infographic, which results in real and honest changes that affect the recipient's behavior and behavior. Subtopics.
- **Choosing the appropriate features and shapes:** The human memory is a series of links in which the data are associated with images and forms that express them.

Subject criteria:

- Choosing the topic before design: Emphasizing and paying attention to the topic of the infographic, the information and data presented in it first, then choosing the appropriate story and design to present that information.
- Indirect Direction, Simplicity and Conciseness:
- Organized display of information using punctuation and punctuation, which facilitates the processes of memorizing information and remembering it later, focusing on one topic to be treated with infographics.
- Searching for reliable, accurate, and clear sources of information.
- Pay attention to the sequence of information.
- Check for spelling and grammatical errors.

The third axis - visual perception:

In many verses, God Almighty praised the senses of hearing and sight because of their great importance in human life - God Almighty says: And it is He who created for you hearing and sight and hearts little by little, and the visual process is complete for the believer (verse 78). Through what the perceived thing causes by stimulating and alerting it, and through the interaction between (the sense, the mind, and the perceived thing), the response to different perceptions or visual stimuli occurs.

Perception is the most important key to learning and its effective means. Effective learning requires real awareness of the stimuli that the learner receives from the surrounding environment and giving them value and meaning that facilitates a process for retrieval in the future. The environment and its integration with

the individual's previous experiences in a way that helps to develop the cognitive structure of the individual. The educational position is a cognitive position in itself. The teacher must be aware of the process of cognition and the conditions for its occurrence and take into account the internal factors of the learner of preparations, tendencies and experiences, and also must take into account the external factors of the learner such as creating the educational environment such as Summarizing on the board and deciding the use of devices, tools and means that explain the lesson, as it is clear from the realization process that each individual perceives the thing or the event in his own way (Linda Al-Rashed 2010 ؛Abdul Wahid Al-Kubaisi, 2014) stresses that awareness is of great importance in changing human habits and behaviors. We must learn about its elements and components in order to learn how our perceptions are formed and how we can change them for the better. The process of realization consists of several elements:

- Sensation.
- Attention.
- Interpretation and perception.

Stages of visual perception

Visual perception of a specific shape is not done all at once, but rather it takes place in stages that start with an unspecified initial sense that there is something in the visual field, then this feeling develops by trying to verify this thing to identify it as a specific type among a class of subjects, and finally ends with a deeper perception known to the learner by definition. Completely as a specific subject that has a general characteristic that distinguishes it, and in light of this, it was mentioned by (Muhammad Abdel-Rahman, 2017, 268-269; Manal Mubariz, 2017, 214:

- The eye glimpses an object in the visual field, and records its image on the retina.
- The mind plays its role and perceives it as a human being, for example, and not a piece of stone or an animal.
- By increasing the concentration of thought, he is recognized as a human being, male or female, and is characterized by height,

color and certain characteristics, and this may lead to identifying his personality if there is previous knowledge (experience) of him, and this stage does not require looking at the details of the shape of the nose, eyes and mouth to judge that these shapes It denotes a person, for the perception of the face as a whole is prior to the realization of its parts, and to this stage it can be said that the view of the visual objects is no more than a total view.

- It is possible that the perception stops at the previous stage, and the previous overall view may develop into an analytical one according to the will, so a look at the parts that make up the whole is started.

Visual perception skills

It considers that the process of visual perception is one of the most important processes that take place at the level of the brain, in both parts, because the brain is what enables the individual to perceive the full picture of events and stimuli. It is the way we perceive and interpret all visual stimuli, and this is done through performing some visual perceptual tasks (Yousri Joudeh, 2013, 22).

Visual spatial relationships.

Visual spatial relations is the ability to identify a shape or part of a form that is transformed in a different direction from others. This is why some of our children have trouble recognizing b and d or p and q. They don't understand that just because it's rotated, it's a different letter. They also have difficulty distinguishing between inside and outside, above and below, and left and right, as these are spatial skill concepts.

Visual discrimination.

Visual discrimination is the ability to differentiate between objects and shapes. This includes skills such as the ability to identify money and sort coins or other objects. If they cannot distinguish the differences or similarities between objects or images.

Visual memory.

