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AI to the rescue: Exploring the potential of ChatGPT as a teacher ally for workload relief and burnout prevention

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Abstract

This research investigates the effectiveness of AI generative ChatGPT as a teacher assistant to reduce workload and prevent burnout in secondary schools. Lesson planning and content development were significant contributors to teacher burnout. In response, ChatGPT was tested with tailored queries for English, science, and math subjects, utilising an explanatory research approach to assess ChatGPT's capabilities in personalised planning and content development, given that there is limited available information around this topic. The study highlights ChatGPT's benefits in personalised planning through task-specific prompts and AI-human collaboration. Aligned with UAE's AI integration objectives, the study emphasises balanced use and educational reform potential. Integrating AI tools optimises teacher planning, enhances instructional support, and refines resource allocation, contributing to AI's academic potential while stressing burnout mitigation's importance for educational advancement.

Keywords: 5Es instructional model, Artificial intelligence, ChatGPT, Teacher burnout, Workload

Introduction

Teaching is regarded as one of the most demanding professions across various cultural and educational settings, has consistently exhibited higher levels of burnout among teachers compared to professionals in other human service fields (Johnson et al., 2005; Kalimo & Hakanen, 2000; Saloviita & Pakarinen, 2021). The teaching profession involves coping with numerous individual and school-related pressures, including heavy workloads, conflicting roles, school climate, interpersonal conflicts with colleagues, and behavioural challenges posed by students (Granziera et al., 2021; Hakanen et al., 2006; Maslach &



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Leiter, 2016; Montero-Marín et al., 2012; Skaalvik & Skaalvik, 2010). The negative impacts of burnout on teachers' physical and mental health, job satisfaction, and even student academic performance are well-documented (Hakanen et al., 2006; Herman et al., 2018; Schonfeld & Bianchi, 2016). Teachers' non-teaching tasks, such as lesson planning, consume substantial time (Higton et al., 2017). Increased workload stems from preparing challenging subjects and non-teaching tasks, leading to burnout (Agyapong et al., 2022; Mojsa-Kaja et al., 2015). Administrative tasks contribute to heavy workloads, with new demands, such as technology management and assessments, added without reducing previous tasks (Arvidsson et al., 2019). High burnout levels lead to increased absenteeism, attrition, and lower job performance (Ingersoll & Strong, 2011; Klusmann et al., 2016), emphasising the importance of investigating contributing factors (Granziera et al., 2021). Consequently, exploring teacher burnout and its associated factors has attracted considerable attention from educational researchers and policymakers (Saloviita & Pakarinen, 2021). Gaining insight into the factors contributing to teacher burnout can inform decisions and actions to enhance school environments, promote teacher job satisfaction, and deliver high-quality education (Granziera et al., 2021).

Teaching has undergone significant transformations in the 21st century, primarily driven by technological advancements like artificial intelligence (AI) (Petersen, 2021). The emergence of machine learning has facilitated the development of more advanced and innovative technologies, such as generative AI (Hu, 2022). Generative Pre-trained Transformer (GPT) is a model of generative AI that uses a large amount of publicly available digital content data (natural language processing [NLP]) to read and produce human-like text in several languages. GPT demonstrates strong interactive capabilities, being proficient not only in engaging in realistic conversations but also in generating compelling and convincing creative content (Aydin & Karaarslan, 2022; Jovanović & Milosavljević, 2022; Korngiebel & Mooney, 2021; Pavlik, 2023). Generative AI models have achieved a significant breakthrough in on-demand content creation (McKinsey & Company, 2023), particularly in education. AI's various application in education encompasses content development, teaching methodologies, student assessment, and teacher-student communication (Chen et al., 2020; Timms, 2016).

The sophisticated GPT model, ChatGPT, has attracted the attention of various fields, including education (Fütterer et al., 2023; Williams et al., 2023). Within a week of its initial public release on November 30, 2022, ChatGPT quickly amassed over one million subscribers, as reported by Altman (2022) and Mollman (2022). ChatGPT holds significant promise as an asset in the field of education. Educators can leverage ChatGPT to enrich teaching and learning through a multitude of applications, including but not limited to 1) facilitating lesson planning, 2) providing personalised tutoring, 3) automating assignment grading, 4) assisting with language translation, 5) fostering interactive learning

experiences, and 6) supporting adaptive learning approaches (Baidoo-Anu & Owusu Ansah, 2023).

The primary objective of this study was to investigate how incorporating AI-generative ChatGPT as a teacher assistant can alleviate teacher workload. A literature review on teacher burnout and ChatGPT explicitly focused on teacher workload and teaching responsibilities. The review identified lesson planning and content development as the most time-consuming and challenging aspects leading to teacher burnout. Expanding upon these discoveries, the testing methodology for ChatGPT was advanced, encompassing the creation of queries that replicate conventional lesson planning and curriculum creation for students aged 12-15 and 16-18, spanning subjects like English, science, and math. The generated lesson plans were evaluated using the 5Es instructional model.

