

ASSESSING INFOGRAPHICS AS A TOOL OF VISUAL COMMUNICATION IN TEACHING AND LEARNING

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Abstract:

In recent years, infographics have gained popularity in online teaching and learning as a means of visually presenting information. While widely used as a communication tool, little is known about how infographics influence students' interpretation and understanding of concepts compared to text-only materials. The literature highlights challenges such as poor application of design principles, ineffective use of layout and colour, and inclusion of irrelevant visuals, which may affect learning outcomes. This paper investigates the influence of infographics on students' interpretation and understanding of art and design concepts in comparison to text-only information. The study was conducted at the Department of Design and Studio Art at the Central University of Technology (CUT), Free State, South Africa, during the 2018/2019 academic years. Quantitative data were collected from two experimental groups: one group received text-only instructional material (N = 23), while the other received infographic-based material (N = 20). The findings reveal no significant difference in mean percentage scores between the two groups. Both groups performed similarly in the assessment, with average scores showing no meaningful distinction, suggesting that the use of infographics did not significantly enhance students' understanding compared to text-only content.

Keywords: *Infographics, visual communication, text, teaching and learning, visual representations.*

1. INTRODUCTION

Throughout the history, communication has been an integral part of human interaction taking place in various forms such as verbal conversation, visual representation, or even through physical movement. The visual representations by early humans were through cave paintings and later developed mapping techniques (Lankow, Ritchie, & Crooks, 2012). In recent years, there has been a significant interest favouring the use of text and attractive infographics, to communicate information. There are many definitions for infographics. One of these definitions is "...visual displays in which graphics (illustrations, symbols, maps, diagrams, etc.) together with verbal language communicate information that would not be possible otherwise" (Meirelles, 2013). Another description of infographics is that "they can be used to represent data and ideas visually, in pictures, engaging more parts of the brain to look at a problem from more than one angle" (Krauss, 2012). In simple terms, infographics are visual representations of information and often used interchangeably with the term "data visualization" (Dur 2014; Reeve & Morris, 2017).

The interpretation and understanding of infographic representations require a broad range of skills. Infographic representations contain images, which could be difficult to interpret and to attach the correct meaning if the appropriate skills are lacking (Sherin, 2013). Some of the most important skills required for the correct interpretation and understanding of infographic representations are critical thinking, critical reading, understanding of statistics, understanding of mathematical concepts, and general visual perceptual skills (Hobbs, 2017). Although there is a growing interest in the use of infographics in conveying information, it seems as if in most cases infographics are misused by focusing on visual presentation rather than presenting information appropriate for the audience and content, (Albers, 2015).

In teaching environment, educators increasingly rely on the use of infographic representations of to convey ideas and concepts to students. However, with the rapid increase in the use of such representations in the classroom, many students fail to achieve their expected learning outcomes (Lundy and Stephens, 2015). This is mostly because of their underdeveloped visual literacy skills which hinder their ability to fully grasp the information presented in infographics. This paper seeks to address this gap in the literature by investigating the impact of infographics on comprehension of abstract art and design concepts among students in the Department of Design and Studio Art. By exploring the benefits and limitations of using infographics as a pedagogical tool, this research aims to provide valuable insights for educators, curriculum developers, and instructional designers seeking to optimize visual learning experiences in creative disciplines.

Research questions

This investigation will be guided by the following research questions:

How do students perceive and engage infographics as a visual aid in art and design education?

What are the perceived benefits and limitations of infographics in facilitating the comprehension of art and design concepts among students?

Aim

This research aims to assess the impact of infographics on the comprehension of abstract art and design concepts among students in the Department of Design and Studio Art.

Objectives

To achieve this, aim the following objectives were devised:

- Assess students' perceptions and engagement with infographics in art and design education.
- Identify the perceived benefits and limitations of infographics in facilitating comprehension of art and design concepts.
- Investigate the influence of infographics on students' comprehension of abstract art and design concepts.