This is slightly different from visual sequential memory. Visual memory is the ability to store visual details in short-term memory, such as calling a phone number. Reading comprehension

will be affected when visual memory is deficient. Consider showing someone a picture, then taking it away and asking them questions. A child with visual memory problems will find it difficult to remember facts about the picture.

Optical closure.

Visual closure is the ability to fill in missing details in an incomplete form. This requires solving an abstract problem. A good example of this is working on puzzles. The ability to put an image together in your mind and put it together correctly. This will also cause writing and spelling problems. With spelling, a child with visual closure insufficiency will not know the endings or middles of the word. As for writing, a child with a visual closure deficit will not be able to tell if the word is complete.

The floor of the visual form.

This is the ability to perceive form and find it hidden in a lumpy earth of matter. For example, ask the child to find the blue crayon in the pencil box. The floor of the visual form is the ability to filter all other crayons to find the blue crayon. It would be the great equivalent of using visual shape skills when we're looking in our junk drawer to find something we need. Hidden picture activities are useful for children to work on their visual form skills.

The second axis - the level of information processing:

Information processing theory is one of the trends of cognitive psychology, or one of the new dimensions of the development of the cognitive trend in the interpretation of the learning process, and this theory stems from the fact that learning is governed by the way we receive information, how to store and retrieve it again, and that each of its stages is necessary for the learning process , where it explains how information is acquired and transformed into knowledge or knowledge and how to keep it, use this information and employ it behaviorally, and information processing levels refer to the way information and stimuli are encoded (Manal Abdel Aal Mubarez, Magdi Ibrahim Salem et al., 2017, 314), Craik, f, I, M, and R. S. Lockhart, 2008, 52:60) has assumed the Processing Levels Model, which is the most important model that focuses on how information is processed.

Any stimulus can be processed in more than one way, and memory efficiency depends on how it is processed. This is exciting, as the prevailing trend was that the biggest factor in determining understanding is the repetition of the learned material for a long period, and keeping it in short-term memory, but it was found that the ability to create understanding is related to the level at which it is received and Information processing and processing, and the literature reflects divergent visions about the concept of information processing levels. There are many definitions that dealt with the description of the term information processing, but they did not go beyond the general scope set by Craik and Lockhart for it (Craik, f, I, M, and R. S. Lockhart, 2008, 52). :60), where he defined it as: “A method based on integrating the web into the educational process, and it is a flexible strategy that can be used in all academic levels and in all subjects and disciplines.” It was defined by (Mohammed Abu Shama, 2011, 85-86; Sahar Zayan, 2016, 222; Ramy El-Youssef, Hassan El-Omry, 2018, 118; Marwan Nafeh, Ali Al-Subaihi, 2010, 26; Iman Al-Sharif, 2016, 258) that:

- The learner's method and level of reception and preparation of the educational material and how to circulate, transfer and store it.
- The amount and type of connections that it creates, derives or produces between new information and existing information in its knowledge structure.
- The methods of treatment that the learner follows when studying some scientific concepts.
- It aims to determine the best ways to preserve information in memory, as it may be a process of repetition of the concept and its retrieval without meaning (shallow processing), or through the process of finding the semantic context with meaning in which these concepts and laws are applied (deep processing.)
- The number of elements that the learner can prepare with the awareness of the resulting relationships between them through the interaction of the network of meanings interrelationships between these elements.

- It requires a cognitive activity based on cognitive processes such as attention, perception, thinking and problem solving.

The educational importance of information processing

The direction of information processing has played a role in the development of cognitive psychology, which refers to the mechanisms that involve the employment of cognitive or mental activities and organizational processes that occur between the processes of receiving and retrieval of information, and considers that learning is governed by the way it receives In which the learner uses the information and how to store it and retrieve it again. If there is no good reception, the learner will not be able to retrieve the information and therefore the learning will not take place, as indicated by

(Howaida Abdel Hamid, 2016, 129; Saleh Abdel Rahim et al., 2013, 23-24; Suleiman Abdul Wahed Youssef, 2011, 84; Azza Hela, Khadija Al-Qurashi, 2011, 565) The educational importance of information processing theory **is as follows:**

1. Studying the individual differences between learners by revealing the strengths and weaknesses in the mental processes that the learner goes through and by selecting the information provided to him and rejecting other information through the cognitive processing process and then focusing on improving those processes to work efficiently.
2. Improving the education process, studying habits, methods of thinking and solving problems, and benefiting from them to the maximum degree of cognitive abilities
3. Realizing the cognitive structure of learners, identifying the processes involved in the study materials, and providing new and convincing explanations for learning based on the role that cognitive processes play on the one hand, and on the content of knowledge on the other.
4. It gives general directions on how the learner thinks, receives information, stores it and absorbs it again in a set of steps he follows to solve a problem.