This study is particularly relevant to teacher burnout in the United Arab Emirates (UAE), considering the country's focus on integrating artificial intelligence technologies into the education sector. With the UAE's partnership with Microsoft OpenAI and its commitment to adopting AI tools, such as ChatGPT, in teaching methods (Al Falasi, 2023), the findings of this study can directly contribute to addressing teacher burnout in the country. By exploring how incorporating AI-generative ChatGPT as a teacher assistant can mitigate teacher workload, the study aligns with the UAE's vision of utilising advanced technologies to enhance teaching practices and improve student learning outcomes. The insights gained from this research can inform educational policymakers and stakeholders in the UAE on leveraging AI technologies effectively to reduce teacher burnout and promote teacher job satisfaction and well-being.

The following questions guided the research:

1. How can using AI generative chatbots, like ChatGPT, mitigate teachers' workload and reduce the risk of burnout?
2. To what degree can ChatGPT, as an AI generative tool, produce high-quality lesson plans that alleviate teachers' workload and create more time for additional responsibilities?
3. How can the quality of lesson plans and recommendations for content development produced by ChatGPT be enhanced?

Literature review

To identify factors contributing to teacher burnout and explore how they can be addressed with the assistance of ChatGPT, a literature review was conducted on the topics of teacher burnout and ChatGPT, with a specific focus on teacher workload and non-teaching work time.

Teacher burnout

Burnout has been recognised as a psychological risk, especially in occupations that involve customer interaction (Granziera et al., 2021; Maslach & Leiter, 2016; Montero-Marín et al., 2012). It has been defined as a psychological condition that arises from prolonged exposure to stressors associated with work relationships (Maslach & Leiter, 2016). When work becomes tedious, unfulfilling, and unsatisfactory, burnout develops gradually. Burnout is typically split into three dimensions: exhaustion, lack of achievement, feelings of scepticism towards the job and disconnection from one's profession. Among the three dimensions, emotional exhaustion is a fundamental aspect of the psychological phenomenon (Maslach & Leiter, 2017).

The adverse effects of teacher burnout are well-documented in the literature and have a negative impact on the well-being of teachers themselves, including their physical health (Hakanen et al., 2006), mental health (Schonfeld & Bianchi, 2016) as well as job satisfaction (Robinson et al., 2019). Burnout has also negatively affected student academic attainment (Herman et al., 2018). Moreover, high levels of burnout are linked to increased absenteeism, attrition, and turnover rates among teachers, as well as a drop in the quality of job performance (Ingersoll & Strong, 2011; Klusmann et al., 2016). Since teacher burnout has wide-ranging consequences for teachers, school systems, and society, it is critical to explore more closely the factors that contribute to burnout among teachers (Granziera et al., 2021).

Several organisational variables were found to be linked to teacher burnout, including the specific demands from teachers, the size of their classes and schools, and the availability of resources and support. A study by Pietarinen et al. (2013) revealed that subject teachers experience significantly higher burnout than class and special education teachers. Additionally, subject teachers reported the highest levels of inadequacy, while special education teachers reported the lowest levels. The high levels of teacher burnout in subject teachers were reported to be linked to scarcity of resources, workload challenges, and role obscurity (Brunsting et al., 2014).

Prior studies suggest that larger class and school sizes are associated with higher teacher burnout levels. In addition, earlier studies have revealed a correlation between larger school sizes and decreased teacher job satisfaction, reduced levels of job performance, and a sense of demotivation (Pietarinen et al., 2013; Skaalvik & Skaalvik, 2011). Burnout is also associated with teachers' support level, as Brunsting et al. (2014) and Skaalvik and Skaalvik (2011) observed. Teachers who benefited from extra support from trained teaching assistants exhibited lower levels of teacher burnout, mainly when inclusive classrooms accommodated students with special needs (Saloviita & Tolvanen, 2017). Therefore, it is worthwhile to investigate the role of well-equipped teaching assistants and their potential to lower levels of teacher burnout.

Research across different cultural and geographical settings has highlighted notable elements influencing teachers' workplace well-being (Bermejo-Toro et al., 2016; Dicke et al., 2014; Evers et al., 2016; Skaalvik & Skaalvik, 2011; Tonder & Fourie, 2015). These aspects include excessive workload, student misbehaviour, time constraints, role stress, and students' limited motivation to learn. Studies suggest that these challenges significantly impact teachers' resilience and overall well-being. Heavy workload has been associated with various adverse outcomes for teachers, such as emotional exhaustion, stress, depressive symptoms, lower levels of job commitment, decreased engagement, and a greater likelihood of leaving the profession (Hakanen et al., 2006; Lee, 2019; Leung & Lee, 2006; Skaalvik & Skaalvik, 2011).

According to research, teachers' average time on non-teaching tasks is substantial. Prior teacher workload studies revealed that teachers spend significant time on two non-teaching activities: lesson planning and preparation of teaching and learning materials (Castelli et al., 2017; Salmela-Aro et al., 2019). Findings from a study conducted in England showed that primary teachers self-reported more than 60 working hours per week, a total number of hours that was found to be significantly higher than time spent by secondary teachers (Higton et al., 2017). Secondary school teachers have described increased workload concerning the amount of time spent on class preparation due to the difficulty of a subject they teach (Agyapong et al., 2022). Similarly, teachers from Poland confirmed that extensive non-teaching workload is associated with higher levels of teacher burnout (Mojsa-Kaja et al., 2015). Almost half of the interviewed teachers reported that increased administrative tasks contributed to their already heavy workload (Arvidsson et al., 2019). The increase in workload was not due to teaching responsibilities but rather the addition of new demands without removing previous tasks. These new demands included managing new technological systems, aligning long-term educational plans with goals, conducting extensive grading and assessments, and developing individualised student plans with limited time, resulting in unexpected changes to their schedule and increased workload.

