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Attitudes of the Tenth Grade Learners Towards the Use of Infographics in Hodeida Governorate

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Keywords

1. Attitudes
2. Infographics
3. Tenth Grade Learners

Abstract:

This study aimed to investigate tenth-grade learners' attitudes toward the use of infographics in English language classrooms at schools in Hodeida Governorate. A quasi-experimental design was adopted using the control-and-experiment-groups method as well as pre- and post-tests. Data were collected through a 31-item closed-ended attitude scale based on a five-point Likert format. The attitude scale was administered to both groups (experimental and control) before and after the instructional intervention. The experimental group was taught using 40 infographics-based instructional materials, including pictures, tables, charts, drawings, and graphs, whereas the control group received instruction through the traditional teaching method.

The study sample consisted of 80 tenth-grade learners (40 in each group) from various schools during the 2025/2026 academic year. The results revealed statistically significant differences ($p \leq 0.05$) in favor of the experimental group in the post-test, indicating a positive shift in learners' attitudes toward the use of infographics in teaching English. These findings suggest that integrating infographics into English language instruction can effectively enhance learner engagement and positive perceptions of learning. Accordingly, the study recommends that diverse visual materials be incorporated into English classroom teaching and that further research be conducted in different educational contexts to explore the broader impact of infographics-based instruction on learning English as a foreign language.

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اتجاهات طلاب الصف العاشر نحو استخدام الإنفوجرافيكس في محافظة الحديدة

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الكلمات المفتاحية

1. الاتجاهات
2. الإنفوجرافيكس (المعلومات المصورة)
3. أدب الأطفال

الملخص:

هدفت هذه الدراسة إلى تقصّي اتجاهات طلاب الصف العاشر نحو استخدام الإنفوجرافيك في تدريس اللغة الإنجليزية بمحافظة الحديدة. وقد استُخدم تصميم شبه تجريبي قائم على مجموعتين (تجريبية وضابطة) باستخدام أسلوب الاختبار القبلي/الاختبار البعدي. جُمعت البيانات من خلال مقياس اتجاهات مغلق مكوّن من (31) فقرة وفق مقياس ليكرت الخماسي. وطُبِّق المقياس على المجموعتين قبل التدخّل التعليمي وبعده. دُرِّست المجموعة التجريبية باستخدام (40) مادة تعليمية قائمة على الإنفوجرافيك شملت الصور، والجداول، والمخططات، والرسومات، والبيانات البيانية، في حين تلقّت المجموعة الضابطة التدريس بالطريقة التقليدية.

تكوّنت عينة الدراسة من (80) طالبة من طلاب الصف العاشر (40 في المجموعة التجريبية و40 في المجموعة الضابطة) من مدارس مختلفة خلال العام الدراسي 2026/2025. وأظهرت النتائج وجود فروق ذات دلالة إحصائية ($\alpha \leq 0.05$) لصالح المجموعة التجريبية في التطبيق البعدي، مما يدل على حدوث تحسّن إيجابي في اتجاهات الطلاب نحو استخدام الإنفوجرافيك. وتشير هذه النتائج إلى أن دمج الإنفوجرافيك في تدريس اللغة الإنجليزية يسهم بفاعلية في تعزيز دافعية المتعلمين وتنمية تصوراتهم الإيجابية تجاه عملية التعلم. وبناءً عليه، توصي الدراسة بدمج المزيد من المواد البصرية المتنوعة في التدريس الصفي، وإجراء دراسات مستقبلية في سياقات تعليمية مختلفة لاستكشاف الأثر الأوسع للتعليم المعتمد على الإنفوجرافيك في تعلم اللغة الإنجليزية.

Introduction:

Learners' attitudes play a crucial role in shaping their academic experiences and outcomes, especially in the field of English as a Foreign Language (EFL). According to some researchers (e.g. Astrom et al., 2025; Magati et al., 2024; and Fadhael, 2009), a positive attitude can significantly contribute to enhancing the learner's overall educational experience. This is because attitude is regarded as one of the key psychological and educational factors that can influence not only learners' motivation and engagement but also their actual proficiency in English.

Other researchers (e.g. Sabbar, 2013) also emphasize that learners' attitude towards the subjects they are learning is strongly affected by the type of teaching methods and techniques employed in the classroom. Drawing on such research observations, infographics have been utilized in learning settings and have emerged as a modern efficient educational tool. In the context of teaching English, many studies have highlighted the value of infographics as a learning tool, pointing to their role in fostering a more positive and engaging environment (see Parveen and Husain, 2021; Cahyani et al., 2020; Ibrahim and Maharaj, 2019; Alqudah et al., 2019; Hope and Cheta, 2018; and Alrwele, 2017). These studies stress that infographics can significantly shape learners' attitudes by presenting information visually in a way that enhances comprehension and retention.