Information processing levels:

Information processing levels refer to the way in which information and stimuli are encoded, and the differences in levels

of information processing lie on a continuum that extends between the shallow or marginal method of processing to the deep level that focuses on meaning. It is the stages of analysis that stimuli go through in memory, starting from sensory analysis and ending with meaning analysis, and the level of information processing is determined in the way the student follows when studying some scientific concepts. Deep, and until the vision becomes clear, it was pointed out by (Amal Sherida, Muhammad Al-Watian, 2012, 36-407; Jamal Al-Hawari, 486-486-2015; Hamdi Al-Banna, 2011, 20-21; Iman Al-Sharif, 65, 259). The characteristics of the shallow and deep level of information processing can be summarized in the following points:

Shallow processing level:

- Attention is focused on the physical properties of the stimulus
- It is a stage in which stimuli are analyzed in memory in light of their physical features such as the shape of the word, the letters that make up it, or the positions of the letters.
- The expression of this level is to remember only the stimuli.
- Information is processed according to its physical characteristics or according to its formal characteristics only, such as asking to judge whether the letters provided are small or large.
- The level produces weak memory effects (memorization and memorization)
- Learners with a shallow method of learning see that school learning is their way towards other goals, such as getting a job, as it is based on extrinsic motivation such as fear of failure.
- It aims to please the parents or others and not to stay away from problems or self-satisfaction or self-formation.
- The goal of learning is to fulfill the requirements of the academic content by memorizing, remembering and retrieving the academic content in which they think they will perform the exam, and showing them the concept of productivity.

Deep processing level

- Attention is focused on the significance of the stimulus, such as synonyms, associations, fluency rates, or merging the word within the sentence.
- Produces strong memory effects and a slow rate of decay, and thus better retention.
- In which the meaning is analyzed and the relationships between the variables presented are understood
- He makes an effort to reach the meaning through a deductive stance and discusses the evidence.
- A level related to the significance of the meaning associated with the stimulus, such as the interconnections within the sentence.
- The study excites their interests, and they link and integrate experiences.
- The learner seeks to discover the meaning and seeks to know the intent and objectives behind the study material, they have serious interests towards the study.

Research procedures :

1. Reviewing some studies, references and literature related to interactive infographics and analyzing this literature to benefit from it in preparing the theoretical framework for research, a list of design criteria for the learning environment based on the interactive infographic, and preparing the experimental treatment material.

2. Analyzing the content of the basics of photography and determining the basic concepts and skills that will be presented through the interactive infographic and required to be taught to the students of the research group, and surveying the opinions of the arbitrators about the achievement of the educational content for learning objectives and its suitability for learners, and (15) arbitrators were presented in the field of educational technology, curricula and teaching methods. The arbitrators agreed on the comprehensiveness of the list, the appropriateness of the educational content for learners, the linkage of the content to the

objectives and its achievement, with the reformulation of some phrases, and the researcher made the required modifications.

3. Reviewing some studies, references and literature related to the level of information processing and analyzing this literature to benefit from it in preparing the theoretical framework for research.

4. Reviewing some studies, references and literature related to visual perception and analytical thinking and analyzing these literature to benefit from them in preparing the theoretical framework for research.

Building measuring tools:

1. Preparing a scale for the level of information processing and presenting it to the arbitrators and making the proposed modifications to reach its final form.

2. Preparing a situational test for visual perception skills and presenting it to the arbitrators and making the proposed modifications to reach its final image.

3. Preparing a situational test for analytical thinking skills and presenting it to the arbitrators and making the proposed modifications to reach its final form.