The National Center for Education Statistics (NCES) revealed that elementary teachers in the United States spend an average of 32 hours weekly in direct contact with students while they are paid to work for 38 hours. Similarly, on average, secondary school teachers spend 30 hours weekly with students while they are paid to work 38 hours. As a result, teachers are left with minimal time to perform other critical teaching tasks. The report also indicated that most teachers are left with an average of 45 minutes for daily planning time within their paid hours (Snyder & Dillow, 2012). According to NCES, the average K-12 teacher works around 52 hours per week.

Artificial intelligence and ChatGPT

Artificial Intelligence (AI) frequently refers to teaching machines that perform tasks that mimic human intelligence. Many everyday technologies, such as chatbots, voice assistants and others, use AI. Machine learning is a subset of AI that involves developing models capable of learning from data patterns without human intervention. The massive amounts of complex data being generated today have increased the potential and necessity for machine learning. Several types of machine learning models build upon classical statistical techniques developed in the past. Until recently, machine learning models were mainly used for predictive purposes, such as identifying patterns in content. An example of a predictive model is Learning Analytics (LA), which combines data mining and artificial intelligence and is often used for predictive and prescriptive purposes. In predictive analytics, LA predicts “what will happen,” while in prescriptive analytics, it recommends future actions and interventions (Banihashem et al., 2022). Recent developments in LA enhance study success by collecting and analysing data to provide feedback and support. Effective techniques detect at-risk students, but there is a need for standardised measures, visualisations, and personalised interventions. However, fully automated systems must balance personalisation and collaboration for effective learning (Ifenthaler & Yau, 2020). Learning Analytics collects performance data (grades, scores) for educators’ early recognition and learning activity data (forum posts, interactions) for student reflection (Banihashem et al., 2022).

Regarding generative AI models, they can now create new content on demand, a significant breakthrough (McKinsey & Company, 2023). The application of AI in education provides an opportunity to break physical barriers as learning materials are now accessible online. Different studies have demonstrated the transition of AI in education from conventional computers to embedded systems such as robots. AI in education goes beyond the normal functions of computers and involves the collaboration of different professionals, including data scientists, product designers, linguists, cognitive scientists, psychologists, and education experts. AI surpasses the conventional understanding of various technological applications in education. AI in education has been applied in other areas, such as content development, teaching methods, student assessment, and communication between teachers and students (Timms, 2016). This has been achieved using different platforms and applications, including Interactive Learning Environments (ILEs), Intelligent Tutoring Systems (ITS), adaptive learning systems, virtual reality (VR) and 3D technology (Chen et al., 2020). In a study by Chassignol et al. (2018), it is highlighted that AI has been used in education administration and teaching, subsequently impacting students’ learning. The scholarly sources analysed for the study demonstrate that AI has been utilised in educational institutions in various ways, such as automating administrative tasks, developing curriculum and content, providing instruction, and

improving students' learning processes. Through technology such as virtual reality, web-based platforms, robotics, video conferencing, audio-visual files, and 3D technology, students can learn better and have a personalised and richer educational experience. AI has also made teachers more effective and efficient (Chen et al., 2020). Among the opportunities AI provides in education is the further development of massive open online courses (MOOCs), making it easier to assess many assignments and detect learning and teaching gaps. At the same time, these intelligent assessment systems can skip some correct but rare unique solutions since the system decides based on massive statistics. This means that AI-based assessment systems cannot be accurate in every situation without a human mentor (Chassignol et al., 2018).

Generative AI can create new content using unsupervised and semi-supervised machine learning algorithms, such as text, audio, video, images, and code (McKinsey & Company, 2023). Such technologies include Generative Adversarial Networks (GANs) and Transformer-based models like Generative Pre-trained Transformer (GPT). However, generative AI must be modelled to enable it to create new content from existing data. Creating a generative AI model has traditionally been a daunting task, typically undertaken by only a handful of tech giants with extensive resources. Well-known donors have provided billions in funding to companies like OpenAI, which has produced ChatGPT, previous GPT models, and DALL-E. DeepMind, a subsidiary of Alphabet, Google's parent company, and Meta, have also released products that leverage generative AI. These businesses employ some of the world's most accomplished computer scientists and engineers, but training a model with vast internet data incurs significant expenses. While OpenAI has not revealed precise figures, it is believed that GPT-3 was trained on approximately 45 terabytes of text data at the cost of several million dollars.