Background of the study

In many EFL contexts, especially in developing countries such as Yemen, a major challenge facing educators is the lack of learners' desire and motivation to learn English. This issue can be easily noticed among students at secondary schools, where learners often tend to show limited engagement, low participation, and minimal interest in English classes. This is due to the fact that most learners at this educational level view English as a difficult and uninteresting subject and thus fail to engage enthusiastically during classes. Not only does this lack of desire to learn English hinder its acquisition; it also weakens learners' long-term educational outcomes.

There are several underlying factors that contribute to this motivational decline. Chief among them is the over-reliance on traditional teaching methods that prioritize memorization over interaction and lecture-based instruction over active learning. In such environments, learners rarely encounter English in meaningful or engaging ways, which diminishes their passionate and cognitive connection to the subject. The second fact is the lack of modern teaching techniques, including visual aids and learner-centered materials, which means that learners are not provided with stimulating input that matches their learning preferences. This leads in turn to disinterest and an inability to see the relevance of English to their daily activities and future careers.

To address this problem, educators and researchers are increasingly turning attention to innovative strategies that incorporate visual and interactive elements into the classroom activities. One of such techniques is the use of infographics, that is, visual representations of information that combines graphics, minimal texts, charts, and illustrations to convey complex ideas in an engaging and accessible way. Infographics offer learners an alternative to dense, text-heavy materials and make abstract concepts more concrete and memorable. Some studies, such as Parveen and Husain (2021), Cahyani et al. (2020) and Ibrahim and Maharaj (2019), highlight the effectiveness of infographics in enhancing learners' motivation, engagement, and overall attitude towards English learning. Infographics have also been shown to promote better understanding, retention, vocabulary acquisition, and the development of higher-order thinking skills.

In light of all this, the present study aims to investigate the attitudes of tenth-grade learners toward the use of infographics in EFL classrooms at schools in Hodeida Governorate. To this end, the study addresses the following main research question:

What are the attitudes of tenth-grade learners toward the use of infographics in instruction on English language in

comparison to the traditional teaching method?

To provide a more detailed analysis, this main question is further examined through the following sub-questions, each of which corresponds to one domain of the attitude scale:

1. To what extent do tenth-grade learners demonstrate **positive affective attitudes** toward learning English through infographics compared to traditional teaching instruction?
2. To what extent do tenth-grade learners show a greater **preference for visual learning formats** when taught using infographics compared to text-based instruction?
3. To what extent do infographics enhance learners' **perceived cognitive benefits**, including comprehension, retention, vocabulary acquisition, and ease of learning?
4. To what extent do infographics contribute to the development of learners' **higher-order thinking skills**, particularly analytical thinking, critical thinking, and the organization of ideas?
5. How do tenth-grade learners perceive the **usability and design quality** of infographics as a learning medium?

The current study was conducted at Hodeida Governorate, with a sample of eighty tenth-grade learners (forty learners per group; experimental and control) from various schools in the 2025/2026 academic year.

The study is expected to be of practical as well as theoretical importance, as follows:

1. It is hoped that the results of this study will offer a foundation for subsequent studies to explore other aspects of the infographic method.
2. The study attempts to introduce educational policymakers and curriculum developers to the potential benefits of innovative teaching methods like infographics, encouraging their adoption and implementation.
3. By bridging the gap between infographics and teaching methods, this study hopes to provide interdisciplinary insights that enrich both fields. It may help teachers understand how psychological principles can be harnessed to enhance language teaching and learning.
4. This study will, hopefully, offer a scientific response to the aspirations and objectives of the secondary schools in the Republic of Yemen seeking to apply the modern teaching methods used at secondary schools.

Literature Review

Understanding students' attitudes is crucial in shaping effective teaching strategies in the EFL context. Attitude has long been recognized as a key concept in social psychology and educational research and has been defined as "…. summary evaluations of people, groups, ideas, and other objects, reflecting whether individuals like or dislike them. The study of attitudes takes a central position in social psychology. Decades of research have demonstrated that attitudes are important for understanding how individuals perceive the world and how they behave" (Wolf et al., 2020). In *Longman Dictionary of Contemporary English* (2009, p. 94), attitude is "the opinions and feelings that you usually have about something, especially when this is show in your behaviour". According to Al-Mutayer (2015) and Pickens (2005) attitude refers to an individual's evaluative response – either positive or negative – toward a person, object, or idea, shaped by belief, emotions, and past experiences. It influences not only behavior but also engagement, learning preferences, and academic success. Wolf et al. (2020) state that attitudes comprise cognitive, affective, and behavioral components.

