



## THE ROLE OF VISUAL LEARNING AIDS ACROSS DIVERSE LEARNING STYLES IN HIGH SCHOOL EDUCATION

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### **Abstract:**

The current research delves into the impact of incorporating visual learning tools into high school programs, specifically examining the differences in outcomes among students who identify as visual, auditory, or kinesthetic learners. Rooted in Mayer's dual coding, cognitive load theory, and Baddeley's working memory model, this study assesses the effectiveness of visual aids in improving learning for various learning styles. Using a qualitative approach, data was gathered from a thorough literature review and multiple academic studies. The results indicate that visual aids enhance engagement, comprehension, and critical thinking in students with different learning styles and support educators in developing inclusive teaching methods. The recommendations include proactive integration of visual displays in teaching practices, administrative support, and policy initiatives to secure funding and set standards, underscoring the importance of visual multimedia in the classroom.

**Keywords:** Visual Aids, Learning Styles, High Schools, Engagement, Teaching Practices

### **1. Introduction**

#### **1.1 Background**

In today's schools, students have a wide range of abilities and preferences when it comes to learning. The concept of learning styles categorizes these preferences into visual, auditory, reading/writing, and kinesthetic areas (Avni, 2023). Visual learners understand best with visual aids like diagrams, charts, and graphic organizers. Auditory learners do well with both written and spoken explanations. Kinesthetic learners prefer hands-on activities and interacting with their environment. While many students use multiple styles, they usually have one dominant area. This variability can make it challenging for educators to effectively engage all students.

Interestingly, there is growing evidence that supports the advantages of multimodal teaching methods, as opposed to the conventional preference for lecture or

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textbook-based training (Manchishi, 2024). A supplementary strategy involves incorporating visual learning aids in conjunction with the standard spoken and written material. Design elements such as information graphics, idea maps, comparison visual matrices, and flowcharts use visual-spatial cognition to improve the ability to remember, identify patterns, and understand information more deeply (Carney & Levin, 2002). Although research validates the wider use of visual aids, only a limited number of studies explicitly evaluate results among the major learning paradigms. Are visual aids most effective in enhancing the performance of self-identified visual learners? Alternatively, do all categories of learners experience equivalent benefits, therefore suggesting a generalizable impact? A thorough comparison of results would enhance teachers' ability to strategically use visual aids to provide differentiated yet inclusive teaching. The existence of this knowledge gap serves as an additional impetus for my research.

This study investigates the impact of adjunct visual learning tools on student performance, with a particular focus on comparing results across students who self-identify as visual, auditory, or kinesthetic learners based on self-reported inventories. The findings aim to direct educators in implementing visual instructional aids fairly in order to promote academic achievement for all multi-modal populations in the growing diversity of classrooms.

## 2. Research Questions

- 1) How do visual learning aids influence academic engagement and comprehension among students with a dominant visual learning style?
- 2) What is the impact of visual learning aids on the academic performance of students who identify as auditory learners in high school science courses?
- 3) In what ways do visual learning aids affect the learning outcomes of kinesthetic learners, particularly in terms of engagement and higher-order thinking skills?

### 2.1 Research Objectives

- 1) Assess the efficacy of visual learning aids on pupils who have a propensity for visual learning activities.
- 2) Investigate the influence of visual aids on students who have a predilection for auditory learning.
- 3) An investigation of the impact of visual aids on pupils who have a preference for kinesthetic learning.

## 3. Literature Review

Research has demonstrated that visual learning aids, including diagrams, illustrations, charts, and graphs, are effective in enhancing student learning outcomes in a variety of contexts (Qasserras & Qasserras, 2023). A significant amount of research has shown that visual aids can improve the quality of teaching and learning by facilitating the long-term

retention of essential information, illustrating complex concepts, and tapping into students' visual processing preferences (Pateşan *et al.*, 2018). This literature review summarizes the primary discoveries regarding the advantages of visual learning aids and their effects on a variety of learners.

Visual learning aids have been shown to enhance the overall level of student achievement and content mastery in numerous studies. For instance, Dexter and Hughes (2011) discovered a consistent moderate to large positive effect on student learning across subject areas in a meta-analysis that examined the effects of graphic organizers. Similarly, in an experimental study, students who were instructed using visual concept maps demonstrated substantially higher levels of content retention and transfer than those who were instructed using textual outlines (Nesbit & Adesope, 2006). The advantages of visuals are evident in students of all academic levels, with elementary, intermediate, and high school students experiencing favorable outcomes.

