

DIDACTIC DESIGN WITH THE CHATPDF HELP

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DOI: 10.46727/c.25-04-2024.p21-31

Abstract. This article proposes to explore the qualities, efficiency, accuracy, usability and applicability of ChatPdf in instructional design. In this regard, a lesson from the 6th grade physics textbook has been uploaded to the application. The research methodology consisted of the teacher's request to ChatPdf to provide several didactical design products, namely the creation of a lesson plan, a learning unit and an evaluation test. Following the discussion between the teacher and the ChatPDF, it appears that it can be used in didactical design, but with certain reservations, in the sense that the products are not of the best quality and do not respect the typical didactic design agreed at the national level. User intervention and refinement of requested responses/products is imperative. However, its use is useful, it helps the teacher save time for didactic design.

Keywords: virtual assistant, Artificial Intelligence, AIED, didactical design, teacher.

Introduction

Information technologies and more recently, Artificial Intelligence (AI) have penetrated modern society and revolutionized many sectors, including education, through the development of dedicated e-learning applications. Artificial Intelligence in Education (AIED) is an emerging interdisciplinary field that applies artificial intelligence technologies to educational field. Learning with artificial intelligence involves the use of artificial intelligence-based tools in teaching and learning and includes: direct learner support, dialogue-based tutoring systems, exploratory learning environments, automated writing, assessment and chatbots; administrative support (recruitment, calendar and learning

management); supporting teachers [2]. Transforming computer on a way of communication, work, learning and instruction guide through a computerized environment, driven by the science of automatic data processing, and Artificial Intelligence, mediates the widespread using of the ICT means [3].

The Council of Europe has classified the use of AI in education as follows [4]: learning with AI; using AI to learn to learn; learning about AI (AI literacy). Several acronyms are used in this regard; AI&ED refers to *AI and Education*, while AIED refers to *AI in Education*. Learning using artificial intelligence systems is also called *AI for education*.

More recently, generative AI systems have been developed. Thus, in recent years, the development of virtual assistants and the chatbots that use generative artificial intelligence (AIG) has gained momentum. They are starting to be used more and more in various fields, including the labor market.

A *chatbot* is a computer program designed to simulate conversations with users, through the internet; it operates based on a predefined set of rules and is not capable of understanding natural language in the same way a virtual assistant does. A *chatbot* is a software program designed to automatically respond to messages, in a natural language, simulating human conversations. A virtual assistant is an artificial intelligence-powered software program that can understand and respond to natural language, perform tasks, and interact with users in a conversational manner. However, it's important to note that while all virtual assistants can be considered chatbots, not all chatbots are virtual assistants. Virtual assistants are typically more advanced and have more capabilities, such as understanding context, learning from past interactions, and performing tasks on behalf of the user. So, while a *virtual assistant* can be a chatbot, but a chatbot isn't necessarily a virtual assistant.

Dialogue-based AI training systems engage users in a conversation, written or spoken, about the subject to be learned. Chatbots can communicate with users via a text or an audio message, called *prompt*, and are used to answer questions. Some examples of such virtual assistants are Microsoft Copilot, Google Bard/Gemini, Mistral, Amazon Alexa, Apple Siri and of course ChatGPT.

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namely the creation of a lesson plan, a learning unit and an evaluation test. Following the discussion between the teacher and the chatbot, it appears that it can be used in didactical design, but with certain reservations, in the sense that the products are not of the best quality and do not respect the typical didactic design agreed at the national level. User intervention and refinement of requested responses/products is imperative. However, its use is useful, it helps the teacher save time for didactic design.

Theoretical framework

ChatPdf is a tool that uses artificial intelligence to allow users to interact with their pdf documents. This tool is powered by ChatGPT, a virtual assistant that provides instant answers to user questions. A virtual assistant, like ChatPDF, is a computer program that uses artificial intelligence to communicate with users and answer their questions. This virtual assistant is developed by OpenAI, a research organization that specializes in creating artificial generative intelligence (AI).