ChatGPT, developed by OpenAI, is a free chatbot that can generate answers to questions and has already gained a million users. Despite fears about its impact, machine learning has positively affected various industries. The adoption and investment in AI have significantly increased in the past five years. However, the full extent of the impact and risks of generative AI is still unknown (McKinsey & Company, 2023). AI chatbots have previously received poor reviews, but ChatGPT appears to perform well despite still being evaluated. The first text-based machine learning models were trained using supervised learning, where humans labelled inputs to be classified by the model. The next generation of text-based machine learning models uses self-supervised learning. This entails providing the model with a substantial amount of text to make predictions, such as inferring the conclusion of a phrase from just a few words. The success of ChatGPT demonstrates that these models can be highly accurate with sufficient example text. In its capacity as an AI language model, ChatGPT may assist teachers with a range of daily duties, including:

- Answering inquiries: ChatGPT can address a range of inquiries, including academics, curricula, lesson preparation, and instructional techniques.
- Providing resources: ChatGPT can assist educators in finding materials to complement their instruction, including lesson plans, teaching aids, and scholarly papers.
- Grading tasks: ChatGPT can help grade tasks and give students feedback.
- Personalising instruction: ChatGPT may assess student data and recommend tailored lesson plans and learning techniques to raise academic achievement.
- Creating assessments: ChatGPT can assist with creating and customising tests for a range of subjects and grade levels.
- Assisting with administrative tasks: ChatGPT can help with administrative tasks like scheduling, organising classroom materials, and communicating with students and parents.
- Providing language translation: ChatGPT can translate the language for teachers who work with multilingual students or need to communicate with parents who speak different languages.

Integrating AI principles and technology into web-based learning platforms, such as Adaptive and Intelligent Web-Based Educational Systems (AIWBES) and Intelligent Web-Based Education (IWBE), improves the learning experience by considering several factors such as the learner's knowledge, skill, and performance capabilities. Findings from the literature review are presented in Table 1.

Methodology

This section outlines the methodology employed in this study. The researchers utilised an explanatory research design, a research method that explores why something occurs when limited information is available (Ivankova et al., 2006). It can be an assistive tool to increase researchers' perception of a specific topic, check how or why a particular phenomenon occurs, and predict its possible future occurrence (Awotunde et al., 2021). The ChatGPT testing primarily concentrated on lesson planning and material development for English, science, and math subjects, targeting students aged 12-15 and 16-18. The lesson plans generated through ChatGPT were evaluated according to the 5Es teaching model (see Table 2). Researchers used a set of ChatGPT prompts during this testing process to create lesson plans for specific subjects and age groups, as described earlier. The main focus of the research is to examine ChatGPT's potential in designing effective and engaging learning materials. This approach did not include direct interaction with students but helped judge the tool's proficiency in generating lesson plans mapped to the 5Es instructional pedagogical model aligned with the constructivism theory (Chinwe & Chinyere, 2010). This exploration into ChatGPT's capabilities sheds light on its potential to significantly assist teachers in developing engaging and comprehensive learning content for diverse students.

Table 1 Summary of the literature review findings

| Topic | Key findings | References |
|---|--|---|
| Teacher Burnout | Burnout arises from prolonged exposure to work-related stressors. | Granziera et al., 2021; Maslach & Leiter, 2016; Montero-Marín et al., 2012 |
| | Burnout is split into three dimensions: exhaustion, lack of achievement, and scepticism towards the job. | Maslach & Leiter, 2016 |
| | Emotional exhaustion is a fundamental aspect of burnout. | Maslach & Leiter, 2017 |
| | Effects of burnout include negative impacts on physical and mental health, job satisfaction, and student attainment. | Hakanen et al., 2006; Herman et al., 2018; Robinson et al., 2019; Schonfeld & Bianchi, 2016 |
| | Burnout relates to absenteeism, attrition, turnover, and decreased job performance. | Ingersoll & Strong, 2011; Klusmann et al., 2016 |
| | Organisational variables like workload, class size, resources, and support contribute to burnout. | Brunsting et al., 2014; Pietarinen et al., 2013; Saloviita & Pakarinen, 2021; Saloviita & Tolvanen, 2017; Skaalvik & Skaalvik, 2011 |
| Application of AI in Education | AI includes machine learning; generative AI creates new content. | McKinsey & Company, 2023 |
| | AI in education breaks barriers and improves accessibility. | Timms, 2016 |
| | AI is used in content development, teaching methods, assessment, and communication. | Chassignol et al., 2018; Chen et al., 2020 |
| | AI enhances education through virtual reality, robotics, adaptive learning, etc. | Chen et al., 2020 |
| | Generative AI uses GANs and transformer models like GPT for content creation. | McKinsey & Company, 2023 |
| | Companies like OpenAI, Google, and Meta invest in generative AI. | McKinsey & Company, 2023 |
| | ChatGPT, a successful AI chatbot, can assist teachers in answering questions, grading assignments, etc. | McKinsey & Company, 2023 |
| ChatGPT uses self-supervised learning to generate accurate responses. | McKinsey & Company, 2023 | |

ChatGPT testing

Two primary criteria shaped and guided the content and scope of ChatGPT testing. Firstly, the literature review findings identified lesson planning and content development as the most time-consuming non-teaching tasks contributing to teachers' workload and burnout. These tasks require teachers to carefully consider learners' distinct needs, learning objectives, and appropriate resources and activities, which can significantly impact their overall workload and well-being. Therefore, teachers must find ways to streamline these processes to reduce stress and manage workload. Secondly, subject teachers have reported the highest levels of inadequacy due to workload problems, ambiguity, and lack of

resources. Based on these two findings, the ChatGPT testing for this study focused on lesson planning and material development cycles two and three, covering English, science, and math for 12-15 and 16-18-year-old students. The testing queries were designed to simulate everyday tasks of lesson planning and material intended for classroom teaching.