In educational settings, especially in EFL classrooms, learners' attitudes toward learning tools can directly impact motivation and outcomes. A lack of desire to learn, as observed in the case of many EFL learners, is often linked to uninspiring instructional methods and failure to connect content with learners' interests or learning styles. To address this challenge, infographics have been utilized and proved efficient as a visual learning technique that supports cognitive processing and engages learners effectively and behaviorally.

The notion of infographic is defined as "a visualization of data or ideas that tries to convey complex information to an audience in a manner that can be quickly consumed and easily understood" (Hertavira, 2019:39). In other words, they are visual representations of complex information designed to be quickly understood and easily retained. Oxford dictionaries online website (2016) defines it as "a visual presentation of information in the form of a chart, graph, or other image accompanied by minimal text, intended to give an easily understood overview, often of a complex subject: a mass-transit infographic that uses different colors to represent different modes of transportation.

Studies such as Hertavira (2019) and Purchase et al. (2018) emphasize the role of infographics in presentations aiming to enhance communication by condensing large amounts of information into texts and images. Infographics often display quantitative data via various visual elements like bar charts or maps, making the information more engaging and memorable. According to Purchase et al. (2018, p. 211), there are seven types of infographics: Bar Charts, Geographical, Units, Area-as-Quantity, Single Circle, Proportion-as-Quantity, and Flags. Hertavira (2019) confirms that this visual technique ability to integrate charts, symbols, texts, and images into cohesive visuals aligns with how the human brain processes information, making them an ideal medium for enhancing comprehension and engagement in language learning. According to Beegel (2014, p. 9), effective infographics quickly grab attention by combining a striking headline with engaging visuals, capturing viewers within the first few seconds. It has become an increasingly valuable medium for creators to express ideas clearly while also conveying important information (cited in Hertavira, 2019, p. 41).

Previous Studies:

Alqudah, Bin Bidin and Hussin (2019)

The purpose of this study was to evaluate the effect of infographics on learners' interactions and how they understand the information being presented in higher education. Lectures at Applied Sciences Private University in Jordan and two other colleges—one scientific and the other humanistic—were used to compare the two variables used in this study. The researcher used the (ASSURE) instructional model to create infographic materials to achieve this goal. These materials were used to deliver lectures to the two experimental groups using an infographic approach in two chosen courses from the Business College and the Information Technology College. In the meantime, two control groups were using the traditional method to take the same courses in different classes. Moreover, (138) learners participated in total, including all members of the experimental and control groups. Additionally, after lectures using infographic materials, experimental groups were given a post-test questionnaire to measure their interaction and perception. The findings of this study showed that infographics have a positive and significant impact on learners' interactions and perceptions.

Hope and Cheta (2018)

The study showed how infographics affected the size of the class, the learners' attitudes, and their academic achievement in Media Systems among the University of Port Harcourt's Curriculum Studies and Educational Technology undergraduate students. The study's sample consisted of all seventy-nine (79) three hundred (300) level learners of computer science education who were specifically chosen by the researchers, whereas the population consisted of all seventy-nine (79) three hundred (300) level learners of computer science education. A questionnaire of 20 items was designed to ascertain how learners felt about media systems. According to the study, learners' attitudes toward using infographics and their academic achievement in the media system differed significantly. The size of the classes and their academic achievement in the use of infographics in media systems also differed significantly.

The academic performance of male and female learners regarding the use of infographics in media systems differed significantly, with males outperforming their

female classmates. The usage of infographics in media systems was more popular and appealing to men. In addition to encouraging teachers to employ infographics in their instruction, the recommendations suggested that learners cultivate a favorable attitude toward the usage of infographics in their various courses. The researchers also suggested that parents should offer their children, especially their daughters, a variety of learning possibilities.

The results of the previous studies showed that learners had great perceptions towards the use of infographics in the field of education.

The present study and the previous studies have some aspects in common. For example, they are experimental in nature. They also focus primarily on infographics as a tool for teaching and learning. But while some of the previous studies were carried out to explore the use of infographics in schools in other countries of the Arab world (e.g. Iraq, Jordan, and Saudi Arabia), the present study is the first of its kind in Yemen, specifically within the under-researched context of Hodeida Governorate. Its significance lies in addressing the limited integration of modern visual tools in English classes in secondary schools in Yemen by examining learners' attitudes towards the use of infographics.

By investigating how infographics can influence tenth-grade learners' affective responses, preferences for visual over textual content, understanding and retention, vocabulary development, and perception of usability and design, the study aims to offer a foundational understanding of the pedagogical value of infographics in EFL contexts. Furthermore, by linking attitude theory with educational technology, this study not only contributes to the development of learner-centered approaches but also provides interdisciplinary insights that can help curriculum developers and educational policymakers in adopting innovative teaching strategies. Ultimately, it offers a scientific response to the aspirations of the secondary education system, which seeks to implement contemporary, psychologically informed, and visually driven teaching methodologies.

