

The Effect Of Interaction Between Hyper-Video Navigation Tools And The Cognitive Style In Raising The Level Of Learning Rate Of Students At The College Of Education

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DOI: 10.47750/pnr.2023.14.03.414

Abstract

The purpose of this study is to determine the effect of the interaction between hyper-video navigation tools (buttons, cognitive maps, and hot spots) and cognitive style (independent of cognitive field / dependent according to the cognitive field)¹ on the learning rate of the students at the Department of Education Technology. An experimental approach was used to compare six experimental groups (3*2). The research sample consisted of sixty sixth-grade students from the Department of Learning Techniques, College of Education, University of Jeddah. An embedded figure test (Embedded Figure Test) was used for e-learning technology to determine who is independent of the cognitive field and who is dependent according to the cognitive field. The research sample was divided into six experimental groups, each with ten students. An electronic achievement test was created to measure the learning rate of students. The results showed that the buttons were the appropriate navigation tool for both the independents and the dependents in the cognitive field. That is because the buttons take into account the individual differences between the students, it was concluded that it is the most appropriate tool for roaming through the hyper-video.

Keywords: Hyper-video, navigation tools, cognitive maps, buttons, hotspots, cognitive style.

1 INTRODUCTION

Hypermedia is a web technology's basic element that interlinks nodes containing different types of media, such as text, graphics, video, and sound (Mujacic et al., 2012). Besides, its programs are one of the most important approaches based on the use of computers in educational presentations. They help to bring a commensurate boom with the huge amount of information, speed and freedom of human thinking because of its potential to provide the learner with control over his learning. Hyper-video is one of the modern research trends in the field of hypermedia, whose most important components are hypertext and the moving image. It is not static and can be classified under hypermedia systems (Debevc et al., 2008). Hyper-video navigation tools are one of the most essential factors that guide the learner and reduce distraction and inattention. In other words, the non-linear hyperlinks of the hyper-video can reduce the cognitive load that the learner may face (Eskevich et al., 2013).

Hyper-video can be defined as a collection of video scenes that are linked to one another. It contains tools to navigate the video scenes for providing hyper information that in turn allows the learner to make decisions based on the content and preferences (Woolfitt, 2015). As hyper-video is a combination of video and hypermedia, it supports the concept of hypertext by presenting content through video (Ji & Fan, 2017).

Hyper-video delivers audio-visual content to the learner in a non-linear manner, giving the chance to the learner to interact with the content by clicking on links that take them to other parts of the course material. This is accomplished by concentrating on specific information for improving the learning user's objectives. Here the information is placed in a non-linear structure by presenting it in an audio-visual path, that is based on realistic footage or animation (Taylor, 2020).

The current study is done as one of “Researches Aptitude Treatment Interaction” to measure the effect of the interaction between the hyper- video navigation tools (buttons, cognitive maps, and hot spots) and the cognitive style (independent of the cognitive field / dependent on the cognitive field) on the learning rate of the students at the Department of Education Technology.

The Current Study’s Questions are Formulated as Follows:

- (Q1) What is the effect of the hyper-video navigation tool (Hotspots / Cognitive maps / Buttons) on raising the level of the learning rate of the students at the Department of Educational Technology?
- (Q2) What is the effect of the cognitive style (independence versus dependence on the field), when presenting the content by the hyper- video on raising the level of the learning rate of the students at the Department of Educational Technology?
- (Q3) What is the effect of the interaction between the style of the hyper- video navigation tool (Hotspots / Cognitive maps / Buttons) and the cognitive style (Independence versus dependence on the field) on raising the level of the learning rate of the students at the Department of Educational Technology?
- (Q4) Is there a statistically significant difference in the learning rate of the experimental group of students due to the cognitive style (independence versus dependence on the cognitive /field)?
- (Q5) Are there statistically significant differences in the learning rate of the experimental group students due to the style of the navigation tool (buttons, concept maps, and hot spots)?
- (Q6) Is there a statistically significant effect of the interaction between students' cognitive style (dependence, independence), and navigation tool style (buttons, concept maps, and hot spots) on the learning rate?

2 REVIEW OF LITERATURE

By examining the impact of hot spots, frame lists, and hypertext, as being tools for navigation, on the immediate and delayed achievement of students. It is clear that the hot spots, as a tool for wandering, have achieved the most important advantage in cognitive achievement). Similarly, students who use concept maps, as a navigation tool, have a higher performance in conveying information. In addition, there is a direct relationship between students' use of concept maps, as a navigation tool, and an increase in performance (Tseng et al, 2012).

Cognitive style has a great influence on students, especially with the use of technological innovations. It can be said that students have individual differences due to the differences in cognitive styles. Many educational technology types of research have been concerned with cognitive style, including the current study.