Visual aids may offer specific benefits for the instruction of intricate processes, structures, and relationships, in addition to improving overall learning. Coleman *et al.* (2011) conducted a study that revealed that science students demonstrated a substantially higher level of understanding of cellular respiration concepts when instructed using visual models as opposed to conventional textbook methods. Visual timelines and diagrams have been demonstrated in social studies coursework to assist students in comprehending the interconnectedness of historical events. Visuals facilitate the comprehension of nonlinear, opaque relationships.

Visual learning aids may also assist students in the long-term retention of information. In a study of undergraduate physiology students, the incorporation of visual concept mapping resulted in enhanced retention and recall of key concepts over the course of a semester when compared to the sole reliance on textbooks (Haghverdi, Biria & Karimi, 2010). The dual coding theory posits that information that is encoded both visually and verbally is more easily retrieved from memory (Sadoski & Paivio, 2001). By offering alternative retrieval pathways, visuals may enhance memory. Although visual learning aids are beneficial to all students, research indicates that they may be especially advantageous for specific demographics. Visual resources have been demonstrated to assist English language learners in the acquisition of academic concepts and vocabulary (Sam D. & Rajan, 2013). In a study of students with dyslexia, Olofsson *et al.* (2015) discovered that picture-based dictionaries were more effective than text-only dictionaries in enhancing the reading comprehension of students with dyslexia. Furthermore, students with ADHD exhibited enhanced attention and diminished hyperactive behaviors when learning with visual concept maps as opposed to traditional teaching methods. Diverse learners are facilitated by the multimodal presentation of information.

Nevertheless, the advantages of visual learning aids are not universally recognized in all studies. A randomised control trial revealed that visual simulations may not be sufficient to support complex learning processes, as no additional gains in physics achievement were observed among community college students who were provided

with access to these simulations (Kolvoord *et al.*, 2017). Clark *et al.* (2004) emphasize that visual aids should be used to supplement verbal instruction rather than to supplant it in order to prevent visual channels from becoming overloaded. Visuals are beneficial; however, they are not a cure-all.

In general, there is a considerable body of evidence that supports the incorporation of visual learning aids to enhance student learning, memory, and engagement in a variety of subjects and populations. However, research also underscores the significance of ensuring that visual aids are in accordance with instructional objectives and that they are integrated with other teaching methods. Visual learning aids are a valuable teaching tool that warrants further application due to their demonstrated ability to elucidate concepts, support diverse learners, and cater to student preferences. This review serves as a foundation for the implementation and refinement of visual aids to optimize their benefits in the context of serving all students.

### **3. A Theoretical Framework**

Theories about how people learn and how the brain works can help us understand how useful visual learning tools are. People have different preferred ways to learn and interact with new knowledge. This is called their learning style. Visual learning style theorists claim that some students learn best by seeing things and are good at visual-spatial processing. Cognitive theories explain how visualization methods use mental abilities to help people learn. Mayer's dual coding theory, Sweller's cognitive load theory, and Baddeley's model of working memory are some of the most important theories in this field.

#### **3.1 The Theory of Dual Coding**

Dual coding theory, which was first put forward by Paivio and later built upon by Mayer, says that the mind processes knowledge through two separate channels: verbal and visual (Mayer, 2005). Visual processing works with pictures and verbal processing works with words. Dual coding theory states that showing and hearing information at the same time stimulates both cognitive channels, making more mental models and improving memory. Visual learning aids use the visual channel to help with learning along with spoken teaching. This dual encoding helps you learn, especially when it comes to hard ideas.

#### **3.2 The Idea of Cognitive Load**

Cognitive load theory explains how visual tools help people make better use of their working memory by keeping the visual and auditory channels from becoming too busy (Sweller, 2005). Working memory can run out when there is a lot of complicated information to remember. Visuals help sort through, organize, and connect information. They also help control internal load so that focus can be put on important ideas. This keeps the working memory from getting too busy with too many mental tasks.

### 3.3 Baddeley's Description of How Working Memory Works

Baddeley's model of working memory includes a visuospatial sketchpad that saves and changes visual and spatial information for a short time (Baddeley, 1992). Visual tools for learning give clear pictures that can be stored in the visuospatial sketchpad; this makes them easier to understand than just giving abstract explanations. Visuals also help us remember things by making pictures that are easy to store and get back from long-term memory into working memory.