4. Preparing the experimental treatment material represented in a learning environment based on interactive infographics in order to develop skills for visual perception among students of educational technology, approving it and presenting it to the arbitrators, and making the proposed modifications to reach its final image. The researcher adopted the developed educational infographic model (Mohamed Shaltout, 2019) to design Experimental processing is one of the most important models of infographic instructional design, due to its ease and simplicity in its procedures.

5. Conducting the exploratory experiment to control the measurement tools by calculating their validity and stability, and the coefficients of ease and difficulty, and knowing the appropriateness of the experimental treatment material and the difficulties of application and ways to solve them in preparation for the actual application to the research group. Quality - Minia University, and their number reached (60) male and female students, and it was confirmed that students of the exploratory experiment did not participate in the basic experiment. The exploratory experiment was conducted in the first semester of the

academic year (2022), and the exploratory experiment included

The following steps:

- Pre-application of research tools (information processing scale - visual perception test).
- Applying the experimental treatment material to the exploratory group.
- Application of research tools remotely (Information Processing Scale - Visual Perception Test).
- Calculating the validity and reliability of each of the

Measurement tools.

- Calculating the coefficient of ease, difficulty and discrimination of the visual perception test.

The pilot experiment aimed to:

- Identifying the difficulties that students may face during the application.
- Ensuring the clarity of the educational content presented through interactive infographics.
- Identifying the shortcomings of interactive infographics and research tools so that they can be avoided before starting the basic experiment.
- Knowing the suggestions and opinions about interactive infographics.

Conducting a basic research experiment:

A- Voluntary selection of the research sample from first-year students - Department of Educational Technology - Faculty of Specific Education - Minia University.

B- Applying (the level of information processing test) to classify the students of the research group according to the level of information processing (superficial - deep).

C- Pre-application of measurement tools (visual perception test) on the research sample.

D- Applying the experimental treatment material to the research sample.

E- Applying the measurement tools (visual perception test) posteriorly to the research sample.

Extracting the results and analyzing them statistically:

Conducting statistical treatments to verify the validity of the research hypotheses, interpreting the results in light of these treatments, and then providing recommendations and proposed research.

Research Results:

What is the impact of interactive infographics on developing visual perception skills among students with different level of with information processing level shallow-deep?

This question was answered by finding that there is a statistically significant difference at the 0.05 level between the average scores of the students of the first experimental group (those with the level of shallow preparation) and the scores of the students of the second experimental group (the ones with a deep the level of processing)

Table (2) The value of (T) between the mean scores of the students of the two experimental groups for research in the post measurement of the visual perception test is due to the effect of the level of information processing (shallow / deep) (n = 50 learners)

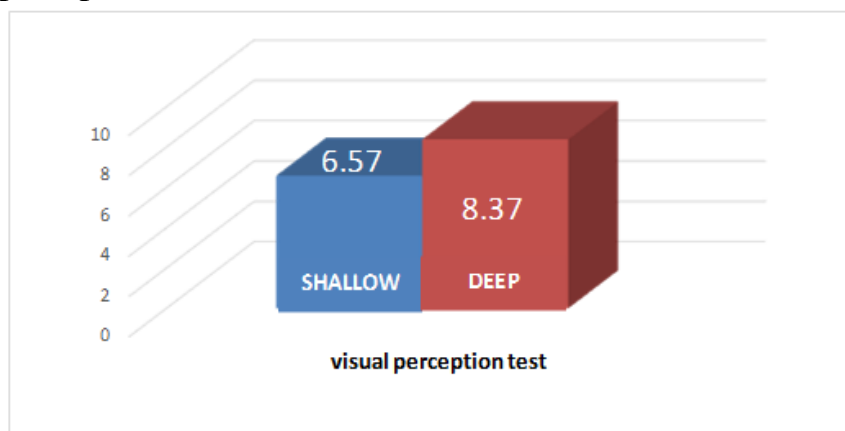
Variable	Maximum score	The group	The number	Mean	Standard deviation	Value T	Indication Level	Eta squared	Effect Size
Visual perception	10	Shallow	23	6.57	1.08	5.79	0.0000	0.85	Large
		Deep	27	8.37	1.11				

The results of Table showed an increase in the arithmetic mean in the dimensional measurement of students of the information processing level (deep) for the visual perception test compared to the dimensional measurement of students of the level of information processing (shallow).