Kulwinder’s study, (2016) is concerned with studying the impact of the interaction between the navigation pattern in educational multimedia software and the cognitive method on the academic achievement of students at the College of Education, King Abdelaziz University. The results indicated that there were no statistically significant differences between the average scores of students on the achievement test due to the difference in cognitive styles independence – dependence.

The cognitive style of students, with the two patterns dependence and independence, has an impact on the use of hyper-video. Individual differences that exit between students because of their perception processes, the acquisition of scientific concepts, commitment to the overall context, and the interaction that occurs independently should be all taken into consideration. Therefore, it is necessary to pay attention to the navigation tools during the hyper-video, as students who are independent of the field are distinguished by the ability to accurately analyze and identify the elements related to the exciting field. Consequently, information can be retrieved and as a result there is no dispersion for independent students if the ramification pattern is non-linear. (Molaei et al., 2014)

People show great variability in terms of navigation skills. This can be due to external factors, the degree of visual access to the environment, and the complexity of the layout (Comber & Maltby, 1996). However, internal factors (personal attributes) such as gender, familiarity, traits of personality, and spatial cognitive styles, are also important. Specifically, cognitive styles reflect the preferred modality for processing environmental information (Coman & Cioruța, 2013).

Educational students are distinguished by their ability to organize the surrounding environment, and they are less able to analyze. This stresses the importance of navigation tools that match the non-linear ramification pattern in

the Hyper-video and are suitable for the characteristics of these students. As a result of that they do not have dispersion, which affects their acquisition of scientific concepts. In a nutshell, it is necessary to test the effects of the navigation tools and the relation between them and the students' cognitive styles to find out the best tool that suits them according to their cognitive styles.

2.1 Hyper-Video

Hyper-video is a set of video scenes that are linked to each other and contain tools to navigate the video scenes to provide hyper information. This type of information gives the learner the chance to make decisions based on the content appropriate to him. It supports the idea of hypertext but through content presented via video, as hyper-video is a mixture of video and hypermedia. (Teresa & Nuno, 2016)

Hyper-video provides the audio-visual content to the learner in a non-linear path, by which the learner can interact with the content through links that lead to other elements of the content. This is done by focusing on specific information or improving the learning user's objectives, which puts information in a non-linear structure by presenting information in an audio-visual path based on realistic footage or animation (De Jesus Oliveira, et al ,2022).

2.2 Hyper-Video Properties and Advantages

The following points are where hyper-video programs are advantageous: (Mimi, 2016).

1. Supporting self-education by interacting with the information presented in an audio-visual way.
2. Taking advantages of the facilities offered by video in education.
3. Overcoming the traditional video concept by giving the learner the chance to interact while watching the video.
4. Navigating through video clips supports the learner's cognitive construction by linking new experiences with previous experiences.
5. Providing an attractive learning environment where interaction prompts the learner to search for additional information to enhance his learning.
6. Supplying an exciting learning, setting. That is because a hyper-video contains audio, images, animations, video clips, text, and hyperlinks.

2.3 Cognitive Representation of Hyper-video software

2.3.1 Unlimited Capacity Theory

"Gardner" asserted that an individual can process through a set of parallel channels and that this ability is undefined (Sanchez-Martin, et al, 2017). According to this theory, the hyper video contributes to the necessary processing of information in working memory (short-term) because it provides a large number of stimuli that attract the attention of the learner, including visual and auditory stimuli (Volkmar, 2013).

This narrow frame of reference combined with the disability approach to autism not only determines what to look for, but can also influence test results. For example, many cognitive scientists seem unaware of how behavioral and communication difficulties associated with autism negatively affect test performance and does not indicate lower intelligence despite lower scores. Viewing autism as a completely disabling condition, they also may not realize that describing and measuring a different cognitive pattern with tests designed to assess "normal" cognition will produce results of questionable validity. Interpretation of results may also show a research bias introduced by the disability model: when intelligence and talent are identified, they are generally considered pathological as "escape abilities" or "islands of ability" and have been shown to be in tests where the autism group outperforms the non-clinical control group. The difference is often explained not by superior ability in this area, but by reference to certain cognitive disorders associated with autism. Clearly, how we represent people and others to ourselves often determines the consequences of our moral judgments about them. But the consequences of autism's calculation of pure helplessness can also be serious and profound for social justice and perhaps for science itself (Volkmar, 2013).

2.3.2 Multi Chain Processing Theory

"Albert" states that a learner can pay attention and process two different stimuli, such as hearing and sight. This can be happened when the learner uses hyper-videos as there is exposure to both audio and visual stimuli. This leads to increased attention and the passing of information **from the short-term memory to the long-term memory (Schunk, 2012).**

By revising the related literature and the previous studies, it has been noticed that the previous studies adopted the previously presented theories presented in the literature. It is emphasized that the Hyper-video presents the content for the learners in a more relevant and attractive way. As a result of that it overcomes many problems related to the attention of the learners) Andrew & Jennifer, 2005) Andrew (ibid) conducted an exploratory study to know about the opinions of teachers and mentors regarding the use of video clips in their classrooms. The results stressed the existence of the teachers' desire to activate this technology because it enhances learners' attention span, cognitive development and practical skills.(Andrew & Jennifer ,2005) Similarly, MirzaKarimova & Fayzjev (2021) referred to the necessity of using video during multimedia programs. The results proved that the lectures that used multimedia programs and contained videos had a higher student acquisition rate than other experimental groups.

