Can ChatGPT be integrated into Blended Learning in Science: A Systematic Literature Review

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Abstract: Success requires highly qualified teachers who use their skills and assessment tools to diagnose learner needs, and then design targeted instruction with available resources. Only in this way can the integration of ChatGPT in blended learning be transformational, when teaching does not reflect traditional practices but is a series of dynamic experiences in the hands of students. Where the research aims to examine the Integration of ChatGPT in Blended Learning: A Systematic Literature Review. The review was conducted based on state-of-the-art methods using the preferred reporting items for reviews and meta-analyses (PRISMA) guidelines. The results of this research explain that there are 4 types of characteristics of Blended Learning, namely Combining Various Delivery Methods, Combining Direct Teaching, and Combining Effective Teaching Methods and Learning Styles, Teachers and Parents Have the Same Role. Some of the benefits of Blended Learning are More Flexible, Effective Learning Results, Increasing Student Interaction and Involvement, Able to Increase Learning Satisfaction, Student Participation Becomes More Active, and costs and Time. Categories of Use of Technology (ChatGPT) in Blended Learning are Managed learning, regulated learning, collaborative learning, and authentic learning.

Keywords: Blended Learning; ChatGPT; Technology

Introduction

The emergence of generative artificial intelligence (Gen-AI) systems, or artificial intelligence (AI) for short, such as the currently popular ChatGPT tool from OpenAI, represents a significant turning point in academia, the consequences of which are beginning to be explored, although their impact may be broader than first estimated (Dwivedi et al., 2023). Gen-AI systems are created to produce various outputs, such as text, images, video, or code, using the data store that trained them. Many students demonstrate weaknesses in some competencies, especially in the early years of their studies, so appropriate course design can help overcome these deficiencies. ChatGPT is a large language model in which a generative trained transformer (GPT) model generates content in response to interactions with requested questions or commands (Roumeliotis & Tselikas, 2023).

The latest model of ChatGPT 3 was only released in November 2022, recently updated to model 3.5 in March 2023, and has spread with incredible speed as one of the most used tools in academia (Karakose et al., 2023). The emergence of tools such as ChatGPT, which have the potential to solve this problem, may weaken the learning process by inhibiting deep assimilation between techniques and results (Sánchez-Ruiz et al., 2023). Blended learning can be defined as a student-centered approach that combines the benefits of online learning (flexibility, abundant resources, and timely updates)

with the interactivity of traditional teaching (Adarkwah & Huang, 2023). Researchers have assessed the feasibility and effectiveness of this model along various dimensions, such as knowledge acquisition, competency performance, technology availability, and satisfaction (Mofokeng, 2021). Although the concept of BL is not new, its use and application have become widespread in the academic world (Selvaraj et al., 2021).

BL integrating this educational methodology has shown several positive results in education, such as improved learning outcomes, increased student commitment and satisfaction, increased independent learning and time management, increased access and adaptability, and cost-effectiveness (Prifti, 2022). Several studies have reported potential challenges or negative outcomes, such as technological barriers that may hinder the effectiveness of BL for some students, increased workload for educators, social isolation, or difficulty in adapting to the learning environment and format (Ng et al., 2023). These challenges can be overcome through careful planning, providing adequate support to both students and educators and continuously evaluating and refining the Blended Learning approach.

Blended Learning aims to increase student engagement and improve learning outcomes by making learning more interactive, flexible, and fun for students (Setiyani et al., 2020). Although each method has a unique approach, it can be combined or used interchangeably, depending on the needs of the student and the goals of the educator (Shemshack & Spector, 2020). However, they could be threatened or strengthened by the emergence of ChatGPT (Florindo, 2023). When faced with challenges or problems, students typically seek help from teachers, consult online resources, such as web pages, texts, videos, or tutorials, and fill gaps in their knowledge (Ong & Quek, 2023; Liu et al., 2024). However, the emergence of ChatGPT introduces new challenges to this process, potentially reducing the efficiency of existing teaching methodologies and designed activities. Based on the background described above, research was conducted that aimed to examine ChatGPT integration in Blended Learning.

Method

We conducted this research as a systematic review following PRISMA guidelines (Page et al., 2021). The PRISMA guidelines provide several things to consider in preparing a systematic review. In this study, we will mainly focus on several main items: Characteristics of Blended Learning, benefits of Blended Learning, and Categories of Technology Use (ChatGPT) in Blended Learning. This helps form the basis of our assessment. Initially, we collected the latest studies on ChatGPT Integration in Blended Learning, based on some selected keywords. Then, we apply eligibility criteria to the collection. We selected only literature published in 2015 or later to provide an overview of current trends. Apart from that, we limited the type of literature to only literature in the form of journals and proceedings.