By calculating the value of (T) to indicate the differences between the averages, it was found that it is statistically significant, where the value of T (5.79) is a significant value at the significance level (0.000), which is less than the significance level (0.05) and in the direction of the level of information processing (deep).

Then the first hypothesis is accepted, and the size of the effect of the infographic technique has a significant impact on the

measurement of visual perception, where the size of the effect was (0.85), which is a large effect size, which indicates the effect of the independent variable (infographic) on the dependent variable (visual perception).



Figure(1) The average scores of the two experimental groups in the post application of the visual perception test

Interpretation of the results:

By presenting the results of the hypothesis of the research, and from the reality of the data that was reached and processed statistically, and in light of the presented results, the researcher interpreted and discussed them based on the theoretical framework and previous studies in this field. The results indicate that the use of interactive infographics contributed to the development of the visual perception skills of the research sample.

The Researcher's Conclusion

Looking at the results of the first hypothesis, it becomes clear that it came in favor of the students of the second experimental group (with a deep processing level) in the visual perception test.

This result is due to the fact that visual perception skills require students' ability to process and process information in a deep way, as it is easy to use and retain, and then easy to retrieve, and that students who appear shallow in processing their information we find they are also shallow in the cognitive representation of information, and then it is difficult to comprehend Information is retained and used effectively and thus leads to a weakness in their

visual perception skills, and the characteristics of the students of the sample with the level of deep processing justify their superiority over the students of the research sample with the level of shallow processing as they:

- Intrinsically enthusiastic and curious about the topic of learning, so they reach a high level of academic achievement.
- They showed great interest and were quiet in their learning of information.
- They were more focused and determined and always looking for meaning, creating relevant arguments and examples rather than memorizing..
- More interactive with the content and critically, by focusing on the concepts needed to solve a complex task, they are more likely to retain their information in the long term.
- Build their own knowledge by making connections between previous and new knowledge to understand new ideas.
- Intrinsic motivation is to enjoy learning and realize the importance of the learned material, and therefore they seek to find the purpose of the learned material.
- Students with a deep processing level practice basic thinking skills such as analysis, interpretation, explanation and summarization, and higher-order thinking skills such as critical and creative thinking and problem solving.
- In contrast to the students of the research sample with a shallow level of preparation who do not care about the topic of the learning subject, their learning motivation is external to them by achieving goals such as getting a job, for they learn by heart and learn only what is required and not more, achievement is through memorization, remembering and retrieval of the content Only for evaluation, as the transmission of learning and benefit from experiences is limited, they accept ideas as they are without information processing, see learning tasks as forced labor, and focus on reproducing only those parts of the content required to complete assessments.

- The researcher also returns the results of the research to presenting the content through the interactive infographic, which is in line with.

The characteristics of students with a deep level of processing:

- Interacting with the content presented through the interactive infographic leads to the creation of an integrated learning environment in which information, concepts and knowledge are acquired.
- Freedom of the learner to choose the part he wants to study according to his abilities through ease of navigation and navigation within the content, which enables learners to follow up and review their lessons on their own and supports the concept of self-learning.
- The interactive infographic allowed students the self-freedom to exploit their previous experiences and invest their efforts in the learning process, which encouraged them to set their goals, increase their abilities to organize their previous experiences, and link new knowledge with old knowledge in an organizational framework of knowledge, which helps in performing educational tasks.
- Diversity of visual learning elements presented through interactive infographics such as texts, still images, graphics, videos, and other elements that attract learners' attention to the learning content, and provide a greater opportunity for learning through more than one sense at a time.
- The link between the educational content of the training and the theoretical aspect assigned to them, led to the integration between the high level of cognitive achievement of students and the high level of their skill performance.
- design according to a specific model; The learner's use of the interactive infographic made browsing the content easy and smooth, and this helped the learner's interaction with the content, with the researcher and with colleagues as well, and increasing the cognitive achievement associated with skills.
- The visual representation of information reduces the burden of processing and storing it, as it is printed in memory faster and

for a longer period, which is commensurate with the presentation of information in an interactive infographic style.