Methodology

This study used a quasi-experimental research design, specifically employing a two-group pre-test/post-test design to collect and analyze data on learners' attitudes toward infographics. A structured scale based on five domains (affective attitude, visual learning preference, cognitive benefits, higher-order thinking skills, and usability/design perception) was used as the main data collection tool. It contained 31 items covering the five domains of learners' attitudes, as shown in Table (1). The scale items were adapted from previous literature, including Putra (2021), Pazilah and Hashim (2018), Hope and Cheta (2018), Bicen and Beheshti (2017), Abu El-Magd (2016), Zhao (2016), Ferreira (2014), Siricharoen and Siricharoen (2015), and Noh et al. (2014), and were validated through expert review and a pilot study to ensure reliability and validity.

Each item offered five response options using a five-point Likert scale ranging from strongly disagree to strongly agree. Learners were instructed to select the option that best represented their views, and then responses were scored as follows: strongly disagree (1 point), disagree (2 points), undecided (3 points), agree (4 points), and strongly agree (5 points).

Considering the participants' low English proficiency, Arabic translations were provided alongside each item to ensure clarity and accessibility. The study population comprised tenth-grade students enrolled in public secondary schools in Hodeida Governorate, Yemen. A random sample of approximately 80 students was taken from various schools across the governorate to participate in the study.

Table (1) The Five Domains of the Scale and Their Items

Domains	No.	Items
Affective Attitude	1	أحب الإنفوجرافيكس (المعلومات المصورة). I like infographics.
	2	أنا أستمتع باستخدام الإنفوجرافيكس (المعلومات المصورة). I enjoy using infographics.
	3	انا استمتع بالتعلم باستخدام الإنفوجرافيكس (المعلومات المصورة). I enjoy learning with Infographics.
	4	إستخدام الإنفوجرافيكس (المعلومات المصورة) في الصف له تأثير إيجابي عليَ. Using infographics in the classroom has a positive effect on me.
	5	انا أفضل الإنفوجرافيكس (المعلومات المصورة) على النصوص الطوية في التعلم. I prefer infographics over long texts for learning.
	6	الإنفوجرافيكس (المعلومات المصورة) تعزز إبداعي. Infographics enhance my creativity.
	7	الإنفوجرافيكس (المعلومات المصورة) تشد إنتباهي للتعلم Infographics grabs my attention to learn.
	8	الإنفوجرافيكس (المعلومات المصورة) تزيد من رغبتي ودافعيتي للتعلم. Infographics increases my willingness and motivation to learn.
	9	الإنفوجرافيكس (المعلومات المصورة) تجعل المعلومات أكثر إقناعاً. Infographics makes information more persuasive.
Visual Learning Preference	10	أميل إلى فهم المعلومات من خلال الصور / الرموز. I tend to understand information through visuals/images/symbols.
	11	أميل إلى فهم المعلومات من خلال رسم بياني / مخطط. I tend to understand information through a diagram/chart.
	12	الألوان الجذابة تساعدني على فهم المعلومات بشكل أفضل. Attractive colors help me understand information better.
	13	أميل إلى فهم المعلومات بتصميم جيد. I tend to understand information with good design.
	14	أستطيع تذكر المعلومات المعروضة في الإنفوجرافيكس (المعلومات المصورة). I can remember the information which is presented in infographics.
	15	أجد أنه من السهل فهم النص عند استخدام الإنفوجرافيكس (المعلومات المصورة). I find it easy to understand the text with the use of infographics.
Cognitive Benefits	16	الإنفوجرافيكس (المعلومات المصورة) تساعدني على تعلم المحتوى الأكثر تعقيداً بسهولة. Infographics helps me to learn more complex content easily.
	17	التعلم باستخدام الإنفوجرافيكس (المعلومات المصورة) يتطلب وقتاً وجهداً أقل. Learning with infographics takes less time and effort.
	18	تساعدني الإنفوجرافيكس في تعلم مفردات جديدة. Infographics helps me to learn new words.
	19	تساعدني الإنفوجرافيكس على تذكر المفردات التي تعلمتها في الصف. Infographics helps me to remember the words I learned in class.
	20	الإنفوجرافيكس (المعلومات المصورة) تساعدني على تعلم لغة جديدة بشكل أسرع وأسهل. Infographics helps me to learn a new language faster and more easily.
	21	الإنفوجرافيكس (المعلومات المصورة) أداة فعالة لتعلم القواعد الإنجليزية. Infographics helps me to learn English grammar more effectively.
	22	الإنفوجرافيكس (المعلومات المصورة) تعرض المعلومات/البيانات بوضوح. Infographics presents information/data clearly.
	23	الإنفوجرافيكس (المعلومات المصورة) تساعدني على فهم العلاقات بين المعلومات/ البيانات. Infographics helps me to classify relationships among information/data.
	24	تركز الإنفوجرافيكس (المعلومات المصورة) على أهم النقاط لعرض البيانات/المعلومات. Infographics focuses on the important points to present the data/information.
	25	الإنفوجرافيكس (المعلومات المصورة) تلخص المعلومات من فصل واحد في كتاب إلى صفحة واحدة. Infographics summarizes information from one chapter of a book into one page.
	26	أميل إلى تحليل المعلومات المعروضة في الإنفوجرافيكس (المعلومات المصورة) لوحدي.