Data analysis of the ChatGPT-generated lesson plans

To determine its effectiveness, the lesson plans generated by ChatGPT were analysed and evaluated using the 5Es instructional model for learning and teaching to assess if it can create quality lesson plans that help teachers reduce their workload and free up some of their time for other tasks. The first and the second authors evaluated the lesson plans generated by ChatGPT using a checklist of the various descriptors of each of the 5E phases (see Table 2). The authors reviewed the lesson plans, and based on the 5E descriptors, they evaluated each lesson plan and recorded qualitative feedback regarding commendable aspects and areas for improvement.

The underlying dynamic and interactive learning theory justifies using the 5Es instructional model as an evaluation framework for lesson plans developed by ChatGPT. Individuals revise their initial concepts through interactions with the environment and others, redefining and reorganising their understanding. The learner interprets objects and phenomena based on current experiences and incorporates these interpretations into their knowledge. The 5E Instructional Model, or the 5Es, consists of the following phases: engagement, exploration, explanation, elaboration, and evaluation. Each of the 5E phases is defined in Table 2. The model acknowledges that students construct knowledge through reconstruction, which can be facilitated through well-designed lesson sequences that challenge their existing conceptions (Bybee, 2006).

Table 2 Summary of the 5 phases of the 5Es model (Bybee, 2006, p.2)

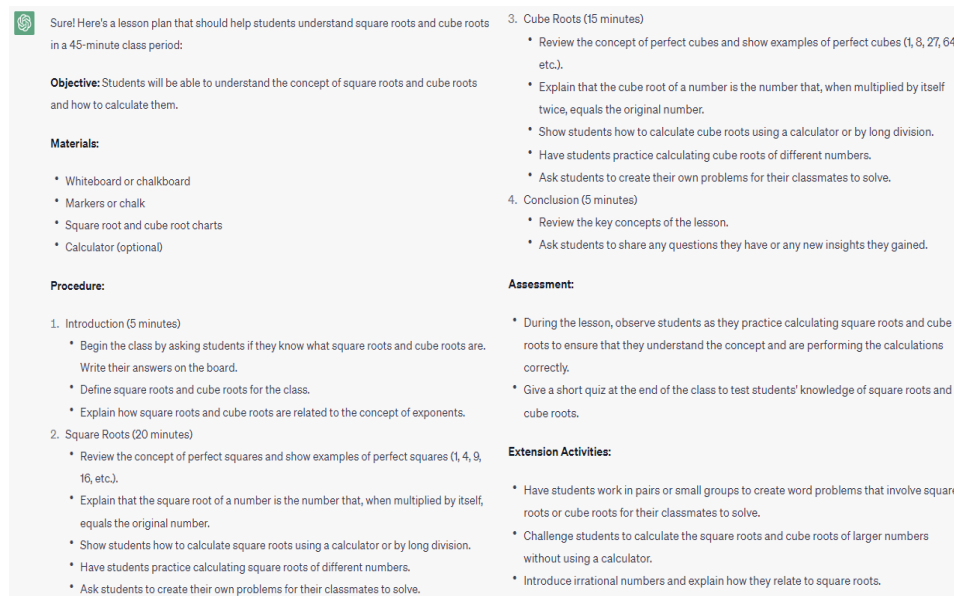
| Phase | Summary |
|-----------|--|
| Engage | The teacher stimulates students' prior knowledge and involves them in activities that promote current concepts. These activities should link prior knowledge with the desired learning outcomes to organise learners' thinking. |
| Explore | The students conduct activities that detect misconceptions or promote conceptual change. Students employ questioning skills and brainstorming to reveal new insights and ideas to help them investigate. |
| Explain | Students pay attention to a specific learning experience, demonstrating their knowledge and using what they learned. Students may explain new concepts with structured and guided support from teachers and the curriculum. |
| Elaborate | At this stage, students are challenged to elaborate on their conceptual understanding; they are required to expand the learning experience to other learning contexts, which leads to a deeper perception of the concepts' core ideas. |
| Evaluate | The teachers encourage students to evaluate their understanding and their application of learning experiences, where teachers can monitor student's progress in acquiring new knowledge and skills about the concepts. |

Findings of ChatGPT testing

The ChatGPT testing aimed to investigate its effectiveness in generating lesson plans and teaching materials as a potential solution to reduce the time required for these tasks. The lesson plans and adaptations that ChatGPT developed in response to our testing prompts were evaluated based on the 5Es Instructional Model, and our evaluation yielded the findings illustrated in the following section.

ChatGPT Test One: A lesson plan for Grade 8 Math

Prompt One: Can you design a lesson plan for an eighth-grade class focusing on square roots and cube roots within a 45-minute class period?



Sure! Here's a lesson plan that should help students understand square roots and cube roots in a 45-minute class period:

Objective: Students will be able to understand the concept of square roots and cube roots and how to calculate them.