Result and Discussion

Preferred Reporting Items for Systematic Reviews (PRISMA) was the reporting technique used in this study. The research was conducted methodically during the required research phases. The information provided is comprehensive and unbiased and aims to combine relevant research results. The steps of a systematic literature review include developing research questions, literature searches, screening and selecting relevant articles, screening and selecting the best research results, analysis, synthesis of qualitative results, and preparation of research reports. Writing the background and objectives of the research, collecting research questions, searching the literature, selecting articles, extracting articles, assessing the quality of basic studies, and summarizing the material are steps in the systematic literature review research process.

The complete article was published in an international journal 2015-2023, indexed in a database, and has the theme ChatGPT Integration in Blended Learning: Systematic Literature Review. Then some of the characteristics of blended learning are as explained below.

Table 1. Characteristics of Blended Learning

| Source	Some characteristics of Blended Learning
Hrastinski, 2019; Kintu et al., 2017; Purnomo et al., 2022	Combining Various Delivery Methods
Müller & Wulf, 2022; Saragih et al., 2020; Tong et al., 2022	Combination of Direct Teaching
Ismawati et al., 2022; Heriansyah, 2020; Wang et al., 2018; Stoian et al., 2022	A Combination of Effective Teaching Methods and Learning Styles
Juwandani et al., 2022; Zhou et al., 2024	Teachers and Parents Have the Same Role
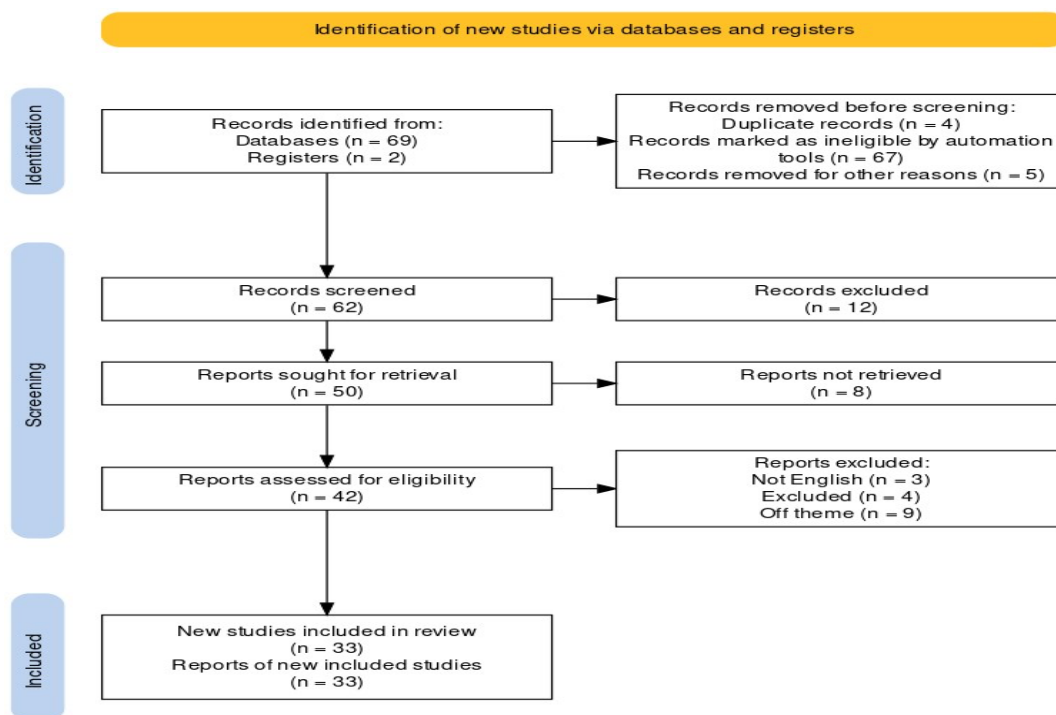
Figure 1. Flow of the literature search process based on PRISMA guidelines

The first characteristic is that this method combines various conventional or offline learning models with online learning. This is not a new method but rather a complement to online learning methods, aka e-learning. In this combined learning, the main focus is that students are expected to be able to learn independently. They must also have responsibility for participating in learning and completing their assignments; Combination of Direct Teaching: The blended learning method is also computer-based learning. That means, in implementing it you must utilize a technological approach by combining various face-to-face learning resources.

For the media used, namely cell phones, computers, video conferencing, and so on; Combination of Effective Teaching Methods and Learning Styles: With the combined learning method, students will be increasingly motivated to be able to carry out various learning activities independently. They can also ask questions easily via discussion forums to both teachers and other students; Teachers and Parents Have the Same Roles: The next characteristic of blended learning is that teachers and parents have the same roles. This method will be the best choice and solution to increase effectiveness and efficiency in teaching and learning activities. The attraction of being able to interact in a learning environment will also increase. This method will also provide sensitive learning facilities, especially regarding differences related to psychological character.