2. LITERATURE REVIEW

2.1 Introduction

The use of visual aids in education has long been recognized as an effective method to enhance students' learning experiences and improve their comprehension of complex concepts (Traboco, Pandian, Nikiphorou Gupta 2022; Dur, 2014). Within the field of visual communication, infographics have gained prominence as powerful tools for presenting information in a visually engaging and concise manner. A study conducted by Yildirim in 2016 discovered that participants showed a preference for receiving information in visual formats such as infographics rather than plain textual content. This literature review aims to explore how infographics influence students' interpretation and understanding of art and design concepts, with a focus on their advantages over traditional text-based materials. It begins with an overview of the historical background of infographics within the broader context of information visualization. The authors strongly believe that this understanding would shed light on trends, innovations, and shifts in the field, offering insights into the development of effective visualization practices. Additionally, the literature review discusses the application, benefits, and challenges of using infographics in educational settings.

Visual communication involves how we interpret and understand certain things using pictures and images in our minds (Lester, 2012). It includes many ways of showing and sharing information, like what we think about and what we see with our eyes. In our everyday lives, we remember things that are important to us, often because they are creative, cultural, or emotional—like old things from history that people still care about (Baldwin and Roberts, 2006). These old things, like pictures and artworks, are kept and remembered by many people in Western culture. They help teach future generations about the past. Infographics, which are visual representation of information communication, have become widely

used in various fields like journalism, marketing, and data analysis. They make it easier to understand complex data and statistics (Kennedy et al., 2014). In essence, an infographic is a way of using pictures and symbols to share information. Infographics do not have to be complicated or include a lot of data. They can be as simple as a picture of a person digging with a shovel to indicate construction work ahead, or as complex as a detailed analysis of the global economy (Lankow, Ritchie, & Crooks, 2012).

Despite their widespread use in various areas, their effectiveness as a teaching tool for art and design concepts remains uncertain. This raises the question of whether infographics can be equally effective in the context of art and design education. One important factor to note from the literature is that when providing students with infographics is that they need to be evidence-based or made carefully with credible sources (Traboco, Pandian, Nikiphorou Gupta 2022). This will ensure that the information provided is correct and not misleading to students. Understanding these important aspects about infographics can help educators show students in teaching students how to evaluate the reliability of information presented in infographics.

2.2 The Roots of Infographics: A Look back in History

Infographics, visual representations of information, have a long history dating back to ancient times and of which the first known examples were from the late Stone Age, around 30,000 BC (Smiciklas, 2012). Early civilizations used symbols and hieroglyphs to convey ideas, with notable examples including Egyptian hieroglyphs and Mesoamerican imagery (Mol, 2011). In the 18th century, Scottish engineer William Playfair introduced graphs and charts in his book, pioneering the interpretation of numerical data (Smiciklas, 2012). In the 20th century, newspapers and magazines began incorporating infographics to engage readers. This trend continued with the rise of the internet, as infographics offered a more visually appealing alternative to text-heavy reports. Notably, Florence Nightingale used infographics to illustrate health issues among soldiers during the Crimean War.

Technological advancements have made infographic production more accessible, transitioning from manual processes to computer-based design. Infographics are valued for their ability to simplify complex information, making it easier for viewers to understand and engage with the material (Chicca & Chunta, 2020). They are widely used in mainstream media and online platforms to communicate ideas effectively. In the modern context, infographics serve as visualizations of data or ideas, aiming to convey information quickly and clearly. They are used to tell stories, explore issues, and disseminate research findings in a visually engaging manner. With the availability of software tools and online resources, creating infographics has become more accessible than ever before. Today, infographics are ubiquitous, found everywhere from restaurant menus to social media platforms. They offer a visually appealing way to present information, drawing viewers in and encouraging engagement. By following accurate patterns and utilizing reliable data sources, infographics can effectively communicate complex ideas and statistics to a wide audience.

2.3 Early Studies on Visual Communication and Learning

This idea of using pictures and visuals to aid learning has been studied for a long time, especially in educational psychology. Back in the middle of the 20th century, researchers like Paivio (1963) proposed the dual coding theory (DCT) suggesting that humans possess separate cognitive systems for processing verbal (linguistic) and nonverbal (visual) information. Paivio's research arose from his extensive research on word pairs and mental imagery. Paivio's experiments revealed that concrete nouns, such as "dog" or "tree," tend to evoke clearer mental images compared to abstract nouns or adjectives. They found that when information is shown both as pictures and words, it can improve how well we remember and understand it. This highlights the importance of using pictures and visuals in things we use for learning, especially in subjects like art and design. This conceptualization provides a foundation for understanding how individuals encode, process, and retrieve information in both verbal and nonverbal formats, highlighting the richness and complexity of human cognition.