Materials:

- Whiteboard or chalkboard
- Markers or chalk
- Square root and cube root charts
- Calculator (optional)

Procedure:

1. Introduction (5 minutes)
 - Begin the class by asking students if they know what square roots and cube roots are. Write their answers on the board.
 - Define square roots and cube roots for the class.
 - Explain how square roots and cube roots are related to the concept of exponents.
2. Square Roots (20 minutes)
 - Review the concept of perfect squares and show examples of perfect squares (1, 4, 9, 16, etc.).
 - Explain that the square root of a number is the number that, when multiplied by itself, equals the original number.
 - Show students how to calculate square roots using a calculator or by long division.
 - Have students practice calculating square roots of different numbers.
 - Ask students to create their own problems for their classmates to solve.
3. Cube Roots (15 minutes)
 - Review the concept of perfect cubes and show examples of perfect cubes (1, 8, 27, 64, etc.).
 - Explain that the cube root of a number is the number that, when multiplied by itself twice, equals the original number.
 - Show students how to calculate cube roots using a calculator or by long division.
 - Have students practice calculating cube roots of different numbers.
 - Ask students to create their own problems for their classmates to solve.
4. Conclusion (5 minutes)
 - Review the key concepts of the lesson.
 - Ask students to share any questions they have or any new insights they gained.

Assessment:

- During the lesson, observe students as they practice calculating square roots and cube roots to ensure that they understand the concept and are performing the calculations correctly.
- Give a short quiz at the end of the class to test students' knowledge of square roots and cube roots.

Extension Activities:

- Have students work in pairs or small groups to create word problems that involve square roots or cube roots for their classmates to solve.
- Challenge students to calculate the square roots and cube roots of larger numbers without using a calculator.
- Introduce irrational numbers and explain how they relate to square roots.


Evaluation of the lesson plan using the 5Es instructional design framework: The assessment of the lesson plan revealed commendable elements, including a well-defined introduction, a diverse range of activities for concept exploration, lucid explanations, thought-provoking tasks, and a concise quiz for evaluation. Nonetheless, there exists room for improvement regarding the introduction's level of engagement and the incorporation of interactive and visual aids in the plan. Strategies for correcting misconceptions are absent from the lesson plan, and opportunities for real-world problem-solving ought to be incorporated. The addition of continuous assessment and feedback mechanisms, including diverse assessment strategies such as performance tasks and projects, could benefit the lesson plan. In summary, the findings suggest that while the lesson plan displays several strengths, several areas require refinement to enhance its overall efficacy. The results are summarised in Table 3.

Table 3 Summary of the evaluation of the lesson plan

| 5Es | Commendable aspects | Improvements needed |
|-----------|---|---|
| Engage | Clear introduction that defines key terms and connects them to exponents. | The introduction could be more engaging and interactive. |
| Explore | A variety of activities that allow students to explore the concepts of square roots and cube roots. | Could benefit from more interactive activities and strategies for addressing misconceptions. |
| Explain | Clear explanations of concepts and opportunities for students to create their problems. | Could benefit from more visual aids and real-world examples. |
| Elaborate | Challenging activities that require students to apply concepts and work in groups. | This could include more opportunities to apply concepts to real-world problems and more challenging problems. |
| Evaluate | Short quiz at the end of class and encouragement for students to ask questions and share insights. | Could benefit from more ongoing assessment and feedback using a variety of strategies. |

The evaluation indicates that ChatGPT failed with the first trial in creating a lesson plan that adheres to the 5Es framework and the constructivist theory expectations. Therefore, a new prompt was fed into the chatbot, requesting it to make the necessary changes to incorporate the needed improvements.

Prompt Two: Can you fix the lesson plan above, incorporating the improvements needed to match the 5Es?

 Sure! Here's a revised lesson plan that incorporates the improvements needed to align with the 5Es of instructional design framework:

Engage: (5-7 minutes)

1. Ask students to think about a real-world situation where they might need to use square roots or cube roots, and write their answers in their notebooks.
2. After a few minutes, ask some students to share their answers with the class.
3. Use their answers to introduce the concept of square roots and cube roots and their real-world applications.

Explore: (10-12 minutes)

1. Provide students with a list of perfect squares and perfect cubes and ask them to identify the pattern.
2. In groups, ask students to create visual representations of perfect squares and perfect cubes using graph paper or drawing tools.
3. After each group presents their visual representation to the class, facilitate a class discussion to help students discover the relationship between square roots, cubes, and exponents.

Explain: (10-12 minutes)

1. Use visual aids such as diagrams, graphs, or animations to explain the concepts of square roots and cube roots.
2. Demonstrate how to calculate square roots and cube roots using a calculator or long division.
3. Provide real-world examples to explain the concepts and their applications.
4. Ask students to create their own problems to test their understanding of the concepts.

Elaborate: (10-12 minutes)

1. Ask students to work in pairs or groups to solve challenging problems that require the use of square roots and cube roots.
2. Provide feedback and support to help students master the concepts and solve problems.
3. Encourage students to ask questions and share their insights with the class.