- From the results of the research, the following recommendations can be drawn: Updating and developing educational technology and computer courses that are taught in the faculties of specific education by encouraging faculty members to use interactive infographics in teaching courses as one of the modern techniques in teaching to make learning more efficient.
- Holding training courses and workshops to train teachers and learners to design and produce interactive infographics
- Attention to design learning environments to suit each of the levels of information processing (surface - deep) rather than placing it in the list of research and theoretical studies only.
- The need to pay attention to the development of visual perception skills among students of educational technology, which contributes to a deeper and easier understanding of the learning material.

Suggested Research:

Through the findings of the research and by reviewing previous related studies and research, it is possible to suggest more studies and research on:

- Conducting a study similar to the current research on students of different educational stages.
- Studying the effectiveness of the interactive infographic on learners' skills.
- Studying the effect of teaching interactive infographic design and production on students' attitudes.
- Conducting a study of the relationship between students' information processing levels and academic achievement.

Resources and References

Arabic reference

Abdel-Raouf Mohamed Ismail (2016), the use of (interactive / static) infographics and its impact on developing educational achievement among students of educational technology and their attitudes towards it, research and articles, Arab Society (Educational Technology), p. 28.

Amal Saleh Sherida, Muhammad bin Suleiman Al-Watian (2012). The role of working memory capacity (high - low) and the level of information processing (superficial - deep) in the reading comprehension of fifth grade male and female students in the Qassim region - Journal of the College of Education for Educational and Psychological Research, PhD thesis, College of Education, Qassim University.

Amal Shaaban Ahmed Khalil (2016). Patterns of educational infographics "fixed / mobile / interactive" and its impact

And its impact on the achievement and efficiency of learning mathematics for primary school students with mild intellectual disabilities, Journal of Education, Faculty of Education, Al-Azhar University, 169 (3).

Gamal Farghal, Ismail El Hawary (2015). The effect of the level of information processing and self-efficacy on the meta-learning skills of a sample of students, College of Education, Al-Azhar University, Journal of Educational, Psychological and Social Research, (163)34, (Part 2).

Hamdi Abdel Azim Mohammed Al-Banna (2011). Skills and levels of information processing and its relationship to the cognitive style (accreditation, independence from the field) among students of Taif University, Arab Studies in Education and Psychology, Saudi Arabia, (5)3.

Howayda Said Abdel Hamid. (2016). The effect of the interaction between navigation methods in flipped education and information levels on the cognitive motivation of postgraduate students at the College of Education, Arab Studies in Education and Psychology, Saudi Arabia, p. 73.

Iman Zaki Mohammed Al-Sharif (2016). The effect of the interaction between the pattern of practicing activities and the learning style in an inverted learning environment on the development of academic achievement, academic self-efficacy and educational satisfaction among educational technology students, Arab Society for Educational Technology, Egypt, p. 29

- Linda Saleh Mohammed Al-Rashed, Abdel Wahab, Abdel Nasser Anis (2010). Discriminatory indications of visual perception skills among female students with difficulties learning to read and normal in the Kingdom of Saudi Arabia: A Bahraini development study, a master's thesis, College of Graduate Studies, Arab Gulf University.
- Maher Muhammed Salih Zangour (2015). The effect of the difference between the two modes of control "Learner Control - Program Control" in the multimedia program on preferred learning styles, information processing skills, processing levels, and future thinking in mathematics among middle school students, Journal of Mathematics Education, 18 (5).
- Mahmoud Mohamed Abu Al-Dahab (2018). Designing a web-based learning environment based on static infographics (vertical, horizontal) and its impact on developing user interface design skills for students of the Department of Information Science, Twenty-fourth Conference of the Association of Specialized Libraries, Arabian Gulf Branch: Big Data and its Investment Prospects: The Path Towards Knowledge Integration, Sultanate of Oman Muscat, Arab Gulf Branch Library Association
- Marwan bin Ali Nafeh, Ali bin Ahmed Al-Subaihi (2010). The relationship of cognitive style, level of information processing, and academic specialization to the ability to solve problems among King Abdulaziz University students, PhD thesis, College of Education, Taibah University.
- Mohamed Attia Khamis (2015). E-Learning Resources Part One: Individuals and Media, Cairo: Dar Al-Sahab for Publishing.
- Mohamed Shawky Shaltout (2019). The Developed Educational Infographic Model, the Seventh - Fifth International Scientific Conference of the Egyptian Association for Educational Computers, July 2019 - Port Said - Egypt.
- Mr. Mahmoud Mohamed El-Gabaly (2019). Differences between cerebral control patterns in (non-motor) visual perception skills in a sample of middle school students with learning difficulties - Journal of the Faculty of Arts, Sohag University, (50)2.
- Muhammad Rushdi Abu Shama (2011). The effect of the interaction between the self-questioning strategy and the levels of information processing in developing the levels of reading comprehension of physical texts and the trend towards studying them among first-year secondary students, Journal of the College of Education Mansoura, Egypt, 77(2).