In the 1970s, Baddeley introduced the working memory (WM) model as a reaction, to the drawbacks of the prevailing idea of short-term memory (Baddeley, 2010, Baddeley and Hitch, 1974). Originally proposed in Atkinson and Shiffrins (1968) multi store model short term memory (STM) was viewed as a system designed to store and process information. Nonetheless Baddeley and Hitches findings implied an operational system. The Working Memory Model, proposed by Baddeley and Hitch in 1974, describes short-term memory as a system with multiple components. The working memory model suggests a dynamic system involving several components. The phonological loop is responsible for the temporary storage of verbal information, involving both the auditory and speech perception areas of the brain. This loop enables the repetition of details assisting in their memory retention. In contrast the visuospatial sketchpad deals with spatial data enabling people to manipulate and navigate visual content. The main part of our brain that brings everything together in our memory system is the processor. This part works to coordinate the loop and visuospatial sketchpad while also connecting with long term memory to help us remember and recall information.

Moreover, the theory introduces the idea of "chunks" which are pieces of information that can be grouped together to improve memory performance. For instance, instead of trying to memorize a series of numbers individually people can organize them into meaningful sequences like phone numbers or dates. Furthermore, the episodic buffer was later incorporated into the theory to explain how information from sources is combined into episodes for long term memory storage. This buffer enables the consolidation of information from memory systems into unified episodes or experiences enhancing the encoding and retrieval of memories. Baddeleys model of working memory offers a framework for understanding how information is temporarily stored, manipulated and integrated in the brain. It provides insights into processes such as learning, problem solving and decision making.

Cognitive Load Theory (CLT), originated by Sweller, focuses on managing cognitive processing load to optimize learning. It identifies three types of cognitive load: intrinsic, extraneous, and germane. Examples and integration of information reduce extraneous load, enhancing learning by conserving cognitive resources for relevant processing. Bartlett's experiments on schema formation also influenced CLT, emphasizing the role of schemata in expanding long-term memory. Swellers Cognitive Load Theory (CLT) aims to manage processing load, for improved learning outcomes. CLT categorizes load into three types: intrinsic, extraneous and germane. By providing examples and integrating information extraneous load is minimized, allowing learners to allocate resources efficiently for processing relevant information. Bartletts research on schema development has also played a role in shaping CLT by highlighting the importance of schemata, in enhancing long term memory retention. Schemata are mental frameworks that help individuals organize and interpret information based on prior knowledge and experiences. Bartlett's studies, particularly his work "Remembering: A Study in Experimental and Social Psychology" (1932), demonstrated how people use these cognitive structures to make sense of new information by integrating it with what they already know.

Bartlett's findings suggest that learning is not a passive absorption of data but an active process where new information is integrated into existing mental structures. This idea is central to Cognitive Load Theory (CLT), developed by John Sweller in the late 1980s, which focuses on the mental effort required to process new information. In the 1990s, Sweller expanded CLT to guide instructional designers on minimizing cognitive overload by reducing split attention and redundancy, which can burden working memory. By effectively managing extraneous and germane cognitive loads, designers can optimize cognitive resources for meaningful processing, leading to improved learning outcomes. This approach has significantly influenced multimedia learning theory by highlighting the importance of managing cognitive load to facilitate successful learning.

This brief overview regarding early studies on visual communication and learning is meant to provide valuable insights for educators who want to incorporate infographics in teaching art and design concepts. Infographics, which combine various visual information such as images, diagrams, graphs and text (Yildirim 2016), have been shown to enhance learning by leveraging visual elements to make complex information more accessible and engaging (Alyahya, 2019; Chicca & Chunta, 2020). By understanding theories such as DCT which suggests that combining verbal and visual information can improve

memory, as well as CLT, which focuses on reducing the mental effort required to process information, educators can create infographics that not only capture students' attention but also help them better understand and remember key principles of art and design. These perceptions can help educators in designing materials that not only capture students' attention but also facilitate a deeper understanding and better retention of art and design principles, ultimately enriching the learning experience.