Higher-order thinking Skills		I tend to analyze the information presented in infographics on my own.
	27	الإنفوجرافيكس (المعلومات المصورة) تُنمي قدرتي على التفكير النقدي وتنظيم أفكاري. Infographics develops my ability to think critically and organize my ideas.
	28	إستخدام الإنفوجرافيكس (المعلومات المصورة) يساعدني لإتقان مهارات اللغة الإنجليزية. Using infographics helps me to improve my English skills.
Usability/ Design Perception	**29**	الإنفوجرافيكس (المعلومات المصورة) سهلة الاستخدام. Infographics is easy to use.
	30	الإنفوجرافيكس (المعلومات المصورة) تستخدم التصميم المرئي الإبداعي والتكنولوجي بفاعلية. Infographics utilizes creative visual design and technology effectively.
	31	الإنفوجرافيكس (المعلومات المصورة) تجعلني قوي الملاحظة أثناء التعلم. Infographics makes me able to notice well during learning.

4. Data Analysis and Results Discussion

In this section, the results relevant to the sub-questions are presented first, as each one addresses a specific domain of learners' attitudes toward the use of infographics in English classes, including affective attitude, visual learning preference, perceived cognitive benefits, higher-order thinking skills, and usability/design perception. Examining these domains individually provides a detailed and structured understanding of how learners responded to the instructional intervention. Drawing on a synthesis of the results relevant to the sub-question, we then present the results relevant to the main research question, offering an overall evaluation of learners' attitudes toward the use of infographics to learn English.

Results relevant to the first sub-question:

The first sub-question is intended to explore tenth-grade learners' affective attitudes toward the use of infographics. To investigate this issue, the following null hypothesis was formulated and tested:

"There are no statistically significant differences ($\alpha \leq 0.05$) in the mean scores of affective attitudes toward infographics between the experimental group taught by using infographics and the control group taught by using a traditional method."

Table (2) Affective Attitude

		Experimental Group	Control Group
Pre-administration	**Mean**	28.90	28.80
	Std. Deviation	6.659	6.489
Post-administration	**Mean**	40.38	29.00
	Std. Deviation	3.712	6.251
T [Pre vs Post administrations]		8.63	32.0
Sig. [Pre vs Post administrations]		< 0.001	< 0.001
Cohen's d [Pre vs Post administrations]		3.97	10.36
T [Ex. vs Con]		9.93	
Sig. [Ex. vs Con]		< 0.001	
Cohen's d [Ex. vs Con]		2.22	
Effect size		Very large	

Table (2) revealed the results of this domain (affective attitude) as follows:

- In the pre-test phase, both groups showed almost identical mean scores in affective attitude toward infographics (Experimental: M = 28.90, SD = 6.66; Control: M = 28.80, SD = 6.49). This indicates that the two groups started with equal attitudes.
- In the post-test phase, the experimental group showed clear improvement. Its mean score increased from (28.90) to (40.38) (gain = 11.48 points). The standard deviation also decreased from (6.66) to (3.71). The within-group comparison showed a statistically significant difference between the pre- and post-tests ($t = 8.63$, $p < 0.001$), with an extremely large effect size. This result suggests that there was much improvement in learners' passionate engagement with infographic-based instruction.

- The control group showed almost no change, with its mean score increasing slightly from (28.80) to (29.00) (gain = 0.20 points). Although the within-group result was statistically significant, the gain was too small to have real educational value. This suggests that the traditional method did not improve learners' affective attitudes. The large standard deviation (6.25) also shows continued variability and a lack of consistent positive responses.
- The between-group comparison at post-administration showed a statistically significant difference in favor of the experimental group ($t = 9.93$, $p < 0.001$). The effect size was very large (Cohen's $d = 2.22$). This confirms that infographic-based instruction had a strong positive impact on learners' affective attitudes compared with traditional teaching.