These ideas explain why using both spoken and visual methods of teaching is more effective than using just one of them. Visuals make up for the limitations of verbal working memory and processing by combining mental models, strengthening dual encoding in memory, and controlling intrinsic load by breaking up information into chunks. These brain benefits can be used to good effect by students who learn best through seeing and moving things around.

If you only use visual learning tools, you might overstimulate the visual channel and forget to use your speaking skills (Mayer & Moreno, 2003). Multimedia design principles show that students learn best when spoken and visual material flow together. Visual tools can help students who learn best by seeing things, but they should also be used with teaching methods that are designed to work with all learning styles. For cognitive thinking to work well, both visual and verbal channels need to be used together.

In conclusion, ideas about dual coding, working memory, and different learning styles help explain how visual learning aids help people understand, remember, and find information. These theoretical bases help us figure out how to use images in lessons and lessons plans in a way that works for the different types of learners. More research is needed to improve theoretical models of how visual information is processed during learning tasks and how verbal and visual cognitive processes work together.

## 4. Methodology

I employed a qualitative methodology, as defined by Adlini *et al.* (2022), which entails the recognition of significant patterns within a diverse body of literature that deviates from numerical data. As part of my research methodology, I employed certain keywords and Boolean operators to conduct targeted searches in different internet databases. I incorporated concepts such as visual teaching aids, auditory, kinesthetic, and reading/writing by using the "and/or" connectors in my search queries to maximize the relevance of the results. Through a systematic approach, I implemented these tailored searches in academic databases such as Google Scholar, Springer, and ProQuest, which produced peer-reviewed literature pertaining to the research subject.

In order to refine and pick the most relevant publications, the researcher implemented a comprehensive, multi-stage selection process. At the beginning of the literature evaluation, he systematically excluded all studies that were not pertinent to the objectives of the study by carefully examining the title and abstract of each study. He conducted a comprehensive examination of the complete texts of references for which the

titles and abstracts lacked definitive information to ensure their relevance. he implemented rigorous exclusion criteria to eliminate papers that were not relevant to my topic and tailored the inclusion criteria based on variables such as peer-review status, recent publication date, and relevance to my research. This, in turn, directed the choice of the final papers according to my study objectives.

The researcher conducted systematic data extraction by meticulously consolidating all significant publication information, such as the author's name, the publication year, the title, and the main discoveries, in a highly organised spreadsheet. In addition, I employed single coding by converting the fundamental abstracts and study variables into numerical values. In order to provide a targeted literature analysis that aligned with my research goals, I systematically categorized these studies into themes that corresponded to every variable of interest investigated. Implementing this meticulous approach of obtaining facts and coding greatly facilitated the development of a robust synthesis of evidence from the literature for my research.

## 5. Findings

The purpose of this section is to provide a summary of the findings from a number of studies that investigated the function that visual aids and learning styles play in educational settings. In each study, a summary is provided that includes information on the authors, publication outlet, year of publication, research objectives, research design, methodology, and the most important findings.

R. S. Aisami (2015) investigates the fundamental aspects of learning styles and their relationship with visual literacy in the context of improving learning outcomes and performance. The article is titled "Learning Styles and Visual Literacy for Learning and Performance" and was published in the journal *Procedia – Social and Behavioral Sciences*. The research is conducted utilizing a qualitative research methodology, and the primary method of data analysis is meta-analysis. According to the findings, the introduction of visual features considerably improves both the efficiency and performance of learning, hence appealing to a variety of tastes regarding learning.

Authors	Title	Journal	Year	Research Design	Methods	Key Findings
Aisami, R. S.	Learning Styles and Visual Literacy for Learning and Performance	<i>Procedia – Social and Behavioral Sciences</i>	2015	Qualitative	Meta-analysis	Visuals enhance learning and performance, improving task efficiency and catering to diverse learning styles.

Through their systematic review titled "The Impact of Visual Displays on Learning Across the Disciplines" that was published in *Educational Psychology Review* in 2020, Guo, D., McTigue, E. M., Matthews, S. D., and Zimmer, W. investigate how the

incorporation of visual displays influences the learning of content-area subjects among students in grades K-12. In this qualitative study, the methodological quality of previously published material is critically evaluated in a systematic manner. Within the context of elementary, middle, and high school education, the findings suggest that visual displays are especially useful for fostering higher-order learning skills.

Authors	Title	Journal	Year	Research Design	Methods	Key Findings
Guo, D., McTigue, E. M., Matthews, S. D., & Zimmer, W.	The Impact of Visual Displays on Learning Across the Disciplines	<i>Educational Psychology Review</i>	2020	Qualitative	Systematic evaluation	Visual displays benefit higher-order learning, particularly in K-12 education.