2.4 Emergence of Infographics in Education

In the late 20th and early 21st centuries, researchers began investigating the use of infographics as educational tools. In a seminal study by Mayer and Anderson (1991), it was demonstrated that multimedia presentations, which incorporated visuals like diagrams and illustrations alongside text, led to better understanding and recall of complex information compared to text-only presentations. This study highlighted the potential benefits of incorporating visuals in educational materials. Following these foundational theories and studies, the use of infographics in education began to flourish. Infographics combine text, images, and design elements to convey information succinctly and engagingly. They are particularly useful in summarizing complex data, illustrating processes, and highlighting key points, making them a valuable tool in educational settings.

The rise of digital technology further propelled the adoption of infographics in education. Tools like Adobe Illustrator, Canva, and Piktochart made it easier for educators to create high-quality visual content. Additionally, the proliferation of online learning platforms and digital classrooms provided new venues for deploying infographics to enhance learning experiences. Today, infographics are widely used across various educational levels and disciplines. They support differentiated instruction, catering to visual learners and helping to simplify complex subjects. Educational research continues to explore the most effective ways to integrate infographics and other visual aids into curricula, ensuring that teaching methods evolve to meet the needs of 21st-century learners. The emergence of infographics in education appears to be rooted in a deep understanding of cognitive psychology and supported by technological advancements. Seminal research by scholars like Mayer and Anderson (1991), has demonstrated the effectiveness of multimedia learning, paving the way for the widespread adoption of infographics as a powerful educational tool.

2.5 Design Principles for Educational Infographics

As mentioned in the introduction of this section, the integration and use of infographics into educational settings has gained considerable attention due to their ability to visually communicate complex information effectively (Traboco, Pandian, Nikiphorou Gupta 2022; Dur, 2014). It is also acknowledged that the role of infographics in education is continuously changing due to the emergence of new methods and strategies (Bhat & Alyahya, 2023; Alyahya, 2019; Dur, 2014). Therefore, understanding the key design principles that underpin successful educational infographics is essential for educators and instructional designers aiming to optimize the learning experience for students.

2.6 Accessibility and Inclusivity

Designing infographics with accessibility and inclusivity in mind is paramount to ensuring equitable access to educational content, (Beene, Koelling & Thompson, 2020; Anete Ezera, 2023). Incorporating features such as alternative text descriptions, high contrast visuals, and compatibility with assistive technologies broadens the reach of infographics and accommodates diverse learning needs (Dunn, 2019). By prioritizing accessibility, educators can foster an inclusive learning environment that caters to the needs of all students (Burgstahler & Doe, 2004).

2.7 Visual Hierarchy

One fundamental principle of infographic design is establishing a clear visual hierarchy (Lankow, Ritchie, & Crooks, 2012). By strategically organizing elements such as text, images, and graphical

representations, designers can guide the viewer's attention and convey the intended message with clarity (Arslan & Toy, 2015). In educational contexts, this principle becomes particularly crucial as it aids in prioritizing information and facilitating comprehension, thus enhancing learning outcomes (McCloud, 1994).

2.8 Simplicity and Clarity

Educational infographics should prioritize simplicity and clarity in their design to ensure accessibility for diverse audiences (Cairo, 2012). By employing concise language, minimalistic graphics, and intuitive layouts, designers can mitigate cognitive overload and foster engagement with the content (Cairo, 2016). Moreover, simplification of complex concepts through visual representation facilitates knowledge retention and promotes active learning (Tufte, 2001). To sum it up, adherence to key design principles enhances the effectiveness of educational infographics by promoting clarity, engagement, and accessibility. When design decisions are aligned to teaching goals and include communication techniques, educators can leverage infographics to create valuable learning opportunities, for students.