Learners who used infographics reported greater enjoyment, higher motivation, better attention, stronger preferences for visuals over text, and better perceptions of creativity and persuasion. These results show that visual tools create a more engaging and supportive learning environment. They also support theories that multimodal materials reduce boredom and anxiety caused by text-heavy instruction.

Overall, the results clearly show that infographics produced a meaningful improvement in learners' affective attitudes, while traditional instruction did not. Therefore, the null hypothesis is rejected.

Results relevant to sub-question 2:

The second sub-question focused on determining the degree to which tenth-grade learners prefer visual formats over text-based materials. Accordingly, the following null hypothesis was examined:

"There are no statistically significant differences ($\alpha \leq 0.05$) in the mean scores of visual learning preference between the experimental group taught by using infographics and the control group taught by using a traditional method."

Table (3) Visual Learning Preference

		Experimental Group	Control Group
Pre-administration	**Mean**	19.68	19.63
	Std. Deviation	4.864	4.533
Post-administration	**Mean**	26.73	19.60
	Std. Deviation	2.708	4.205
T [Pre vs Post administrations]		8.28	35.0
Sig. [Pre vs Post administrations]		< 0.001	< 0.001
Cohen's d [Pre vs Post administrations]		3.77	11.45
T [Ex. vs Con]		8.94	
Sig. [Ex. vs Con]		< 0.001	
Cohen's d [Ex. vs Con]		2.00	
Effect size		Very large	

Based on the results displayed in Table 3 above, a discussion of students' visual learning preference can be presented as follows:

- At the pre-administration stage, the experimental and control groups showed almost identical mean scores (Experimental: $M = 19.68$, $SD = 4.86$; Control: $M = 19.63$, $SD = 4.53$). This shows that both groups started at the same level before the intervention.
- At the post-administration stage, learners in the experimental group experienced a clear improvement, with the mean score increasing from (19.68) to (26.73), a gain of (7.05) points, and the standard deviation decreasing from (4.86) to (2.71). The within-group test showed a statistically significant difference ($t = 8.28$, $p < 0.001$) with a strong effect size (Cohen's $d = 3.77$). This confirms that infographic-based instruction strengthened learners' preference for visual learning.
- The control group showed almost no change to their attitude toward the use of infographics in English classes, with

the mean score decreasing slightly from (19.63) to (19.60) (gain = –0.03). The standard deviation remained high (4.53 → 4.21). This indicates that learners' attitudes stayed inconsistent and did not improve under the traditional teaching method.

- The between-group comparison at post-administration showed a highly significant difference in favor of the experimental group ($t = 8.94$, $p < 0.001$). The effect size was very large (Cohen's $d = 2.00$). These results clearly suggest that infographic-based instruction helped learners rely more on visual formats for understanding and remembering English content.

Pedagogically, infographics support learning because they provide clear, organized, and visually rich information. They draw attention to key points, simplify complex ideas, and improve processing through images, diagrams, colors, and structured layouts. These features allow learners to comprehend and recall information more easily than with text-only materials.

Therefore, the null hypothesis for this domain is rejected. Infographics significantly improved tenth-grade learners' preference for visual learning. Learners who used infographics reported better understanding through visuals, greater ease of learning, and stronger memory for graphically presented content.

Results relevant to sub-question 3:

The third sub-question aimed to assess the impact of infographic-based instruction on learners' comprehension, memory retention, and vocabulary development in English. To address this inquiry, the following null hypothesis was tested:

"There are no statistically significant differences ($\alpha \leq 0.05$) in the mean scores obtained by the experimental group and the control group in the domain of perceived cognitive benefits."

Table (4) Cognitive Benefits

		Experimental Group	Control Group
Pre-administration	**Mean**	33.48	33.40
	Std. Deviation	7.473	7.225
Post-administration	**Mean**	44.55	33.65
	Std. Deviation	3.471	6.952
T [Pre vs Post administrations]		7.52	38.7
Sig. [Pre vs Post administrations]		< 0.001	< 0.001
Cohen's d [Pre vs Post administrations]		3.28	12.98
T [Ex. vs Con]		8.75	
Sig. [Ex. vs Con]		< 0.001	
Cohen's d [Ex. vs Con]		1.96	
Effect size		Very large	

Regarding the domain of cognitive benefits, the results are as follows:

- Before the intervention, both the experimental and control groups showed nearly identical mean scores in cognitive benefits (Experimental: $M = 33.48$, $SD = 7.47$; Control: $M = 33.40$, $SD = 7.23$). This confirms that both groups started the study at the same cognitive level.
- Following the intervention, a clear improvement was observed in the experimental group, with their mean score increasing from (33.48) to (44.55), a gain of (11.07) points. The standard deviation dropped from (7.47) to (3.47). The within-group test showed a statistically significant difference ($t = 7.52$, $p < 0.001$) with a high effect size (Cohen's $d = 3.28$). This indicates that infographic-based instruction greatly improved learners' perceived cognitive outcomes.
- The control group showed almost no improvement, obtaining a mean score that increased slightly from (33.40) to (33.65) (gain = 0.25 points). The standard deviation remained high (7.23 → 6.95). This shows continued variability and no meaningful

improvement under traditional instruction.