The creators of ChatPdf have proposed that this tool be useful for a wide range of users, such as: students, helping them study for exams, assisting and helping them with homework so that they can effortlessly answer questions, or make summaries; teachers whom it helps to create teaching material, design learning units, lesson plans or evaluation tests; researchers whom it helps to go through scientific papers, articles and academic books to obtain the necessary information for their research; various users who want to navigate through various documents contracts, laws, financial reports, manuals or training materials.

To obtain information from a PDF document, it is enough for the user to ask questions, and the virtual assistant will respond. You can even discuss with multiple PDFs in a single conversation - the answers contain references to their source in the original PDF document without having to flip through the pages. ChatPdf accepts PDF documents in any language and can converse in the user's respective language in the same language it recognizes in the prompt. By prompt, we mean the user's requirement/question to which the model is trained to respond. "In the context of artificial intelligence and programming, a 'prompt' is a request or instruction that indicates the user to provide an input or that guides the behavior of an AI system." (Copilot [8])

To use ChatPDF, follow these steps: access the link <https://www.chatpdf.com/> ; upload the PDF document from your computer into the application; open the uploaded document and start the conversation with the virtual assistant to obtain the desired information.

Research questions and objectives

The purpose of this research is to explore the degree of usefulness of ChatPdf in didactic design. The objectives of this research are: exploring and understanding its functionality; evaluating its efficiency in providing precise and useful answers; analyzing how it operates, namely how it interacts with users and checking the degree of applicability in didactic design, namely what types of questions can be asked to the virtual assistant so that its answers are useful to the teacher.

The research questions refer to exploring its qualities, efficiency, precision, usability, and applicability:

1. How efficient is ChatPDF in extracting relevant information from the PDF document, respectively from the lesson?
2. How accurate is ChatPDF in answering questions?
3. How easy is it to use ChatPDF?
4. In what contexts is ChatPDF most useful?

Research methodology

The research methodology consisted in asking the teacher for several didactic design products, namely the creation of a lesson plan, a learning unit, and an assessment test. ChatPdf responded to these requests, as can be seen in the chapter devoted to research results.

Research results

Introducing and working with ChatPdf

To design various teaching materials with the help of ChatPDF, the teacher upload the PDF document from his computer into the application and open the uploaded document - “The deviation of light beams: reflection and refraction (experimental, qualitative description)”.

<https://www.chatpdf.com/c/7EaPVXYyzbmZsp56V6qDa>.

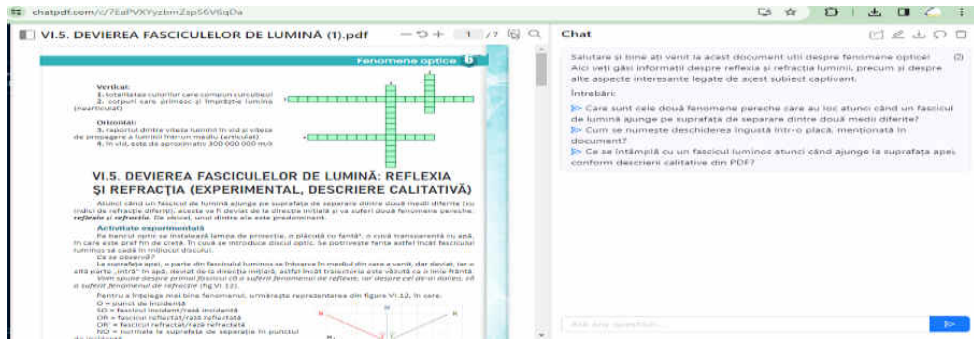


Figure 1

AI welcomes us with a greeting and suggests three evaluation questions for the PDF document, formulated in English. After the professor introduces the questions in Romanian, ChatPDF also responds in Romanian. A dialogue between ChatPDF and the professor follows. The professor requests the creation of a learning unit; in this regard, he writes in the prompt “Create a learning unit referring to the Reflection of light”.

ChatPdf responds:

„Learning Unit: Optical Phenomena - Reflection and Refraction of Light

Learning Objectives:

- To understand the phenomena of reflection and refraction of light.
- To identify the laws of reflection and refraction of light.
- To apply the knowledge in practical experiments to observe and understand optical phenomena.