2.3.3 Theory of Multimedia Learning

The principle known as the "multimedia principle" states that "people learn more deeply from words and pictures than from words alone (Mayer & Mayer, 2005). However, simply adding words to pictures is not an effective way to achieve multimedia learning. The goal is to let the instructional media activate the human mind. This is the basis for Mayer's cognitive theory of multimedia learning. This theory proposes three main assumptions when it comes to learning with multimedia:

1. There are two separate channels (auditory and visual) for processing information (sometimes referred to as Dual-Coding theory)
2. Each channel has a limited (finite) capacity (similar to Sweller's notion of Cognitive Load)
3. Learning is an active process of filtering, selecting, organizing, and integrating information based upon prior knowledge.

Humans can only process a finite amount of information in a channel at a time, and they make sense of incoming information by actively creating mental representations (Mayer & Mayer, 2005). The roles of the three memory stores are explained as follows:

Sensory (which receives stimuli and stores them for a very short time), working (where we actively process information to create mental constructs (or 'schema'), and long-term (the repository of all things learned). Mayer's cognitive theory of multimedia learning presents the idea that the brain does not interpret a multimedia presentation of words, pictures, and auditory information in a mutually exclusive fashion; rather, these elements are selected and organized dynamically to produce logical mental constructs. Furthermore, Mayer underscores the importance of learning (based upon the testing of content and demonstrating the successful transfer of knowledge) when new information is integrated with prior knowledge. Design principles including providing coherent verbal, and pictorial information, guide the learners to select relevant words and images, and reduce the load for single processing channels. This can be entailed from the above-mentioned theory

2.3.4 Theory of Meaningful Learning

The theory of meaningful learning states that learned information has been completely comprehended and can now be used to make connections with other previously known knowledge, thus assisting in further comprehension (Mimi, 2016). Because information is stored in a network of connections, it can be accessed from a variety of starting points, depending on the context in which it is being retrieved.

Meaningful learning can incorporate a variety of techniques, such as concept maps, collaboration, and hands-on activities, into the learning process. Some techniques may be more beneficial than others, depending on the learner's needs and preferences.

2.3.5 Regolith's Expansionary Theory

Regolith's expansionary theory principles are based on the learner's practicing of mental operations to identify the main ideas and sub-ideas included in the content, as well as linking concepts, principles, and procedures this theory is connected to concept maps, which help the learner to clarify the relationships that link the components of the educational content to each other (Schroeder et al., 2018).

2.3.6 Hint Collection Theory

The principles of this theory proclaim that the greater the number of hints in an educational situation, the greater the chances of learning. According to the principles of this theory, buttons contribute significantly to the learner's perception of the displayed content (Pflum et al., 2013).

2.3.7 Cognitive Load Theory

This theory clarifies that the buttons decrease the learner's cognitive load. This happens by arranging the visual elements in the form of an interactive object that supports the educational content and links its parts to each other for the learner (Sweller, 2011).

2.3.8 Navigation Tools

The navigation tools are the main components responsible for the Hyper-video programs to deliver information to learners in the shortest time and with the least effort. Many studies have referred to the importance of using appropriate navigation tools within e-learning environments. The results of studies revealed that the incorrect choice of the navigation tool may lead learners to some ambiguities. In turn the learners find it difficult to find certain points within the e-learning environment i.e., they lose the optimal way to reach the target information (Emilio & Valladares, 2020; Beladam & Ghomari, 2021; Mohamed, 2017).

Several forms of navigation tools are used in e-learning environments, including:

- Buttons.
- Icons.
- Keywords.
- Hotspots.
- Track Eyes guides.
- Menus.
- Cognitive maps

Hotspots

The use of hotspots during multimedia and hypermedia programs has a clear influence on the level of learners' achievement That is because it causes the greatest interaction between the learner and the educational content of the program (Abdel Aziz, 2010; Jatinder & Chinu, 2014). These studies agreed with the principles of learning theories. For instance, Cognitive Flexibility Theory, clarifies that Hotspots constitute one of the flexible alternatives in e-learning environments, which help the learner to develop his knowledge, processing skills, thinking skills, and as a result achieve cognitive flexibility. In addition, the principles of this theory agree with the theory of dual coding, which show that the learner uses three main operations: testing, organizing, and integration. Based on this theory, the hotspots provide the learner with the text to be stored in the verbal working memory, as well as the image to be stored in the visual working memory, and after that verbal and visual information is integrated, this means that hotspots support the arrangement of visual elements through hypermedia programs.