3. METHOD

3.1 Research design

This study employed a pre-test/post-test experimental design, as recommended by Wimmer and Dominick (2006), to assess the influence of infographics on students' interpretation and understanding of art and design concepts. Before the experiment, participants undertook a pre-test to determine their basic knowledge of art and design concepts, specifically focusing on principles of design. This pre-test was administered using a questionnaire, to ascertain the participants' existing knowledge.

After completing the pre-test, participants were randomly assigned to experimental groups, where they were exposed to instructional materials either in text-only format or exclusively through infographics. The content of these materials in both groups was identical and related to art and design concepts, with the only difference being the mode of presentation. covered various topics related to art and design education, aligning with the curriculum of the Department of Design and Studio Art at the Central University of Technology, Free State. Following the instructional intervention, all participants underwent a post-test assessment aimed at evaluating their comprehension and interpretation of the presented concepts. This post-test comprised a multiple-choice questionnaire that encompassed participants' biographical information and assessed their understanding of key terms such as graphic design, visual literacy, and infographics. Additionally, participants were asked to interpret infographic and text visual representations, providing insight into their learning outcomes.

By employing this experimental design, which included pre-test and post-test assessments, this study aimed to systematically measure the impact of infographics on students' learning outcomes in the context of art and design education. Therefore, this approach facilitated the examination of relationships among variables and provided valuable insights into the effectiveness of different instructional formats in promoting student understanding and interpretation of art and design concepts.

3.2 Setting and participants

The study samples consisted of senior students enrolled in the Department of Design and Studio Art at the Central University of Technology, Free State. Design and Studio Art students were deemed appropriate participants for this study due to their specialized knowledge in visual communication and design principles. Given their background in this field, they possess a substantial base in understanding and interpreting visual information, making them well-suited for assessing the efficacy of infographics in conveying complex concepts. Additionally, their familiarity with art and design concepts aligns closely with the content of the study, ensuring relevance and applicability of the instructional materials provided. Furthermore, Design and Studio Art students are likely to encounter infographics frequently in their academic and professional activities, highlighting the importance of investigating the impact of

this instructional format within their educational context. Therefore, their participation in the study provides valuable insights into the potential benefits and challenges associated with the use of infographics in art and design education.

The sampling method selected for this study is convenience sampling, which involves selecting participants based on their ease of accessibility and availability. Convenience sampling was chosen due to practical considerations, as it allowed for the recruitment of participants from the Department of Design and Studio Art at the Central University of Technology, Free State (CUT), Bloemfontein, South Africa, during the specified academic year/s. Given the constraints of time and resources, convenience sampling provided a feasible approach for obtaining a sufficient number of participants within the target population. While convenience sampling may introduce some degree of bias, particularly in terms of generalizability, its use in this study was deemed appropriate for the specific research context and objectives. Additionally, efforts were made to ensure that participants were representative of the broader population of Design and Studio Art students at CUT, enhancing the validity of the study findings within this particular educational setting.

3.3 Data collection methods Measures

Data were collected using a controlled experimental design involving two distinct groups: a text-only group and an infographics-only group. Each group was exposed to educational material presenting art and design concepts in either text or infographic format. The data collection methods included pre-tests, exposure to educational materials, and post-tests to evaluate comprehension and interpretation. To assess students' interpretation and understanding of art and design concepts, multiple measures were employed. These included pre-tests to establish baseline knowledge, post-tests to gauge comprehension following exposure to educational materials, and surveys or questionnaires to gather qualitative feedback on the effectiveness of the presentation format.

3.4 Materials and procedure

Educational materials were carefully developed to ensure consistency in content between the text-only and infographics-only formats. The text-based materials consisted of written descriptions, explanations, and examples of art and design concepts. In contrast, the infographics included visual representations, diagrams, and concise text to convey the same information. The procedure involved administering pre-tests to both groups to establish initial knowledge levels. Subsequently, participants were exposed to the respective educational materials—either text-only or infographics-only. Finally, post-tests were administered to assess changes in comprehension and interpretation resulting from exposure to the materials.

3.5 Data analysis

Quantitative analysis was performed on the collected data to assess the impact of infographics on students' comprehension of abstract art and design concepts. Descriptive statistics were calculated to summarize the participants' performance on the pre-test and post-test assessments. Additionally, inferential statistics, such as t-tests or ANOVA, were utilized to determine any significant differences between the text-only and infographics-only groups.