Evaluate: (5-7 minutes)

1. Administer a short quiz to assess students' understanding of the concepts of square roots and cube roots.
2. Use a variety of assessment strategies such as performance tasks or projects to evaluate students' understanding of the concepts.
3. Provide feedback and support to help students improve their understanding of the concepts.

Closure: (1-2 minutes)

1. Recap the main concepts of the lesson and their real-world applications.
2. Encourage students to continue exploring the concepts of square roots and cube roots outside of the classroom.

The updated lesson plan, which adheres to the principles of the 5Es model, demonstrates a more student-centred and interactive approach. The lesson plan incorporates discovery-based activities and group work, as well as visual aids and real-world examples to aid students in grasping the concepts. Additionally, it offers more opportunities for students to apply these concepts to real-world problems. It employs various assessment strategies to


Table 4 Comparison between the two lesson plans created by ChatGPT

| 5Es | Original lesson plan | Revised lesson plan |
|-----------|--|--|
| Engage | Clear introduction that defines key terms and connects them to exponents. | Engages students with real-world scenarios relevant to square roots and cube roots. |
| Explore | Provides a variety of activities that allow students to explore the concepts of square roots and cube roots. | Integrates an interactive student-centred approach incorporating activities that facilitate group exploration and collaboration. |
| Explain | It provides clear explanations of concepts and opportunities for students to create their problems. | Provides clear explanations of the concepts and incorporates visual aids and real-world examples to assist students in understanding new concepts. |
| Elaborate | Provides challenging activities that require students to apply concepts and work in groups. | It increases students' opportunities to apply the acquired concepts to real-world challenges. Additionally, it includes various assessment methods that offer feedback and support to help students improve their mastery of the concepts. |
| Evaluate | Provides a short quiz at the end of class and encourages students to ask questions and share insights. | Incorporates a variety of assessment strategies to evaluate students' grasp of the concepts and provides continuous feedback and assistance to aid them in enhancing their comprehension. |

evaluate their comprehension while providing continuous feedback and support to enhance their learning. In contrast to the original version, the modified lesson plan maintains greater comprehensiveness and incorporates more learner-engaging elements. Additionally, the adjusted version is better suited to effectively facilitate students' understanding and proficiency in grasping square roots and cube roots. These results are summarised in Table 4.

ChatGPT can also develop the content and propose the supplementary material needed to accomplish the activities. For the lesson mentioned above plan, we requested ChatGPT to provide examples of real-life problems, and it did.

Prompt Three: Provide examples of real-life problems for the evaluation step.

 Sure, here are some examples of real-life problems that require finding square roots and cube roots that can be used for the evaluate step:

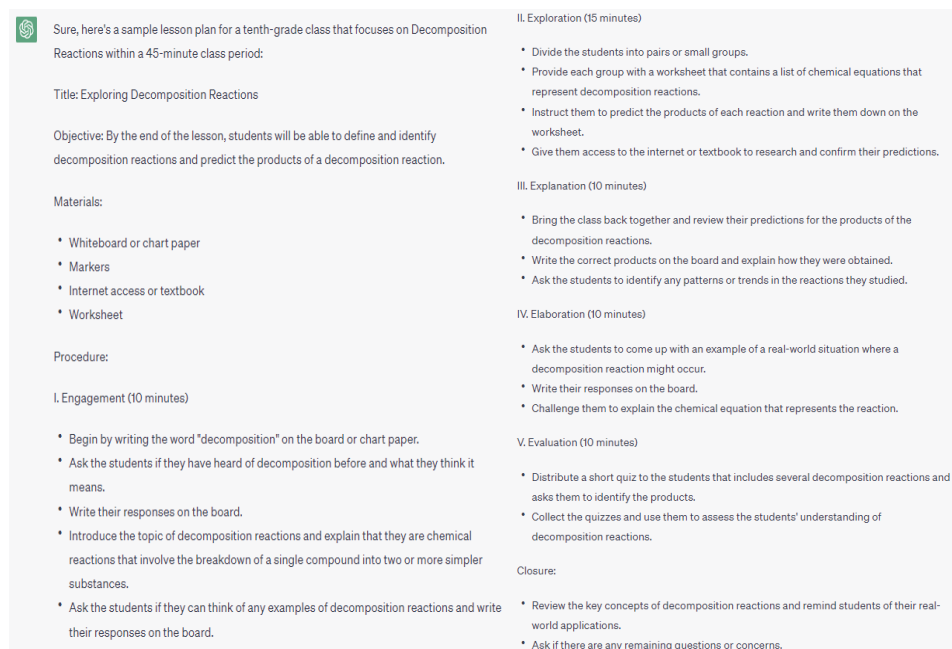
1. A construction company needs to build a water tank in the shape of a cube with a volume of 512 cubic meters. What is the length of each side of the cube that needs to be built?
2. A car rental company charges a base rate of \$30 per day plus \$0.25 per mile driven. How far can a customer drive if they have a budget of \$50 per day, including the base rate?
3. A farmer has a rectangular field that is 100 meters long and 75 meters wide. The farmer wants to install a fence around the perimeter of the field. How many meters of fencing will the farmer need?
4. A real estate agent needs to calculate the area of a triangular-shaped piece of land before they can put it up for sale. The base of the triangle is 15 meters and the height is 10 meters. What is the area of the triangular piece of land?
5. A cake recipe calls for $1\frac{1}{2}$ cups of flour. If you want to make 4 times the amount of cake, how many cups of flour will you need?