- The between-group comparison at post-administration showed a highly significant difference favoring the experimental group ($t = 8.75$, $p < 0.001$). The effect size was very large (Cohen's $d = 1.96$). This confirms that learners taught with infographics experienced greater cognitive benefits, such as better understanding of complex material, improved vocabulary retention, clearer grasp of grammar, stronger organization of information, and easier summarization.

These findings support cognitive learning theories, like the dual coding theory and multimedia learning principles. These theories argue that combining visual and verbal information improves comprehension and memory more than text alone. Infographics reduce cognitive load, highlight key ideas, show relationships between concepts, and support efficient learning. These features likely made learning easier and more effective for learners in the experimental group.

In short, the results are not in support of the null hypothesis, clearly showing that infographics produced a clear and meaningful improvement in learners' cognitive benefits, while traditional instruction led to no significant cognitive change.

Results relevant to sub-question 4:

The fourth sub-question investigated whether using infographics contributes to the enhancement of learners' critical thinking skills and their ability to organize information effectively. To evaluate this aspect, the following null hypothesis was proposed and tested:

"There are no statistically significant differences ($\alpha \leq 0.05$) in the mean scores obtained by the experimental group and the control group in the domain of higher-order thinking skills."

Table (5) Higher-order Thinking Skills

		Experimental Group	Control Group
Pre-administration	**Mean**	9.75	9.58
	Std. Deviation	2.743	2.521
Post-administration	**Mean**	13.63	9.58
	Std. Deviation	1.213	2.206
T [Pre vs Post administrations]		1.16	13.3
Sig. [Pre vs Post administrations]		0.253	< 0.001
Cohen's d [Pre vs Post administrations]		0.38	4.59
T [Ex. vs Con]		10.25	
Sig. [Ex. vs Con]		< 0.001	
Cohen's d [Ex. vs Con]		2.29	
Effect size		Very large	

Table (5) shows the results of this domain (higher-order thinking skills) as follows:

- At the pre-administration stage, both groups showed almost identical scores in higher-order thinking skills (Experimental: $M = 9.75$, $SD = 2.74$; Control: $M = 9.58$, $SD = 2.52$). This indicates that learners in both groups began with similar cognitive levels.
- The experimental group showed a clear improvement at the post-administration stage, obtaining a higher post-test mean score of 9.75 than the pre-test score of 13.63, a gain of (3.88) points. The standard deviation decreased to (1.21). Although the within-group comparison was not statistically significant ($t = 1.16$, $p = 0.253$), the moderate effect size (Cohen's $d = 0.38$) and the noticeable rise in scores suggest practical improvement. This indicates that infographics helped learners analyze information, think critically, and organize ideas more effectively.
- The control group showed no improvement in this domain, obtaining

the same score before and after the treatment (9.58 → 9.58). The within-group comparison appeared statistically significant (t = 13.3, p < 0.001), but this result likely reflects natural variation rather than instructional impact, since the mean did not change. The small drop in standard deviation (2.52 → 2.21) shows minor score fluctuations but no meaningful growth.

- The between-group comparison at the post-administration stage showed a highly significant difference in favor of the experimental group (t = 10.25, p < 0.001). The effect size was very large (Cohen's d = 2.29). This confirms that learners who used infographics performed much better in analyzing information, organizing ideas, and applying critical thinking than those taught through traditional methods.

These results indicate that infographics can significantly improve higher-order thinking and organizational skills among tenth-grade learners. The strong between-group effect confirms that infographics are a powerful tool for promoting analytical thinking, conceptual organization, and overall cognitive development in English learning. Therefore, the fourth null hypothesis is not supported.

Results relevant to sub-question 5:

The fifth sub-question is concerned with learners' perceptions of the practicality, clarity, and visual design quality of infographics utilized during English instruction. To analyze this issue, the following null hypothesis was formulated to be tested:

"There are no statistically significant differences (α ≤ 0.05) in the mean scores obtained by the experimental group and the control group in the domain of usability and design perception."