Cognitive Maps

The importance of using concept maps as a navigation tool is to provide the greatest amount of interaction between the learner and the content. In addition, it facilitates the retention of information and the speed of remembering it (Tseng, et.al, 2012; Kamal, 2013; Jamal, 2015; Eid, 2016). The principles of learning theories shed light on the pros of the concept maps to reorganize the learner's cognitive structure. In addition, Regolith's expansionary theory principles referred to the necessity of the learner practicing of mental operations to identify the main ideas and sub-ideas included in the content, linking concepts, principles, and procedures. These mental operations are

provided by concept maps, which help the learner to clarify the relationships that link the components of the educational content to each other. Furthermore, according to Piaget's cognitive development theory, concept maps provide the learner with more mental stimuli. Besides, they aid the learner to represent information, understand new stimuli, and link them to the learner's cognitive structure with permanent modification, this supports achieving a state of cognitive equilibrium.

Buttons

It is noticeable that previous studies concerned with the effect of buttons are scarce in the Arab context. On the other hand, there are plenty of foreign studies in this domain such as of Wijaya, (2021); Viviani, (2016); Gnezdilova& Bugaeva, (2021); Nyarko,et.al (2021). The general consensus in these studies is that the use of buttons as a navigation tool led to attracting the learners' attention to the content by giving them more hints, as well as helping the learners to focus attention on each part of the content.

Table (1) A comparison between the navigation tools in terms of characteristics and ramification patterns

	Hotspots	Cognitive maps	Buttons
Properties	Consists of photos and text	Consists of text	Consists of photo
Ramification type	Hierarchical	hierarchical grid	Axial

3 MATERIALS AND METHODS

3.1 Materials

3.1.1 Participants

The research sample consisted of sixty males using e-Learning technology. They are sixth-grade students at the Department of Learning Techniques, College of Education, University of Jeddah. Embedded Figure Test (EFT) was applied to determine those who are independent of the cognitive field and dependent on the cognitive field. The research sample was divided into 6 experimental groups so each group included 10 students.

For ethical considerations, Informed consent was received from all, the participants, including the students in the sixth grade, the Department of Learning Techniques, College of Education, University of Jeddah. All data are anonymized. Ethical approval was received from the Ministry of Education in Saudi Arabia.

3.1.2 Data Collection and Analysis:

The current study comes as one of "Researches Aptitude Treatment Interaction" to measure the effect of the interaction between the hyper- video navigation tools (buttons, cognitive maps, and hot spots) and the cognitive style (independent of the cognitive field / dependent on the cognitive field) on the learning rate of the students at the Department of Education Technology.

Analysis of the data was performed to evaluate:¹

- 1-The effect of the hyper- video navigation tool (Hotspots / Cognitive maps / Buttons) on raising the level of the learning rate of the students at the Department of Educational Technology.
- 2- The effect of the cognitive style (independence versus dependence on the field) when presenting the content by the hyper- video on raising the level of the learning rate of the students at the Department of Educational Technology.
- 3- The effect of the interaction between the style of the hyper- video navigation tool (Hotspots / Cognitive maps / Buttons) and the cognitive style (Independence versus dependence on the field) on raising the level of the learning rate of the students at the Department of Educational Technology.
- 4- The existence of a statistically significant difference in the learning rate of the experimental group of students due to the cognitive style (independence versus dependence on the cognitive field).
- 5- The presence of statistically significant differences in the learning rate of the experimental group students due to the style of the navigation tool (buttons, concept maps, and hot spots).
- 6- The presence of a statistically significant effect of the interaction between students' cognitive style (dependence, independence), and navigation tool style (buttons, concept maps, and hot spots) on the learning rate.

This research belongs to the experimental research. it aims to study the relationship between dependent and independent groups as well as investigating the relationship between Aptitude and treatment.

3.2 METHODS

3.2.1 Research Design:

The research uses the factorial design or the multiple experiment design (3×2) as shown in the following table:

Table (2) The experimental design of the research

Navigation tool Cognitive style	Hotspots	Cognitive maps	Buttons
Independent	Group1	Group2	Group3
Dependent	Group4	Group5	Group6

3.2.2 Research Tools

- An electronic achievement test (verbal/pictorial) that calculates the learner's grades It is uploaded through a website for designing electronic tests.
- Embedded Figure Test: It is a test that aims to measure the learner's cognitive style (independence from the perceptual field versus dependence on it).
- The validity of the two test was calculated by calculating the value of the Pearson correlation coefficient between the degree of each phrase and the total score of the test. This enables to determine the level of internal consistency of the two study tools. They have a high level of validity In other words, they are valid for the study purposes.