Table 2. Benefits of Blended Learning

Source	Several benefits of Blended Learning
Gounopoulos et al., 2017; Puspitarini, 2022	More Flexible
Prihadi et al., 2021	Effective Learning Outcomes
Bouilheres et al., 2020; Nikolopoulou & Zacharias, 2023	Increasing Student Interaction and Involvement
Riwayani & Harahap, 2022; Wang et al., 2023	Able to Increase Learning Satisfaction
Dziuban et al., 2018; Lyons & Evans, 2013; Makhdoom et al., 2013; Almusaed et al., 2023	Student Participation Becomes More Active and Saves costs and time

The benefits you can get by implementing blended learning are: More flexible: The aim of implementing the blended learning method is to make learning more flexible. Of course, this is different if you compare it with traditional learning. This method allows students to learn at their own pace; Effective Learning Outcomes: Combining various teaching methods from blended learning has been proven to be able to improve student learning outcomes. For example, based on research, students who are in elementary school and apply Core5 blended learning for learning English show positive results. There is an increase in students' reading achievement of up to 20%; Increasing Student Interaction and Engagement: Now many students are

familiar with technology. They utilize this technology every day.

Therefore, utilizing technology when studying will make it easier for them to be involved in learning activities; Benefits of Blended Learning, Able to Increase Learning Satisfaction: The blended learning method has also been proven to be able to increase students' satisfaction regarding learning and the learning outcomes they get. This is because from the start they already understand what the learning flow is like. The students understand what is expected of them and the conditions for achieving the goals and final assignment. Student Participation Becomes More Active: In offline or traditional learning, students tend to be passive when participating in learning. One reason is that the learning that takes place in the classroom is teacher-centered. On the other hand, you tend to find this passivity in blended learning rarely.

Students tend to be active in participating and taking part in learning activities; which Saves costs and time. The mixed learning model allows teachers and students to save more time and costs. This means that teachers can save on paper usage because learning activities can be carried out paperless. Teachers can use handouts, worksheets, and other supports without having to print or duplicate them. Files related to the material just need to be uploaded, and then students just need to download them via computer, laptop, or cellphone. Teachers and students can also save more time because they don't need to travel to school, especially when the location from home to school is very far.

Table 3. ChatGPT in Blended Learning

Source	Technology Use Category (ChatGPT) in Blended Learning
Habibi et al., 2023; Chen et al., 2023; Alshahrani, 2023	Managed learning
Chang et al., 2023; Wu et al., 2024; Ding et al., 2023	Regulated learning
Yu, 2024; Pinochet et al., 2023	Collaborative learning
Murcahyanto, 2023; Zheng, 2023; Chiu, 2023; Wei, 2023	Authentic learning

The Use of Technology (ChatGPT) categories in Blended Learning are explained as follows: Managed learning: Managing teaching and assessment is just as important online as it is in the physical classroom. Online platforms such as Schoology, Google Classroom, and Blackboard CourseSites enable educators to communicate and submit assignments, provide feedback, and offer learning resources to meet a variety of student needs. Teachers and administrators can communicate with students, parents, and other stakeholders in rich dialogue that puts students at the center of the conversation; Managed learning: Teachers frame learning by leading students toward controlled experiences. Following the teacher's direction, students participate in guided instruction and practice. Examples include completing digital worksheets, posting reading responses on discussion boards, taking notes from video tutorials or recordings of teacher lectures and demonstrations, or participating in whole-class reviews using Kahoot or Edpuzzle.

The first two categories of using technology for learning are a good foundation to develop. When adding the next two categories, teachers empower students to take the lead, which can bring greater challenges—and deeper learning; Collaborative learning: Student-led learning experiences—both individual and group activities—can encourage collaboration and critical thinking. Teachers and students can work together to personalize learning based on student needs through invaluable online resources. Use networking portals like LinkedIn and Twitter to connect with experts who can provide guidance and share their expertise with students.

Using video conferencing, students can follow up with these experts, further connecting the curriculum to real-world interests. Sometimes students need personalized support. Teachers can keep this personalized support manageable in several ways. After building a resource library based on common areas of need, teachers can expand it to meet less frequently emerging needs, and advise individual students or groups about these useful resources; Authentic learning: Learning should be made public. Students step up their game when they have to share their results with an interested outside audience—either in a live event or in a publication. Engage authentic audience-based learning outside the classroom to provide context for how the curriculum applies to real-world situations.

Conclusion

Blended learning is a learning method that is a solution in situations where schools cannot carry out face-to-face learning activities assisted by chatbot integration. This method comes with many benefits that can be felt not only by teachers but also by students and parents. Even so, there are challenges when you want to implement it. Moreover, there are still many people who are unfamiliar with the combined learning method. Apart from that, this method must also be supported by the facilities available from both the school and the students. That way, learning will take place effectively and students will be able to achieve their learning goals.

Conflicts of Interest
The author declares that there is no conflict of interest in the research and publication of this research.

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