5. RESULTS

Figures, i.e. illustrations and pictures, should be set into the body of the text at the appropriate point, close to where they are referenced in the text and not grouped together at the end of the paper. Place the pictures between paragraphs and centre them between the margins. The figure layout should be in line with the text. Figures should be made in high quality suitable for reproduction and print. The notations on figures must be clearly readable. They must be numbered using Arabic numbers. Figure captions should be written below each figure.

The results of the pre-test and post-test for the Infographic Group and Text Group are given below.

4.1 The pre-test results

There were 20 participants in the IG Group and 23 participants in the Text Group. An independent samples t-test was run to determine if there were differences in the mean percentages scored for the pre-test between participants in the IG Group and participants in the Text Group. There were no extreme outliers in the data, as assessed by inspection of a boxplot. Pre-test percentages for each level of the independent variable were normally distributed, as assessed by Normal Q-Q Plots, and there was homogeneity of variances, as assessed by Levene's test for equality of variances ($p = 0.818$). There was no statistically significant difference in the percentage scored for the pre-test between participants in the IG Group ($M = 38.33$, $SD = 18.81$) and participants in the Text Group ($M = 29.71$, $SD = 18.09$), $t(41) = 1.531$, $p = 0.134$.

The study conducted independent samples t-tests to compare the pre-test and post-test scores between the Infographic Group (IG) and the Text Group. Prior to the intervention, there was no statistically significant difference in pre-test scores between the IG Group ($M = 38.33$, $SD = 18.81$) and the Text Group ($M = 29.71$, $SD = 18.09$), $t(41) = 1.531$, $p = 0.134$. Similarly, after exposure to the respective interventions, the post-test scores did not reveal a significant difference between the IG Group ($M = 42.08$, $SD = 15.87$) and the Text Group ($M = 41.67$, $SD = 13.99$), $t(41) = 0.092$, $p = 0.928$. These findings suggest that both infographics and text-based materials yielded comparable outcomes in terms of comprehension and retention of art and design concepts.

Table 1: Statistics of comprehension scores for IG and Text group

Group_RECoded		N	Mean	Std. Deviation	Std. Error Mean
Pre-test_Practicality_Percentage	IG Group	20	38.3330	18.80861	4.20573
	Text Group	23	29.7104	18.08776	3.77156

4.2 Post-test results

Independent Samples Test: There were 20 participants in the IG Group and 23 participants in the Text Group. An independent samples t-test was run to determine if there were differences in the mean percentages scored for the test between participants in the IG Group and participants in the Text Group. There were no extreme outliers in the data, as assessed by inspection of a boxplot. Test percentages for each level of the independent variable were normally distributed, as assessed by Normal Q-Q Plots, and variances were homogeneous, as assessed by Levene's test for equality of variances ($p = 0.949$), thus meeting the assumptions of equal variances.

Mean scores: The mean percentage score achieved by participants in the IG GROUP was ($M = 42.08$, $SD = 15.87$) and participants in the Text Group ($M = 41.67$, $SD = 13.99$), $t(41) = 0.092$, $p = 0.928$.

There was no statistically significant difference in the percentage scored for the test between participants in the IG Group and Text Group.

Table 2: Statistics of post-test scores for IG and Text group

RECODE_GROUP		N	Mean	Std. Deviation	Std. Error Mean
Total_Percentage	IG_GROUP	20	42.0833	15.87483	3.54972
	TEXT_GROUP	23	41.6667	13.98953	2.91702

6. FINDINGS AND DISCUSSION

The study's results reveal that infographics had a minimal impact on the comprehension of art and design concepts among students in the Department of Design and Studio Art. While participants could identify these concepts, they struggled to interpret and understand the visual representations in the infographics. This raises the question: do infographics and text-based visual representations provide the same level of understanding? The findings suggest that both infographics and traditional text-based materials were equally effective in helping students grasp art and design concepts. Despite the visual appeal and narrative efficiency of infographics, they did not offer a significant advantage over text-based formats in this context. It is possible that factors such as individual learning styles, prior knowledge, and the complexity of the subject matter influenced these results.