- Ramy Mahmoud Al-Youssef, Al-Omari Hassan Ghazi (2018). The predictive ability of the level of information processing and the learning style of the level of awareness of meta-memory processes among academically distinguished students, *Al-Zarqa Journal for Research and Human Studies*, Vol. 1.
- Rehab Hussein Abdel Wahab (2017). The impact of peer support style in an information-based learning environment
- Sahar Mohamed Abdel Hamid. (2015). Visual perception as an approach to developing a pre-school child's spatial sense, *Journal of Scientific Research in Education*, Egypt, 16 (2).
- Sahar Zidan Zayan (2016). The effectiveness of a training program using the computer in improving the skills of information processing and processing skills and its impact on dyslexia among primary school students, *Specialized International Educational Journal*, International Consultation and Training Group, Jordan, 5 (7).
- Salah Mohamed Abu Zeid (2016). Using infographics in teaching geography to develop achievement and visual thinking skills among secondary school students, *Journal of the Educational Society for Social Studies*, Faculty of Education, Ain Shams University, p. 79.
- Saleh Ali Abdel Rahim, Haider Muhammad Kattan and others (2013). *Flashes in Cognitive Psychology*, Amman: Dar Al-Radwan.
- Sharafia Monieh (2013). The Effect of Perceptual Burden on Selective Visual Attention, Master's Study, College of Humanities and Social Sciences, Department of Psychology, Education and Artovonia, Master's Thesis, College of Humanities and Social Sciences, Mentouri Brothers University.
- Suleiman Abdel Wahed Youssef (2011). *The reference in cognitive psychology, the human mind and information processing*, Cairo: Modern Book House.

English reference

- Banu İnanç . (2014). Interactive Infographics on the Internet. *Online Journal of Art and Design* volume 2, issue 4, Retrieved in 12-5-2018. from https://www.researchgate.net/publication/303738492_Interactive_Infographics_on_the_Internet?enrichId=rgreqa84de7b40061af9928bfe66b39ca6df-

- Craik, F. I., & Lockhart, R. S. (2008). Levels of processing and Zinchenko's approach to memory research. *Journal of Russian & East European Psychology*, 46(6)
- Havva A.,(2012). Significance of visual perception in education of art history. Elsevier Ltd in science direct. Retrieved in11-5-2018.from <https://ac.elscdn.com/S1877042812032910/1-s2.0/S1877042812032910>
- http://www.publishingschool.co.uk/uploads/publications/LSP_2014_Infographics.pdf
- John Dalton & Webber Design.(2014). A Brief Guide to Producing Compelling Infographics. London School of Publishing.2, Retrieved in27-4-2018.from <http://www.tojet.net/articles/v15i3/15311.pdf>.
- Justin Beegel, M. B. A. (2014). *Infographics for dummies*. John Wiley & Sons.
- Li, Z. & Merrill, M.D. (1991). ID Expert 2.0: Design theory and process. *Educational Technology Research & Development*, 39(2), 55-56.
- Pınar Nuhoglu Kibar. Buket Akkoyunlu,(2014) .A New Approach to Equip Students with Visual Literacy Skills: Use of Infographics in Education: European Conference on Information Literacy . ECIL 2014: Information Literacy. Lifelong Learning and Digital Citizenship in the 21st Century pp 456-465
- Vongdoiwang. Siricharoen WV. Infographics: The New Communication Tools in Digital Age. In *The International Conference on E-Technologies and Business on the Web (EBW2013)* : Bangkok, Thailand . 2013 may 7 (vol.169174).
- Yildirim, S., (2016). Infographics for Educational Purposes: Their Structure, Properties and Reader Approaches. *Journal of Educational Technology*, 15(3),