

# ChatGPT for Teachers and Students in Science Learning: A Systematic Literature Review

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Received: August 5, 2023

Revised: September 9, 2023

Accepted: October 25, 2023

Published: October 31, 2023

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DOI: [10.29303/jppipa.v9i10.5259](https://doi.org/10.29303/jppipa.v9i10.5259)

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**Abstract:** In Indonesia Science education has not reached a portion that is in accordance with the needs of science education. Science learning should not only focus on knowledge but must also be balanced with application in everyday life. With this application, students will know that what they learn in science is applied and useful for life. That way, students will continue to try to experiment because of their high curiosity so that students are able to produce scientific products. Science problems are not only experienced by students, but teachers who teach science at school also have science problems they face. For this reason, Chat GPT (Generative Pre-Trainer Transformer) is used as one of the Open AI (Artificial Intelligence) innovations, a research company engaged in the development of artificial intelligence. The purpose of this research is to explain GPT Chat for Teachers and Students in Science Learning. A review is conducted on the state-of-the-art methods using the preferred reporting items for reviews and meta-analyses (PRISMA) guidelines. The results of this research show that Chat GPT has main functions, Chat GPT also has many uses for teachers and students, and science learning has five domains of science education, which must be supported by appropriate technological sophistication.

**Keywords:** ChatGPT; Science learning; Student; Teacher

## Introduction

Science introduction learning must be packaged in an attractive form and in accordance with the level of comprehension of early childhood so that science knowledge becomes fun learning and becomes an introduction to studying science at the level of future educational units. Introduction to science learning is learning that is oriented and has a scope regarding events that occur in nature. Science learning makes students more active in interacting with the surrounding environment (Yannier et al., 2020). Science is a branch of knowledge that studies natural objects and phenomena through a process of scientific observation so as to produce scientific products such as facts, principles, concepts, laws, or theories. Science has a very important role in providing understanding to students, arousing a

very high sense of curiosity in the field of science (Rachmadtullah et al., 2022).

Through science learning, science learning can be carried out because students have an understanding of the universe in which there are concepts, principles, procedures, facts, and theories that exist in the everyday life that we experience. The role of teachers in science learning has a big influence on children's ability to achieve the goals and benefits of learning science (Shana & Abulibdeh, 2020). Teachers need to place a position so that children are able to learn naturally and find new knowledge from every activity carried out. Education is essentially a conscious effort to prepare students through guidance, teaching and or training activities for their role in the future (Singh et al., 2021). Science education abroad has developed very rapidly, especially in developed countries, as evidenced by the discovery

### How to Cite:

Purnama, I., Edi, F., Megahati S, R. R. P., & Wijanarko, T. (2023). ChatGPT for Teachers and Students in Science Learning: A Systematic Literature Review. *Jurnal Penelitian Pendidikan IPA*, 9(10), 760-765. <https://doi.org/10.29303/jppipa.v9i10.5259>

and creation of new technologies that have never existed before (Schot & Steinmueller, 2018). However, in Indonesia science education has not yet reached the portion that meets the needs of science education.

Science learning should not only focus on knowledge but must also be balanced with application in everyday life (Johnston et al., 2019). With this application, students will know that what they learn in science is applied and useful for life (Haryanto & Arty, 2019). That way, students will continue to try to experiment because of their high curiosity so that students are able to produce scientific products. However, creating these conditions is a bit difficult because there are many factors that cause science problems in the learning process which result in science learning not being carried out optimally. Science problems are not only experienced by students, but teachers who teach science at school also have science problems they face (Margot & Kettler, 2019). For this reason, Chat GPT (Generative Pre-Trainer Transformer) is used as one of the Open AI (Artificial Intelligence) innovations, a research company engaged in the development of artificial intelligence (Zhang et al., 2023).

GPT Chat is a search engine like Google with a chat or dialogue form. GPT chat is a tool for information retrieval and communication tools for scientists as well as supporting learning (Roumeliotis & Tselikas, 2023). In this era of digitalization, the presence of ChatGPT technology opens opportunities to utilize AI chatbots for education in Indonesia, especially in developing student competencies (skills) needed in the 21<sup>st</sup> century. In November 2022, an artificial intelligence research laboratory (Artificial Intelligence) named OpenAI in the United States released a chatbot application called ChatGPT. This machine is a natural language processing technology capable of responding to questions. There are six competencies they need to have in Era Education 4.0, namely critical thinking, collaboration, communication and creativity plus two other supporting competencies, namely character education and citizenship. Chat GPT has main functions, chat GPT also has many uses for teachers and students, and science learning has five domains of science education, which must be supported by appropriate technological sophistication. Based on the above background, the researcher aims to study the identification of GPT Chat for Teachers and Students in Science Learning.