Proposed Activities:

1. Practical Experiment: Building a Kaleidoscope

- Students will construct a kaleidoscope using simple materials such as a cardboard cylinder, colored beads, and a prism.
- They will observe the optical phenomena generated by the reflection of light inside the kaleidoscope.

2. Practical Experiment: Reflection of Light on a Plane Mirror

- Students will observe the reflection of light on a plane mirror and measure the angles of incidence and reflection.
- They will complete a table with the measured values and draw light rays to understand the phenomenon.

3. Research Activity: Applications of Light Reflection in Nature

- Students will search for and present examples of natural objects that reflect light and phenomena of reflection captured in nature.
- They will discuss the importance of light reflection in the surrounding environment.

4. Interactive Game: Crossword Puzzle with Optical Terms

- Students will solve a crossword puzzle to reinforce their knowledge of optical phenomena.

5. Assessment:

- Students will be evaluated based on their participation in experiments, presentation of results, and understanding of optical phenomena.
- A question-and-answer session will be organized to assess the knowledge acquired.

This learning unit provides students with the opportunity to explore and understand fundamental optical phenomena, such as the reflection and refraction of light, through practical experiments and interactive activities.”

Teacher

Create an assessment test with 10 items, 3 objective, 3 subjective and 4 semi-objectives. Additional requirements: the three subjective items must be of the Problem-Solving type.

ChatPdf responds:

Assessment Test: Reflecting Light

Objective Items:

1. **Multiple Choice:** Which of the following best describes the law of reflection? A) Light bends when it hits a surface. B) The angle of reflection is equal to the angle of incidence. C) Light changes color upon reflection. D) Reflection only occurs in transparent materials.
2. **True or False:** Regular reflection occurs on rough surfaces. A) True B) False
3. **Matching:** Match the following terms with their definitions:
 - Regular Reflection
 - Diffuse Reflection
 - Incident Ray

- Reflected Ray A) Reflection of light in multiple directions. B) Light ray approaching a surface. C) Reflection of light in a single direction. D) Light ray bouncing off a surface.

Subjective Items (Problem Solving):

4. **Problem Solving:** A light ray strikes a mirror at an angle of 30 degrees. Calculate the angle of reflection and illustrate the path of the reflected ray.
5. **Problem Solving:** Describe an experiment you could conduct to demonstrate the difference between regular and diffuse reflection. Outline the materials needed and the steps to follow.
6. **Problem Solving:** Explain how the laws of reflection can be applied in designing a periscope. Provide a sketch of the periscope and explain how it works.

Semi-Objective Items:

7. **Fill in the Blank:** The angle of _____ is equal to the angle of reflection.
8. **Short Answer:** Define regular reflection and provide an example of where it occurs in everyday life.
9. **Diagram Interpretation:** Given a diagram showing incident and reflected rays, identify the angle of incidence and the angle of reflection.
10. **Matching:** Match the following objects with their primary use related to reflection:
 - Periscope
 - Rearview mirror
 - Solar cooker
 - Kaleidoscope A) Reflecting sunlight for cooking. B) Providing a wide-angle view in vehicles. C) Creating colorful patterns through reflection. D) Reflecting light to see around corners.

This assessment test is designed to evaluate students' understanding of light reflection concepts through a variety of question types, including objective, subjective (problem-solving), and semi-objective items.”

Teacher: Create a lesson plan for Reflecting Light. The following will be covered: the purpose of the lesson, the objectives, the skills developed, the duration, the necessary materials, the structure of the lesson.

ChatPdf responds:

„Lesson Plan: Reflecting Light

Purpose: The purpose of this lesson is to introduce students to the concept of reflecting light and help them understand the principles of reflection, types of reflection, and practical applications of reflection in everyday life.

Objectives:

- Understand the definition of reflection and the laws of reflection.
- Differentiate between regular reflection and diffuse reflection.
- Explore how mirrors and other reflective surfaces work.
- Develop critical thinking skills through hands-on experiments.
- Enhance observational skills by analyzing the behavior of light.

