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CREATING EFFECTIVE EDUCATIONAL RESOURCES WITH INFOGRAPHICS AND VISUAL TOOLS IN MS POWERPOINT

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Abstract: This article analyzes the didactic potential of Microsoft PowerPoint in the context of digital education. The primary objective of this research is to move beyond traditional text-based presentations and develop a scientifically-grounded methodology for creating educational resources that enhance student comprehension and engagement through infographics and modern visualization tools. The study systematically analyzes theories of cognitive psychology (including R. Mayer's principles of multimedia learning and A. Paivio's dual coding theory) and principles of visual design. As a result, a three-stage "Pedagogical-Visual Design" (PVD) model is proposed for creating high-impact educational content using modern PowerPoint features (SmartArt, 3D Models, Icons, Morph transition). The practical significance of this model is discussed, highlighting its role in reducing cognitive load and enhancing the retention of knowledge in long-term memory during the learning process.

Keywords: digital pedagogy, PowerPoint, infographics, visual learning, cognitive load theory, multimedia learning, e-learning resources, SmartArt, Morph, visual design.

Introduction. The digital transformation of the education system places a new demand on educators to find and effectively utilize novel and efficient didactic tools [1]. For many years, Microsoft PowerPoint has been widely used as a primary tool for creating presentations. However, in most cases, it is merely used for the static display of text and images. This often leads to ineffective sessions, a phenomenon frequently termed "Death by PowerPoint," which causes student boredom and a failure to absorb information [2, 3].

Modern research in cognitive psychology indicates that the human brain processes information through two simultaneous channels: visual (images, diagrams, video) and verbal (spoken or written text) [4]. According to Allan Paivio's "Dual Coding Theory," when information is presented through both channels simultaneously, the probability of recall and understanding increases dramatically [5]. Furthermore, Richard Mayer's "Cognitive Theory of Multimedia Learning" offers specific principles (e.g., multimedia, coherence, contiguity principles) for developing learning materials that reduce extraneous cognitive load and ensure effective learning [6, 7].

An infographic is a graphic visual representation of complex information, knowledge, or data designed for quick and clear presentation [8]. It combines numbers, text, and images into a single visual narrative, capturing the learner's attention and simplifying complex ideas [9]. From this perspective, the **primary goal** of this research is to develop a methodology for creating highly effective, cognitively optimized e-learning resources by integrating modern visual tools of MS PowerPoint with the principles of infographics.

Methods. This study is theoretical and methodological in nature, employing the following methods:

1. **Systematic Literature Review:** Over 50 scientific sources in the fields of digital pedagogy, cognitive psychology (Cognitive Load Theory, Dual Coding Theory), multimedia

learning, and data visualization were analyzed, including the works of scholars such as Mayer, Sweller, Paivio, Tufte, and Reynolds.

2. **Functional Analysis of Software Tools:** The technical and didactic capabilities of MS PowerPoint (Microsoft 365 version) features designed for creating infographics were examined. These include SmartArt, the Icon library, 3D Models, the Chart wizard, and the Morph transition function.

3. **Modeling and Synthesis:** A practical model for creating educational resources was developed by synthesizing the pedagogical and psychological principles derived from the literature review with the technical capabilities of PowerPoint. The key criteria for the model were effectiveness, visual appeal, and alignment with pedagogical objectives.

Results. The research resulted in the development of a three-stage **"Pedagogical-Visual Design" (PVD) model** for creating effective infographic-based educational resources in MS PowerPoint.

Stage 1: Pedagogical Design & Content Structuring. At this stage, the primary focus is on the pedagogical goal, not the technical tools.

- **Defining Learning Objectives:** The specific knowledge or skills a student should acquire from the slide are clearly defined.
- **Isolating the Core Idea:** The most critical key points are extracted from the larger body of information. The principle of "one slide, one idea" is followed.
- **Creating a Storyboard:** A logical sequence for the information—a visual narrative—is developed. Complex processes are broken down into steps, chronologies into timelines, and comparisons into side-by-side blocks.

Stage 2: Visual Concept & Design Development. This stage involves translating the content into a visual form.

- **Selecting the Infographic Type:** An appropriate infographic type is chosen based on the objective (e.g., a flowchart for a process, a chart for statistics, a timeline for chronology, a comparison table for contrasts).
- **Using Visual Metaphors:** Universally understood icons and symbols are used to simplify complex ideas. PowerPoint's built-in **Icon Library** provides extensive resources for this purpose.
- **Color and Typography:** Based on design principles (C.R.A.P. – Contrast, Repetition, Alignment, Proximity), a color palette is selected to draw the learner's attention to key elements. Easy-to-read, standard fonts (e.g., Segoe UI, Calibri) are used.

Stage 3: Implementation & Interactivity with PowerPoint Tools. At this stage, the developed concept is technically implemented.

- **SmartArt and Charts: SmartArt** objects are utilized to visualize complex hierarchies and processes, while charts are used to present numerical data effectively.
- **Morph Transition:** The **Morph** transition is used to create a dynamic narrative from static slides. This feature allows for the smooth animation of an object's size, position, and color from one slide to the next, enabling the step-by-step explanation of complex processes. This focuses the learner's attention and reduces cognitive load.

- **3D Models and SVG:** To visualize complex subject-specific objects (e.g., a human organ, a chemical molecule, a technical device), using PowerPoint's built-in **3D Models** library yields high efficiency.

Table 1. Comparative Analysis of Traditional and Infographic Slides

Criterion	Traditional Slide	Infographic Slide (based on PVD model)
Content	Blocks of text, bulleted lists	Keywords, short phrases, numbers
Visual Elements	Standard templates, low-quality images	Purposeful icons, charts, SmartArt
Composition	Disorganized, fear of "white space"	Clear hierarchy, C.R.A.P. principles
Cognitive Impact	High cognitive load, boredom	Optimal cognitive load, high engagement
Comprehension	Low retention	High understanding and retention

Discussion. The proposed "Pedagogical-Visual Design" model allows for the transformation of PowerPoint from a simple presentation tool into a powerful environment for creating didactic resources. Its main achievement is the subordination of technology to pedagogy. That is, the pedagogical goal and cognitive effectiveness are determined first, and only then are the appropriate technical tools selected.

This approach aligns perfectly with John Sweller's "Cognitive Load Theory". Infographics reduce the **intrinsic cognitive load** required to process complex textual information. A well-thought-out design minimizes **extraneous cognitive load** by eliminating distracting and unnecessary elements. As a result, the learner's mental resources are directed towards assimilating new knowledge, i.e., the **germane cognitive load**.

Dynamic tools like the Morph transition play a crucial role in managing attention and explaining complex processes sequentially. This helps the learner to grasp individual parts of a system one at a time, rather than being overwhelmed by the whole system at once.

However, this methodology also has its **limitations**. First, it requires educators to possess not only pedagogical knowledge but also an understanding of basic design principles and technical skills. Second, excessive animation and decoration can turn into "chartjunk," producing a counter-effective result. Therefore, every visual element must serve a clear pedagogical purpose.

Conclusion. In conclusion, MS PowerPoint possesses extensive and accessible capabilities for working with infographics and modern visual tools. Its rational use can significantly enrich the learning process, increase student engagement, and enhance the effectiveness of material comprehension. The proposed "Pedagogical-Visual Design" model serves as a practical guide for educators and instructional designers to move away from traditional, text-heavy slides and toward the creation of cognitively effective and visually appealing e-learning resources. Future research should focus on experimentally investigating the impact of resources created based on this model on students' academic performance.

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