Shabiralyani, G., Hasan, K. S., Hamad, N., and Iqbal, N. (2015) conducted a study with the title "Impact of Visual Aids in Enhancing the Learning Process", which was published in the Journal of Education and Practice. The purpose of this study was to evaluate the usefulness of visual aids in educational environments. The authors implemented a quantitative research methodology and collected data by means of questionnaires that did not allow for open-ended responses. The findings of their investigation indicate that visual aids not only stimulate cognitive processes but also improve the entire learning environment. They serve as a dynamic alternative to the conventional, tedious educational methods that have been conventionally used.

Authors	Title	Journal	Year	Research Design	Methods	Key Findings
Shabiralyani, G., Hasan, K. S., Hamad, N., & Iqbal, N.	Impact of Visual Aids in Enhancing the Learning Process	<i>Journal of Education and Practice</i>	2015	Quantitative	Closed-ended questionnaires	Visual aids stimulate thinking, enhance the learning environment, and serve as effective alternatives to monotonous methods.

In the research article titled "The Role of Visual Learning in Improving Students' High-Order Thinking Skills," which was published in the Journal of Education and Practice in 2016, Raiyn, J. investigates the impact that visual learning strategies have on the development of high-order thinking skills among students. According to the findings of the qualitative research that utilized SWOT analysis, using visual learning tools results

in a considerable improvement in the student's capacity to engage in many complicated cognitive processes.

Authors	Title	Journal	Year	Research Design	Methods	Key Findings
Raiyn, J.	The Role of Visual Learning in Improving Students' High-Order Thinking Skills	<i>Journal of Education and Practice</i>	2016	Qualitative	SWOT analysis	Visual learning tools significantly enhance students' high-order thinking skills.

The authors Cavite, J., and Gonzaga, M. (2023), in their article titled "Pupils' Learning Styles and Academic Performance in Modular Learning," which was published in the International Journal of Multidisciplinary Educational Research and Innovation, aim to evaluate the correlation between the preferred learning styles of students and their academic performance within the context of modular learning. In this quantitative study, a modified survey questionnaire is used, and Analysis of Variance (ANOVA) is used to examine the data collected. According to the data, auditory learning is the preferred mode of instruction among the majority of respondents, which has a substantial impact on the academic outcomes of these individuals.

Authors	Title	Journal	Year	Research Design	Methods	Key Findings
Cavite, J., & Gonzaga, M.	Pupils' Learning Styles and Academic Performance in Modular Learning	<i>International Journal of Multidisciplinary Educational Research and Innovation</i>	2023	Quantitative	Modified survey questionnaire	Auditory learning is the preferred method among respondents, significantly affecting academic performance.

An investigation of the relationship between visual and verbal learning styles and the academic success of on-campus learners is presented in the article "Effects of Visual and Verbal Learning Styles on Learning" which was published in the Institute for Learning Styles Journal in 2007. The study was written by Pallapu, P. (2007). A quantitative research design is utilized for the study, and a pilot survey is utilized for the purpose of data gathering. The findings indicate that students who have a predilection for visual learning styles have a tendency to attain higher levels of academic performance in comparison to their classmates who are more involved in verbal learning.



Authors	Title	Journal	Year	Research Design	Methods	Key Findings
Pallapu, P.	Effects of Visual and Verbal Learning Styles on Learning	<i>Institute for Learning Styles Journal</i>	2007	Quantitative	Pilot survey	Visual learners generally achieve higher academic success rates compared to verbal learners.

Syofyan, R., and Siwi, M. K. (2018) conducted a study titled "The Impact of Visual, Auditory, and Kinesthetic Learning Styles on Economics Education Teaching," which was published in PICEEBA. In this study, they examined the impact that various learning styles have on the teaching of economics. The gathering of data for this study is accomplished through the use of a mixed-methods strategy, which includes both surveys and meta-analysis. The findings highlight the significance of adapting instructional methods to the specific learning styles of each student. This not only helps students become more focused, but it also assists them in identifying their own personal strengths and shortcomings, which ultimately leads to improved educational outcomes.

Authors	Title	Journal	Year	Research Design	Methods	Key Findings
Syofyan, R., & Siwi, M. K.	The Impact of Visual, Auditory, and Kinesthetic Learning Styles on Economics Education Teaching	<i>PICEEBA</i>	2018	Mixed Methods	Meta-analysis and questionnaire	Tailoring teaching methods to individual learning styles improves focus and educational success.