3.2.3. Research Limitation

This work is limited to its investigatory and preliminary nature along with the small sample size. In addition, it is limited by gender because of the rules of education in the Kingdom of Saudi Arabia. The tools were designed by the researcher, then the YouTube is used to upload the videos and they are linked together.

3.2.4 Design Process

First: The Experimental design and the production of experimental processing tools

After reviewing many educational design models, it has been noticed that many design models are derived from the general model of design (ADDIE: Analyze, Design, Develop, Implement, and Evaluate) Due to the nature of the research. The model of five main stages is selected by the researcher. That is because it presents a procedural framework that can support the researcher in designing the educational and experimental treatment. The following shows the procedures that are followed for producing the general model of the educational design.

3.3 Procedure

3.3.1 Analysis Stage

It included the following steps:

A - Defining the problem and requirements: The problem was identified by studying the effect of the interaction between the hyper-video navigation tools (hot spots, cognitive maps, buttons) and the cognitive style (independent of the cognitive field / dependent on the cognitive field). The study was done on the learning rate of students in the sixth grade, the Department of Learning Techniques, in the digital photography course in an attempt to provide the appropriate treatment for the largest number of students.

B- Analyzing the characteristics of the learners: The characteristics of the students, who are sixth graders at the Department of Education Technologies, College of Education. Their ages range from (17-18) years, their cultural, social, and economic levels converge, and as well as their physical, emotional and social developmental characteristics. That is because they belong to the adolescence stage. in fact, they have the ability to use the Internet. The researcher met the participants in an introductory meeting to make sure of their readiness to study the educational content. The researcher explained to the participants how learning takes place through the hyper-

video program and clarifies how to use this program. It was stressed that the main goal of this type of learning is to increase their achievement level.

C- Analyzing and identifying the necessary material and technological capabilities, which are the availability of internet connection and the ability of learners to deal effectively with YouTube.

D- Determining the requirements for the hyper-video: They were represented in: Navigation tools that link more than one video, and the navigation tools were represented in (hot spots, cognitive maps, and buttons). These requirements were provided through YouTube, which allows uploading videos and linking them together through tools designed by the researcher. Three different hyper-Video styles have been designed that differ among themselves in the navigation tools.

Fig.1. Analysis stage procedures

3.3.2 Design Stage:

Here the steps of the analysis stage were converted into clear and executable procedures in a way that ensures the achievement of the desired educational goals. The design stage included the following steps:

A - Determining the content of digital photography: The content is extracted by the researcher to achieve the objectives. These objectives should be suitable for students, scientifically correct, applicable, and sufficient to give a clear and accurate idea about the scientific material. That is why the researcher surveyed the relevant literature and previous studies connected to the digital photography.

B - Defining and formulating procedural educational objectives: They were selected with reference to the general previously-defined goals. A list of goals, in their initial form was prepared by the researcher and then presented to a group of specialized arbitrators in the field of educational technology.

C- Designing video clips: here the video clips, that display the content of digital design, were designed through video editing and montage programs, namely Adobe Premiere and Adobe After Effects.

D- Designing navigation tools: Three types of navigation tools were designed by the researcher as follow: (hot spots, cognitive maps, and buttons). Adobe Photoshop and Adobe illustrator programs were adopted to design the previously-mentioned navigation tools After that three different styles of the hyper-video were produced.

E- Uploading the video clips to YouTube and linking the video clips using the navigation tools. Three playlists were designed by the researcher, while taking into consideration that each list is different from the other.

F-The design of the instruments

- An electronic achievement test was built and uploaded via the "www.quiz-maker.com" website at the following link <http://www.quiz-maker.com/Q7DB0QU72>. It is a website specialized in designing electronic tests and giving test results free of charge for 14 days; the researcher relied on the available sources, the most important of which is the university book, in addition to information via electronic platforms. The test questions varied, including multiple-choice and drag-and-drop questions.
- The test was built according to a specification table that determines the level of each objective and the number of questions needed to measure it, Moreover the pre-defined educational tasks are considered while designing the test.
- The test was presented to experts and specialists for approval.
- The arbitrators agreed with a percentage of (92%) on the validity of the test for the application and its relevance to the objectives set, with modifications to some of the test items.
- The modifications agreed upon by the experts and arbitrators were made, and thus the test in its final form was ready for application.

Fig.2. Design stage procedures

3.3.3 Development Stage:

After completing the analysis and design phases, the program was developed as follows:

- The texts were prepared and written in suitable fonts using PowerPoint and Adobe Photoshop. These programs were used to add aesthetic effects.
- The navigation tools were produced by Adobe Photoshop CS6 and Adobe Illustrator CS6, these navigation tools were made in the form of PNG images in preparation for adding them to videos.
- The video clips were constructed by Adobe After Effects CS6, and effects and navigation tools were added in the form of images by Adobe Premiere CS6.
- The use of visual hints in the videos has been taken into account as they are considered secondary effects to hold the learner's attention.
- Suitable background music has been selected and added to the videos so as not to confuse students.
- A channel was created on YouTube, videos were uploaded to the channel, and a link to the channel was sent to students to subscribe to it via WhatsApp or e-mail.