Table (6) Usability/ Design Perception

		Experimental Group	Control Group
Pre-administration	**Mean**	10.45	10.25
	Std. Deviation	2.726	2.457
Post-administration	**Mean**	13.73	10.30
	Std. Deviation	1.132	2.462
T [Pre vs Post administrations]		3.75	13.7
Sig. [Pre vs Post administrations]		0.001	< 0.001
Cohen's d [Pre vs Post administrations]		1.21	4.71
T [Ex. vs Con]		7.93	
Sig. [Ex. vs Con]		< 0.001	
Cohen's d [Ex. vs Con]		1.77	
Effect size		Very large	

As displaced in Table-6 above, the results obtained are as follows:

- Before the intervention, both groups showed similar baseline perceptions of usability and design (Experimental: M = 10.45, SD = 2.73; Control: M = 10.25, SD = 2.46). This indicates that both groups were equivalent at the start.
- After the intervention, the experimental group demonstrated a clear improvement, obtaining a higher mean score of 10.45 than the pre-intervention score of 13.73, a gain of 3.28 points. The within-group test showed a statistically significant improvement (t = 3.75, p = 0.001) with a large effect size (Cohen's d = 1.21). The standard deviation dropped sharply from (2.73) to (1.13), showing stronger agreement among learners about the positive usability and design features of infographics.
- The control group showed almost no improvement. Its mean rose only slightly from (10.25) to (10.30), which has no practical educational value. Although the within-group test was statistically significant (t = 13.7, p < 0.001), the unchanged standard deviation (2.46 → 2.46) indicates

inconsistent or stable perceptions under traditional teaching.

- The between-group post-test comparison showed a significant difference in favor of the experimental group ($t = 7.93$, $p < 0.001$). The effect size was very large (Cohen's $d = 1.77$). This shows that learners who used infographics viewed them as easier to use, more visually appealing, and more engaging than traditional materials.

Overall, the results confirm that learners found infographics clearer, more engaging, easier to use, and more visually attractive than traditional instruction. These findings support rejecting the null hypothesis.

Collectively, these findings provide a direct answer to the main research question regarding tenth-grade learners' attitudes toward the use of infographics in learning English. The results across all attitude-related domains consistently demonstrate a pattern of large to moderate post-test gains in the experimental group, alongside negligible change in the control group. This trend highlights the positive impact of infographics-based instruction on learners' attitudes toward the use of infographics as an educational tool. Participants exposed to infographics reported increased interest, enjoyment, engagement, and perceived usefulness of visual materials throughout the learning process. These outcomes offer clear empirical evidence that contradicts the main null hypothesis, which stated that "there are no statistically significant differences ($\alpha \leq 0.05$) in the mean post-test scores of overall attitudes toward infographics between the experimental group taught by using infographics and the control group taught by using a traditional method." Accordingly, the consistent superiority of the experimental group's results leads to the rejection of the main null hypothesis, confirming that integrating infographics into instruction significantly enhances learners' attitudes toward visual learning tools and fosters more positive engagement with educational content.

5. The Major Findings

The findings of the present study are consistent with those reported by Alqudah et al.'s (2019) and Hope and Cheta's (2018) studies, both of which confirmed the positive educational impact of infographics on learners' attitudes and engagement. Alqudah et al. (2019) demonstrated that students who were taught using infographics-based materials exhibited significantly improved interactions and more favorable perceptions compared with their peers who learned through traditional instructional approaches. Similarly, Hope and Cheta (2018) found that the use of infographics significantly enhanced learners' attitudes toward learning and positively influenced their academic achievement in media systems courses, with learners expressing stronger acceptance and motivation toward visually supported instruction. By the same token, the results of the current study reveal large to moderate gains across all attitude domains among learners exposed to infographics-based instruction, including affective attitude, visual learning preference, perceived cognitive benefits, higher-order thinking skills, and usability/design perception, while the control group showed negligible change. Collectively, these findings reinforce the conclusion that infographics serve as an effective pedagogical tool for improving learner engagement, shaping positive attitudes toward learning materials, and enhancing students' overall learning experiences across different educational contexts.

6. Conclusion and Recommendations

Based on the positive findings of the current study, which demonstrated statistically significant improvements (≤ 0.05) in tenth-grade learners' attitudes toward infographics across the five domains of affective attitude, visual learning preference, cognitive benefits, higher-order thinking skills, and usability/design perception, several directions for future research can be suggested. First, further studies are recommended to examine the impact of infographics on learners' motivation and classroom interaction, as well as their effectiveness across different

educational stages and contexts beyond the tenth grade. Secondly, the present study suggests that infographics be utilized extensively as an instructional strategy to enhance learner engagement and language proficiency and recommends that visuals be incorporated into teaching practices at educational institutions across Yemen. Additionally, future research could explore the application of infographics in diverse instructional domains to further validate and expand understanding of their pedagogical value in English language teaching and learning.

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