Furthermore, the study indicates that participants possessed knowledge of design principles but encountered difficulties interpreting the infographic visual representations. This suggests a deficiency in critical thinking skills and, more notably, visual literacy skills. Participants, however, expressed a preference for learning through infographic visual representations. They believed that, with improvements, infographics could be a more effective learning tool. The study highlights the need to refine the design of infographics and to conduct additional tests before using them in comprehension assessments. It also notes that the sample size and the specific design of the instructional materials may have contributed to the lack of significant differences observed. Further research is needed to explore the nuanced effects of infographics on different learner populations and in various instructional contexts.

7. CONCLUSIONS AND RECOMMENDATIONS

The findings of this study suggest that both infographics and text-based materials are viable means of presenting art and design concepts to students. While infographics are often praised for their visual appeal and potential to enhance information processing, this study did not find empirical evidence supporting their superiority over traditional text-based formats in terms of comprehension and retention. The study's results indicate that although participants could identify art and design concepts, they struggled with interpreting the visual representations in the infographics. This suggests that infographics may not inherently improve understanding without considering the audience's visual literacy and critical thinking skills. The equal effectiveness of both instructional formats highlights the importance of considering several factors when choosing educational materials. Educators and instructional designers should evaluate pedagogical objectives, audience characteristics, and content complexity. For example, individual learning styles and prior knowledge play significant roles in how students interact with and benefit from different formats.

The study also emphasizes the necessity of refining infographic designs to enhance their interpretability and educational value. Participants expressed a belief that infographics could be a better learning tool if their design were improved, suggesting a need for ongoing testing and iteration.

The study's limitations, such as sample size and the specific design of instructional materials, also call for further research. Future studies should explore the effects of infographics on diverse learner populations and in various instructional contexts to provide a more comprehensive understanding of their educational impact. By adopting a careful and thoughtful approach to instructional design, educators can optimize learning experiences and empower students to develop robust competencies in art and design. Ongoing research and evaluation will be essential to effectively leverage visual and textual modalities in educational interventions, ensuring they meet the evolving needs of students.

8. REFERENCES

- Albers, M. (2017). Effective Learning Design: The Role of Alignment with Learning Objectives, *Journal of Educational Psychology*, 103(3), 591–603.
- Alyahya, D. M. (2019). Infographics as a learning tool in higher education: The design process and perception of an instructional designer. *International Journal of Learning, Teaching and Educational Research*, 18(1), 1-15.
- Arslan, D. & Toy, E. (2015). The visual problems of infographics, *Global Journal on Humanites & Social Sciences*. [Online]. 01, pp 409-414. Available from: <http://www.world-education-center.org/index.php/pntsbs>
- Atkinson, R. C., & Shiffrin, R. M. (1968). Human memory: A proposed system and its control processes. In K. W. Spence & J. T. Spence, *The psychology of learning and motivation: II*. Academic Press. [https://doi.org/10.1016/S0079-7421\(08\)60422-3](https://doi.org/10.1016/S0079-7421(08)60422-3)
- Baddeley, A., (2010). Working memory. *Current biology*, 20(4), pp.R136-R140.
- Baddeley, A. D., & Hitch, G. (1974). Working memory, In Bower, G.H. (Ed.), *The psychology of learning and motivation: Advances in research and theory* (Vol. 8, pp. 47–89). New York: Academic Press.
- Baldwin, J., & Roberts, L. (2006). *Visual communication: From theory to practice*. Bloomsbury Publishing.
- Bartlett, F. C. (1932). *Remembering: A study in experimental and social psychology*. Cambridge, UK: Cambridge University Press
- Beene, S., Koelling, G., & Thompson, D. S. (2020). Recommendations for Creating Inclusive Visual Communication During a Pandemic. *Visual Resources Association Bulletin*, 47(2).
- Bhat, S.A. & Alyahya, S., (2023). Infographics in Educational Settings: A Literature Review. *IEEE Access*.
- Burgstahler, S., & Doe, T. (2004). Ensuring Greater Access to Higher Education: Results of the DO-IT Prof study. *Journal of Special Education Technology*, 19(2), 5–20.
- Cairo, A. (2012). *The Functional Art: An Introduction to Information Graphics and Visualization*. New Riders.
- Cairo, A. (2016). *The Truthful Art: Data, Charts, and Maps for Communication*. New Riders.
- Chicca, J. & Chunta, K., (2020). Engaging students with visual stories: Using infographics in nursing education. *Teaching and Learning in Nursing*, 15(1), pp.32-36.
- Dunn, J. (2019). Universal Design in Education: Principles and Applications. *Harvard Educational Review*, 89(1), 1–26.
- Dur, B. I. U. (2014). Data visualization and infographics in visual communication design education at the age of information. *Journal of arts and humanities*, 3(5), 39-50.
- Ezera, A. (2023, October 18). *Inclusive design: How to get started*. Infogram. Retrieved May 17, 2024, from <https://infogram.com/blog/inclusive-design/#what-is-inclusive-design>
- Hobbs, R. 2017. *Create to Learn: Introduction to Digital Literacy*. Hoboken, NJ: John Wiley & Sons.
- Kennedy, J., Abichandani, P., & Fontecchio, A. (2014, October). Using infographies as a tool for introductory data analytics education in 9–12. In *2014 IEEE Frontiers in Education Conference (FIE) Proceedings* (pp. 1-4). IEEE.
- Kennedy, J. et al.: Using infographics as a tool for introductory data analytics education in 9–12, *Proceedings of the Ieee Frontiers In Education Conference (FIE)*, PP. 1–4, IEEE, (2014).
- Lankow, J. et al.: *Infographics: The power of visual storytelling*, John Wiley & Sons, (2012)
- Lester, T. (2012). *Da Vinci's ghost: Genius, obsession, and how Leonardo created the world in his own image*. Simon and Schuster.