3.3.4 Implementation Stage:

- After uploading the videos on the YouTube channel, these clips were linked together by adding hyperlinks to the navigation tools. Three playlists were created by the researcher where each list is different from the other in the navigation tools that were used.
- Invitations were sent to students by sending a link to the playlist according to the divisions of the experimental groups. The students were divided - as mentioned before - into six groups.
- To prevent mixing between group's students, six groups of students were made on the WhatsApp application to separate each group from the other to avoid making mistakes.
- A meeting was held via Zoom application for the six groups to explain how to use the hyper-video playlist by the navigation tool.
- Student groups were followed through video comments on YouTube or via student groups on WhatsApp.

3.3.5 Evaluation Stage:

The first stage evaluated the experimental treatment materials through the following processes:

- Presenting experimental treatment materials to experts and specialists in the field of educational technology to ensure the following:
 1. The appropriateness of objectives for achievement.
 2. The appropriateness of the written and drawn elements for the age of the participants.
 3. The appropriateness of the density of information presented in the videos.
 4. Availability of educational and technical standards in designing video clips.
 5. Suggestions and modifications are needed to improve the videos.
- These factors were prepared in the form of a survey form for the opinion of experts and specialists.
- The survey form was presented to the arbitrators, and the percentage of arbitrators' agreement on the efficiency of the experimental treatment reached 94%, which is a high percentage of agreement. The arbitrators also agreed on the need to make some amendments, most notably reducing the percentage of hints so as not to distract students.
- The arbitrators agreed on the validity of the three processors and the validity of the shapes of the navigation tools used in the hyper video.

Second Stage: a basic research experiment is conducted by the researcher

The basic research experiment was conducted according to the following stages

A- Determining the experimental groups.

The research sample consisted of 60 sixth-grade students with E-Learning technology at the Department of Educational Technologies. The students were selected after applying (Embedded Figure Test) to be divided into individuals independent of the cognitive field and individual's dependent on the cognitive field. After selecting the total number of the sample, members were divided into 6 groups with 10 students per group.

B- Distributing the experimental groups to the experimental treatments

After defining the six experimental groups for research, and the number of members of each group, the members of the experimental groups were distributed to the three experimental treatments with two groups for each treatment, one of which was dependent on the cognitive field; the other was independent of the cognitive field.

C- Applying the basic research experience

- A timetable has been prepared for examination within three weeks for the first semester of the academic year 1440-1441 AH corresponding to 2019-2020 AD.
- The achievement test was previously applied by the researcher, the validity and the reliability of the test's questions were calculated.
- A schedule has been got ready for displaying the hyper-video clips. The dates and the time of displaying were sent to the groups via the WhatsApp application, and the video links for each group were delivered according to its navigation tool.
- A meeting was held with the students, the research sample, via the Zoom application, to give a brief explanation about the idea of the hyper-video and the purpose of the experiment, and to direct each group to deal with the video through the available navigation tool.
- Students' reports were received daily about their views about the videos. whether these points of views were written under the videos on YouTube or sent via WhatsApp.
- After the members of each experimental group viewed the hyper-video clips according to the roaming tool for each group, the post-achievement test was applied, the result of dividing the degree by time was monitored, and the scores were observed in preparation of conducting the statistical treatment of the results.

4 RESULTS

After examining the effect of the hyper- video navigation tool (Hotspots / Cognitive maps / Buttons) on raising the level of the learning rate of the students in the Department of Educational Technology, it was found that there are statistically significant differences in the learning rate of the experimental group of students due to the style of the navigation tool (buttons, cognitive maps, hot spots).

The condition of moderation was verified for developing the learning rate among the students of the experimental groups according to the type of the wandering tool, where the Shapiro-Wilk's test statistic values ranged between (0.911 and 0.966) in each group. They are values that are not a function, which means that the condition is met. The homogeneity of variance for the three groups is calculated by using Levene's test for homogeneity of variances. The value of "p" = 1,444 (d. h 1 = 2, d. h 2 = 56). It means that the condition is fulfilled;

One-way ANOVA was used to calculate the differences between the mean scores of the experimental groups concerning the average learning rate. Table (3) shows that there were significant differences; Where the value of "P" = 11,413. It is a function value at the 0.01 level, and the effect of the wandering tool pattern (the independent variable) on the variation in the learning rate of the students of the experimental groups (the dependent variable) is calculated by the Eta square = 29%. It is a significant effect according to ta the Cohen criterion; because it is greater than 0.14.