## 6. Discussion

The results from these investigations unequivocally illustrate the substantial advantages of integrating visual learning aids and accommodating various learning styles in the educational setting. The findings remained constant throughout the qualitative, quantitative, and mixed techniques studies that were incorporated. These studies further develop and strengthen previous research that has proven visual aids to be an efficient strategy for involving students with diverse learning preferences and enhancing results.

Key noteworthy findings indicate that visual aids improve student engagement, comprehension, higher-order thinking, and academic performance. The qualitative meta-analysis conducted by Aisami (2015) highlights the significance of visual literacy in facilitating more effective information processing and accommodating various learning styles. A comprehensive investigation conducted by Guo *et al.* (2020) showed that including visual displays in K-12 classrooms enhances the ability to remember and critically evaluate material. The empirical research conducted by Raiyn (2016) and

Shabiralyani *et al.* (2015) objectively assessed the enhancement of cognitive abilities and thinking skills in students following the integration of visual learning tools.

Nevertheless, the existing study has certain constraints, namely its exclusive emphasis on students of school age in K-12 educational settings. Supplementary research examining effects on other populations, such as adult learners in higher education or occupational environments, could provide further insights. Tracking the effects of visual aids over time by using longitudinal data may also provide a more comprehensive and detailed understanding. Further investigation in many topic areas and disciplines beyond the selected fields could provide more viewpoints to this field.

## **7. Conclusion**

### **7.1 Summary**

The existing literature repeatedly emphasizes the substantial advantages of integrating visual learning aids and catering to various learning styles in order to improve student results. Empirical evidence has demonstrated that the inclusion of visual aids in classroom teaching enhances student involvement, understanding, and aptitude for advanced cognitive processes. Teachers must proactively contemplate the use of these tools in their instructional methodologies in order to maximize the learning experience. The involvement of school administrators is essential in facilitating the incorporation of visual multimedia by providing educators with professional development opportunities and guaranteeing the availability of essential classroom technologies. Furthermore, education planners should prioritize the distribution of financial resources and materials to facilitate the extensive implementation of visual tools and pedagogical methods.

### **7.2 Limitations**

Nevertheless, the current study also has significant constraints. The majority of research concentrates on certain educational environments, age cohorts, or academic disciplines, thereby potentially constraining the applicability of the results. Moreover, the majority of research employs qualitative or small-scale quantitative approaches, indicating a need for more comprehensive, longitudinal studies that might offer a wider knowledge of the influence of visual aids in various populations and educational settings.

### **7.3 Recommendations**

In order to effectively cater to the many learning styles of their students, educators are advised to include a range of visual representations, including diagrams, interactive media, simulations, and idea maps, into their curricula and instructional activities. In order to facilitate this integration, school administration should guarantee that classrooms are furnished with the essential computer equipment and that teachers undergo continuous professional development specifically targeted on the proficient utilization of multimedia in teaching. Furthermore, it is imperative for school

administrators to establish a conducive atmosphere that motivates teachers to integrate a wide array of activities specifically designed to cater to different learning preferences. At the policy level, government organizations should develop explicit standards and initiatives that encourage the use of visual-based instructional approaches. One potential approach is to provide specific financial resources towards digital tools and instructional materials that enable the incorporation of visual multimedia in educational settings. Furthermore, future studies should expand upon the current body of knowledge by investigating the enduring impacts of visual learning aids on different demographic cohorts and across a range of academic disciplines and educational tiers. Undertaking such research would contribute to a more profound comprehension of how these technologies might be optimally employed to improve learning results for all students.

### **Conflict of Interest Statement**

The author declares no conflicts of interest.

### **About the Author(s)**

Dr. Lhoussine Qasserras is a seasoned Moroccan educator and TESOL trainer with over 18 years of experience in the field. He holds two advanced master degrees: an MBA from Cardiff Metropolitan University and a M.Ed. from Rabat Mohammed V University. In addition, he earned a PhD in linguistics, specializing in the quality of teacher training. Currently, Dr. Qasserras serves as a senior trainer at the American TESOL Academy of Rabat and a part-time university professor at ESEF, Ibn Tofail University Kenitra. His scholarly contributions include numerous research articles in English language teaching (ELT) and business administration. He has also presented at international ELT conferences across various countries, including Morocco, Spain, Portugal, the UK, Greece, Qatar, Turkey, Romania, France, Tunisia, and Algeria.

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