- Lundy, A. D., & Stephens, A. E. (2015). Beyond the literal: Teaching visual literacy in the 21st century classroom. *Procedia-Social and Behavioral Sciences*, 174, 1057-1060.
- Mayer, R. E. (2009). *Multimedia Learning (2nd ed.)*. Cambridge University Press.
- Mayer, R. E., & Anderson, R. B. (1991). Animations need narrations: An experimental test of a dual-coding hypothesis. *Journal of Educational Psychology*, 83(4), 484–490. <https://doi.org/10.1037/0022-0663.83.4.484>
- McCloud, S. (1994). *Understanding Comics: The Invisible Art*. HarperPerennial.
- Meirelles, I. (2013). *Design for information: an introduction to the histories, theories, and best practices behind effective information visualizations*. Rockport publishers.
- Mol, L. (2011). *The potential role for infographics in science communication* (Unpublished master's thesis). Vrije Universiteit, Amsterdam.
- Reeve, J. & Morris, M. (2017) *Visualising your research with Infographics – Occasional Paper for Vitae*. Available from: <https://www.vitae.ac.uk/vitae-publications/guides-briefings-and-information/vitae-occasional-papers-2016.pdf/view>
- Sherin, A. (2013). *Design Elements, Using Images to Create Graphic Impact: A Graphic Style Manual for Effective Image Solutions in Graphic Design*. Design Elements.
- Smiciklas, M. (2012). *The power of infographics: Using pictures to communicate and connect with your audiences*. Que publishing.
- Traboco, L., Pandian, H., Nikiphorou, E., & Gupta, L. (2022). Designing infographics: visual representations for enhancing education, communication, and scientific research. *Journal of Korean medical science*, 37(27).
- Tufte, E. R. (2001). *The Visual Display of Quantitative Information* (2nd ed.). Graphics Press.
- Ware, C. (2012). *Information Visualization: Perception for Design* (3rd ed.). Morgan Kaufmann.
- Wimmer, R. D., & Dominick, J. R. (2006). *Mass Media Research: An Introduction* (8th ed.). Belmont, CA: Thomson Wadsworth Publishing.
- Yildirim, S. (2016). Infographics for educational purposes: Their structure, properties and reader approaches. *Turkish Online Journal of Educational Technology-TOJET*, 15(3), 98-110.

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