Table (3) values of the mean and standard deviation of the experimental groups in the learning rate according to the type of the wandering tool

Table (3) Results of the t-test of the differences between the experimental groups of students in the rate of learning according to their cognitive style

Group	N	SD	Df	T	sig
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Independent	30	1.84	57	0.349	0.00
Dependent	29	1.77			

Comparisons were made between every two experimental groups using the Tukey posthoc multiple comparison tests. Table (4) shows the significant differences were at the level of 0.05 between the two groups of buttons and the hotspots in favor of the buttons, and between the two groups of each of the cognitive maps. The hotspots are in favor of the cognitive maps, while there are no significant differences between the two sets of buttons and the hotspots. As a result of that the navigation tool patterns can be arranged according to their effect from the greatest to the least on the learning rate as follows: cognitive maps and buttons, then hotspots.

Table (4) The average difference in the learning rate between every two experimental groups according to the type of the navigation tool using the Tukey test Furthermore, the effect of the cognitive style (independence versus dependence on the field) on raising the level of the learning rate of the students at the Department of Educational Technology was evaluated. There is no statistically significant difference in the learning rate of the experimental group of students due to the cognitive style (independence versus dependence on the cognitive domain).

Table (4) Values of the mean and standard deviation of the experimental groups in the learning rate according to the type of the wandering tool

Navigation tool	n	M	SD
Buttons	19	1.89	0.68
Cognitive maps	20	2.23	0.71
Hotspots	20	1.29	0.47

The student's learning rate was calculated by dividing the student's grade in the post-achievement test by the time the student spent in the experiment. The Shapiro-Wilk's test statistic values = 0.936 in each separately, a value that is not a function which means that the condition is satisfied. The t-test was used to indicate the difference between the averages of two independent groups to be evaluate. Table (5) shows that there was no statistically significant differences between the averages of these students who are independent of the cognitive field and these students who are dependent on it in the learning rate; where $t = 0,349$, which is a function.

Table (5) points out to the results of the t-test of the differences between the experimental groups' students in the rate of learning according to their cognitive style. Besides it indicates the effect of the interaction between the style of the hyper- video navigation tool (Hotspots / Cognitive maps / Buttons) and the cognitive style (Independence versus dependence on the field) on raising the level of the learning rate of students at the Department of Educational Technology. There is a statistically significant effect of the interaction between the students' cognitive style (dependence, independence), and the navigation tool style) buttons, cognitive maps, hot spots) on the learning rate.

Table (5) The average difference in the learning rate between every two experimental groups according to the type of the navigation tool using the Tukey test

Navigation tools	Buttons	Cognitive maps	hotspots
Buttons	---		
Cognitive maps	(2.23 – 1.89) 0.34	---	
Hotspots	(1.89 – 1.29) **0.60	(2.23 – 1.29) **0.94	---

The student's learning rate was calculated by dividing the student's grade in the post-achievement test by the time spent in the experiment. Two-way ANOVA was used to verify the hypothesis, and moderation was verified in the distribution of scores for students of the experimental groups. The Shapiro-Wilk's test statistics values ranged between (0.859 and 0.934) in each group, that are non-functional values, which means that the condition is fulfilled. After checking the equal variance error for the six groups using Levine's Test of Equality of Error Variances, it is found out that value of "P" = 1,153 (D.H1 = 5, D.H2 = 53).

Table (6) manifests that there is a significant effect of the interaction between the two independent variables (cognitive method and tools) on the dependent variable (degrees of the post-application of the achievement test). The value of "P" was 6,717, which is a function value at the 0.01 level, and the value of the effect of the interaction

between the perceptual style and the wandering tool style with the partial Eta square 20% of the variance in the learning rate. It is a significant effect according to the Cohen criterion; because it is greater than 0.14.

Table (6) clarifies the average learning rate values for the six groups at the level of cognitive style. The largest value was for the pattern of the map for independent students, followed by the buttons and then the hotspots. The largest value was for the students' dependence on the buttons and cognitive maps. Finally, the learning rate of the independents of the cognitive map's style was greater than the dependents, the learning rate of the dependents on the hotspots pattern was greater than the independents, and the learning rate of the independents of the buttons pattern was almost equal to the dependents.

Table (6) Values of the mean and standard deviation of the six experimental groups in the learning rate

Group		N	M	SD
Cognitive style	Navigation tool			
Dependent	Buttons	9	2.03	0.70
Dependent	Cognitive maps	10	1.82	0.65
Dependent	Hotspots	10	1.49	0.38
Independent	Buttons	10	1.77	0.67
Independent	Cognitive maps	10	2.64	0.51
Independent	Hotspots	10	1.10	0.48

Table (7) indicates that there was no significant effect of the cognitive style on the scores of the post-application of the achievement test, where the value of "P" was 0.152, at the level of each independent variable separately. This value is not a function, On the other hand, a significant effect was found for the pattern of the wandering tool on the application, scores of the post-application of the achievement test where the value of "P" was 13,611. It is a function value at the 0.01 level and with an effect of 34% of the variance in the learning rate. Consequently, this validates the result of the existence of a significant effect according to the Cohen test.