## Method

We conducted this research as a systematic review by following the PRISMA guidelines. The PRISMA guidelines provide several items that need to be considered in preparing a systematic review. In this

study, we will mainly focus on several key items: GPT Chat, sstudent; teacher, science learning. This helps form the basis of our assessment. Initially, we collected the latest studies on GPT Chat for teachers and students in science learning, based on a few selected keywords. Then, we apply eligibility criteria to the collection. We only selected literature published in 2017 or later to provide an overview of recent trends. In addition, we limit the types of literature, namely only literature in the form of journals and proceedings.

## Result and Discussion

Preferred Reporting Items for Systematic Review (PRISMA) is the preferred reporting technique used in this study. The research was conducted methodically over the course of the necessary research stages. The information offered is thorough, and impartial, and attempts to combine pertinent study findings. The steps of a systematic review of the literature involve developing research questions, searching the literature, screening and choosing relevant articles, filtering and choosing the best research findings, analyzing, synthesizing qualitative findings, and composing a research report. Writing background and study objectives, gathering research questions, scanning the literature, choosing articles, extracting articles, evaluating the caliber of basic studies, and synthesizing data are all steps in the systematic literature review research process.

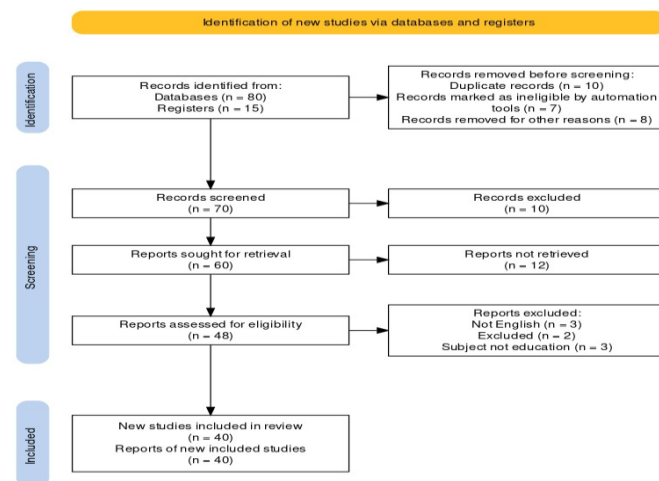


Figure 1. Flow process literatures search base on PRISMA guidelines

Complete articles published in international journals from 2015-2023, indexed in databases, and themed GPT Chat for teachers and students in science learning.

**Table 1.** ChatGPT

Sources	The main function of ChatGPT
(Roumeliotis & Tselikas, 2023); (Dwivedi et al., 2023); (Gao et al., 2023)	Generating text
(He & Garner, 2023); (Ray, 2023); (Moqbel & Al-Kadi, 2023)	Language understanding
(Pan et al., 2023); (Lewis, 2023)	Dialogue systems
(Jiao et al., 2023); (Lyu et al., 2023); (Siu, 2023)	Language translation
(Hassani & Silva, 2023); (Patel & Lam, 2023)	Text summarization
(Kung et al., 2023); (Thorp, 2023); (Sallam, 2023)	Text completion

From the table 3 above it can be explained each of them namely generating text: ChatGPT can be used to generate text that fits the given context. For example, it can be used to write short stories, articles, or answer questions in text form. Language understanding: ChatGPT can be used to understand the natural language spoken by the user and extract relevant information from the received text. Dialogue systems:

ChatGPT can be used to develop chat systems, such as virtual assistants, that can answer questions and complete tasks assigned by users. Language translation: ChatGPT can be used to translate text from one language to another. Text summarization : ChatGPT can be used to simplify long and complex texts into easy-to-read summaries. Text completion : ChatGPT can be used to complete missing or incomplete text rendered.