Skills Developed: Critical thinking; Observation; Experimentation; Communication; Problem-solving.

Duration: 45 minutes to 1 hour

Necessary Materials: Mirrors (plane and curved, if available); Light source (flashlight or lamp); Objects for reflection experiments (coins, pencils, colored paper); Whiteboard and markers; Worksheets for reflection activities; Safety goggles for students.

Structure of the Lesson:

1. **Introduction (5 minutes):** Briefly introduce the topic of reflecting light; Discuss why understanding reflection is important in science and everyday life.
2. **Definition and Laws of Reflection (10 minutes):** Define reflection and explain the laws of reflection (angle of incidence equals angle of reflection); Use diagrams or visual aids to illustrate the concept.
3. **Types of Reflection (10 minutes):** Differentiate between regular reflection (smooth surfaces) and diffuse reflection (rough surfaces); Show examples of regular and diffuse reflection in the environment.
4. **Hands-on Experiment (15 minutes):** divide students into small groups; provide mirrors and objects for reflection experiments; guide students to observe and measure angles of reflection.
5. **Discussion and Analysis (10 minutes):** have students share their observations and findings from the experiment; discuss any challenges faced and how they were overcome.

6. **Applications of Reflection (5 minutes):** explore practical applications of reflection, such as mirrors, periscopes, and kaleidoscopes; encourage students to think about other real-world uses of reflection.
7. **Conclusion (5 minutes):** Summarize the key points about reflecting light; Allow time for questions and reflections from students.

Additional Notes: Ensure safety measures are in place during the experiment, especially when handling mirrors. Encourage active participation and engagement throughout the lesson. Provide opportunities for students to relate the concept of reflection to their own experiences for better understanding.”

Discussions

It is noted that ChatGpt does not mention the skills that students will develop. To have this result, the teacher must clearly request the targeted competences. In this situation, the competencies pursued will be exposed in detail.

„The competencies developed in students during the lesson on the reflection of light include:

1. **Critical Thinking:** Students will enhance their ability to analyze information about light reflection, make connections between concepts, and evaluate the results of experiments (3).
2. **Observation:** Students will develop the skill of carefully observing the behavior of light during experiments and extracting relevant information from their observations (1).
3. **Experimentation:** Students will have the opportunity to conduct practical experiments to better understand the phenomenon of light reflection and apply theoretical knowledge in practice (2).
4. **Communication:** Students will be encouraged to share the results of experiments, discuss their observations, and effectively communicate their ideas and conclusions to their peers and the teacher (2).
5. **Problem Solving:** Students will be engaged in solving various challenges and problems related to light reflection experiments, helping them develop problem-solving skills (2).

These competencies are essential for students' development in the field of

science and prepare them to apply the knowledge and skills they have acquired in practical and everyday contexts.”

It is noted that at the end of each skill, the pages in the lesson aimed at developing those skills are specified.

The homework must also be requested for ChatPDF to formulate it. Requirements must be clearly formulated, giving as many details as possible.

Conclusions

This research explored the qualities, efficiency, accuracy, usability, and applicability of ChatPDF in educational design. The conclusions that can be drawn are as follows: ChatPDF is effective in extracting relevant information from the proposed lesson; it is sufficiently precise in answering questions. However, it also makes errors and grammatical or expression mistakes.

The use of ChatPDF is exceptionally straightforward, and teachers feel they are consulting with a competent individual. It cannot be definitively stated in which contexts ChatPDF is most useful for teachers. In all three scenarios addressed in the research – lesson plan creation, learning unit design, and assessment test creation – it yielded satisfactory results.

Following the discussion between the teacher and ChatPDF, it becomes evident that it can be used in educational design, but with certain reservations. The resulting products are not of the highest quality. First and foremost, there are grammatical errors that need to be observed and corrected. Additionally, it does not strictly adhere to the nationally agreed-upon norms for educational design. User intervention and refining the responses or requested products are imperative. Nevertheless, its use is beneficial as it assists teachers in saving time dedicated to educational design.

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