Table (7) Results of the two-way ANOVA analysis of variance among the six experimental groups in the learning rate

Contrast source	sum of squares	D	mean squares	F value	partial eta square
A- cognitive style	0.050	1	.050	0.152	---
B- navigation tools	9.005	2	4.502	**13.611	0.34
Interaction between A&B	4.443	2	2.222	**6.717	0.20
Error	17.531	53	0.331		
Sum	223.069	59			

5 DISCUSSION

The results indicated that there is no interaction between students' cognitive styles and the variables of designing the interface in programs, The results of the current study are analogous to (Andrew& 2005 and Kulwinder 2016) that confirmed that there is no interaction between the cognitive style and the content hierarchy pattern through Internet-based learning. Also, the study concluded that there are no statistically significant differences between the average scores of students in achievement due to the effect of the interaction between the forms of hyperlinks in educational computer programs and the cognitive style. The study used independent versus dependent cognitive achievement through detail-intensive hypermedia programs.

It was found that there are statistically significant differences in the learning rate of the experimental group of students due to the style of the navigation tool (buttons, cognitive maps, hot spots). This result is consistent with the results of the study by (Andrew&Jennifer,2005) about the existence of statistically significant differences due to the effect of using concept maps as a navigation tool.

The following results can be interpreted based on the data from the statistical analysis:

- It is concluded that cognitive maps are considered an appropriate tool for hyper-video navigation for students independent of the field, because they are characterized by the possibility of expansion through the content.

- Although the accredited students have less media handling than the independent ones, according to a study, using the buttons as a tool for hyper-video navigation helped the accredited students to increase their learning rate. It can be recommended using balanced processing of information by directing the learner's careful attention to stimuli through electronic content.

The results of the current study agree with the Hint Summation Theory, That is because according to the principles of that theory, buttons can contribute to the learner's perception of the displayed content; because the more hints in a learning situation, the higher the chances of learning Happen.

- After making a comparison between the independents and the dependents in terms of the most appropriate tool hyper- video. it became apparent that the buttons were the appropriate roaming tool for both the independents and the dependents, as it takes into account the individual differences between them. Also, it came to the conclusion that Hyper-video was the suitable tool for both for both the independents and the dependents for the same reason. i.e. paying attention to individual differences between independents and the dependents.

Characteristics of independence of and dependence on the cognitive field:

The study outcomes pointed out that there is no interaction between the cognitive style and the content sequencing style through Internet-based learning. The study aimed to measure the impact of the interaction between the content sequencing style (linear / hyperlink) and cognitive style (independent versus dependent), In addition the results revealed that the independent individuals showed the ability to deal with high-density texts to a greater degree than the dependent ones. The results of the current study are in common with the results of (Cai,.et al 2021).

Furthermore, the study's results disclosed that there are no statistically significant differences between the average scores of students in achievement due to the effect of the interaction between the forms of Hyperlinks in educational computer programs and the independent cognitive method versus the dependent one in cognitive achievement during high detailed hypermedia programs.

6 CONCLUSION

Hyper-video navigation tools (buttons, cognitive maps, and hot spots) and the cognitive style of the students at the Department of Education Technology were investigated in this study to see if they can make an impact on the learning rate. The experimental approach was adopted in the current study by comparing six experimental groups (3*2). The research sample included 60 sixth-grade students from the College of Education, University of Jeddah's Department of Learning Techniques. Research participants were divided into six experimental groups, each with a total of 10 students, to determine whether or not they were cognitively independent or cognitively dependent. using the (Embedded Figure Test). For both independent and dependent cognitive field users, the buttons were the most appropriate navigation tool because they consider the individual differences. It is found out that buttons were the most appropriate tool for roaming through the hyper-video. That is because they have taken into consideration both independent and dependent cognitive field users' characteristics.

The current research focused on developing hyper-video programs by using appropriate navigation tools. The research sought to determine the effect of the interaction between hyper-video navigation tools (buttons, cognitive maps, and hot spots) and cognitive style (independent of cognitive field / dependent on the cognitive field) on the learning rate of students at the Department of Education Technology. It was concluded that buttons were the optimal navigation tool for both the independent and dependent cognitive fields, as they account for their differences. It is recommended that future research examine the expansion of the use of hyper-video applications across all educational levels, the different characteristics of learners should be regarded when developing hyper-video programs. Additionally, more researches are needed to investigate the effect of other navigation tools via hyper-video applications.

ACKNOWLEDGEMENTS

The author would like to express sincere gratitude to all the students who participated in this study.

DATA AVAILABILITY STATEMENT

The data reported in this paper are stored on the researcher's personal computer and are not available for public viewing.

CONFLICTS OF INTEREST

The author declares that there are no conflicts of interest regarding the publication of this paper.

FUNDING

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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