**Table 2.** GPT Chat Can be Used as a Tool for Teachers and Student's

Sources	Use of GPT Chat by Teachers and student
(Javaid et al., 2023); (Cooper, 2023)	Looking for Material in Teaching
(Bitzenbauer, 2023)	Better Judgment
(Ajevski et al., 2023)	Adjustments in Study Materials
(Haleem et al., 2022); (Essel et al., 2022)	Roviding Counseling Solutions to Students
(Sulaeman & Sulaeman, 2023); (Cotton et al., 2023)	Helping Students with Learning Difficulties
(Fuchs, 2023); (Tlili et al., 2023)	Remote Teaching

GPT Chat can be used as a tool for Teachers in a variety of ways. Below are some examples of its use as follows: Looking for Material in Teaching: Teachers can use GPT Chat to explain or develop lesson material. Chatgpt may include specific questions or topics, and Chat GPT may provide a more detailed explanation or a variety of additional relevant resources. Better Judgment; GPT Chat can be used to create exam questions or homework assignments and then evaluate the answers given by students. This can save teachers time in creating and checking assignments. Adjustments in Study Materials; Teachers can use Chat GPT to design lesson plans tailored to the individual needs of their students at school. By entering data such as student interests, GPT Chat can recommend appropriate material. Providing Counseling Solutions to Students; Teachers can use Chat GPT as a tool to provide advice or counseling support to their students at school. For example, GPT Chat can provide information about how

to deal with stress or lesson problems that students don't understand.

Helping Students with Learning Difficulties; GPT Chat can be used to provide additional assistance to students who are experiencing learning difficulties. Teachers can direct students to appropriate learning resources or provide additional explanations. Remote Teaching; During distance learning situations, GPT Chat can be a useful tool for communicating with students online and answering their questions. It is important to remember that while Chat GPT can be a useful tool for teachers, it cannot completely replace the role of the teacher. Teachers still have an important role in providing in-depth instruction, supporting students, and understanding each individual's needs. GPT chat is a tool that can improve the efficiency and quality of teaching, but does not replace the role of humans in education.

**Table 3.** Science Learning

Sources	The realm of science learning,
(Ariani & Ratnawulan, 2020); (Dwivedi et al., 2023); (Rubini et al., 2018); (Lederman et al., 2019)	Domain 1
(Simorangkir & Rohaeti, 2019); (Kurniawati et al., 2017); (Wilujeng et al., 2019); (Wirzal et al., 2022)	Domain 2
(Margolis & Laurence, 2023); (D. A. Haggerty et al., 2023)	Domain 3
(Awalin & Ismono, 2021); (Fauzan et al., 2023); (Handini et al. - The Effectiveness of Scientific Collaboration Mode.Pdf, n.d.); (D. Haggerty et al., 2023)	Domain 4

Through science learning based on five domains for science education, students expected not only to increase knowledge and skills, but also develop a positive attitude towards science itself as well as with science environment, as well as apply and connect it in life more active every day. Five domains in science learning, as following: Domain 1- Knowing and Understanding (knowledge domain), in the form of: facts, concepts, laws, several hypotheses and theories used by scientists, and scientific and social problems. Domain 2- Exploring and Discovering (Process of science domain), are Basic science processes: observation, communication, classification, measurement, inference and prediction; Integrated science process: identifying variables, preparing data tables, making graphs, describing relationships intervariable relations, data provision and processing, investigative analysis, hypothesis preparation, operational definition of variables, investigation design, and experiment. Domain 3 – Exploring and Discovering (process of science domain).

There are several important human capabilities in this domain, namely combining several objects and ideas in new ways; generating alternatives or using objects that are not commonly used; imagine; dreaming; and generate great ideas. Domain 4- Feeling and Valuing (attitudinal domain), this domain includes: development of positive attitudes towards science in general, science in schools, and science teachers, development of a positive attitude towards oneself, development sensitivity, and respect for other people's feelings and decisions decisions on social and environmental issues. Domain 5 – Using and Applying (application and connection domain) in the form of: observe examples of science concepts and skills been studied.

## Conclusion

Science problems are not only experienced by students, but teachers who teach science in schools also have science problems they face. Therefore, GPT (Generative Pre-Trainer Transformer) Chat Technology is a key component that allows humans to execute processes and make knowledge available anywhere and anytime. Teachers and students really need technology in science learning.

## Acknowledgments

Thanks to all parties who have supported the implementation of this research. I hope this research can be useful.

## Author Contributions

Conceptualization, I. P., F. E., R. R. P. M., T. W.; methodology, I. P.; validation, F. E.; formal analysis, I. P.; investigation, R. R. P. M. And T. W.; resources, I. P. and.; F. E. data curation, R. R. P.

M.: writing—original draft preparation, T. W. and I. P.; writing—review and editing, F. E.; visualization, R. R. P. M. and T. W.; supervision, I. P.; project administration, F. E.; funding acquisition, R. R. P. M. And T. W. All authors have read and agreed to the published version of the manuscript.

## Funding

This research was independently funded by researchers.

## Conflicts of Interest

The authors declare no conflict of interest.

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