These problems require finding square roots and cube roots to solve them, and they relate to real-life situations such as construction, car rental, farming, real estate, and cooking.

The prompts were replicated with two more subjects to decide if ChatGPT can generate accurate lesson plans with multiple subjects and grade levels.

ChatGPT Test Two: A lesson plan for Grade 10 Science (Chemistry)

Prompt One: Can you design a lesson plan for a tenth-grade class focusing on Decomposition Reaction within a 45-minute class period?



Sure, here's a sample lesson plan for a tenth-grade class that focuses on Decomposition Reactions within a 45-minute class period:

Title: Exploring Decomposition Reactions

Objective: By the end of the lesson, students will be able to define and identify decomposition reactions and predict the products of a decomposition reaction.

Materials:

- Whiteboard or chart paper
- Markers
- Internet access or textbook
- Worksheet

Procedure:

I. Engagement (10 minutes)

- Begin by writing the word "decomposition" on the board or chart paper.
- Ask the students if they have heard of decomposition before and what they think it means.
- Write their responses on the board.
- Introduce the topic of decomposition reactions and explain that they are chemical reactions that involve the breakdown of a single compound into two or more simpler substances.
- Ask the students if they can think of any examples of decomposition reactions and write their responses on the board.

II. Exploration (15 minutes)

- Divide the students into pairs or small groups.
- Provide each group with a worksheet that contains a list of chemical equations that represent decomposition reactions.
- Instruct them to predict the products of each reaction and write them down on the worksheet.
- Give them access to the internet or textbook to research and confirm their predictions.

III. Explanation (10 minutes)

- Bring the class back together and review their predictions for the products of the decomposition reactions.
- Write the correct products on the board and explain how they were obtained.
- Ask the students to identify any patterns or trends in the reactions they studied.

IV. Elaboration (10 minutes)

- Ask the students to come up with an example of a real-world situation where a decomposition reaction might occur.
- Write their responses on the board.
- Challenge them to explain the chemical equation that represents the reaction.

V. Evaluation (10 minutes)

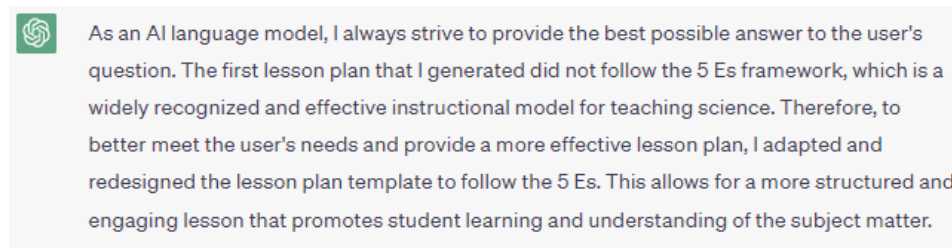
- Distribute a short quiz to the students that includes several decomposition reactions and asks them to identify the products.
- Collect the quizzes and use them to assess the students' understanding of decomposition reactions.

Closure:

- Review the key concepts of decomposition reactions and remind students of their real-world applications.
- Ask if there are any remaining questions or concerns.

ChatGPT opted to create a chemistry lesson plan using the 5Es model without being prompted. This demonstrates the model's adaptability to the given input. We asked ChatGPT to explain his answer in the following prompt.


Prompt Two: Can you explain why you used the 5Es framework for the lesson plan you designed when the first plan you created did not follow that structure? Here is the answer:



As an AI language model, I always strive to provide the best possible answer to the user's question. The first lesson plan that I generated did not follow the 5 Es framework, which is a widely recognized and effective instructional model for teaching science. Therefore, to better meet the user's needs and provide a more effective lesson plan, I adapted and redesigned the lesson plan template to follow the 5 Es. This allows for a more structured and engaging lesson that promotes student learning and understanding of the subject matter.

We decided to increase the complexity of the task assigned to ChatGPT to assess its proficiency in generating lesson plans that adhere to the 5Es framework while also incorporating differentiation to cater to the diverse needs of learners.

Prompt Three: Could you modify the above lesson plan to accommodate students of different levels, including lower achievers, middle achievers, and high achievers? Here is the answer:



Sure, here's how you can differentiate the lesson plan for three levels of learners:

For lower achievers:

- Simplify the language used in the objectives and instructions.
- Provide examples of decomposition reactions before asking them to identify the products.
- Use visual aids to explain the concepts.
- Provide more support during the exploration and elaboration stages.
- Give the students more time to complete the worksheet and encourage them to ask questions.

For middle achievers:

- Use the same lesson plan as written above, but with less support and fewer examples.
- Encourage the students to work independently during the exploration and elaboration stages.
- Use a mix of multiple-choice and short-answer questions on the quiz.

For high achievers:

- Challenge the students to come up with their own examples of decomposition reactions during the engagement stage.
- Provide more complex decomposition reactions in the worksheet.
- Encourage the students to work collaboratively during the exploration and elaboration stages.
- Use open-ended questions on the quiz to test their critical thinking skills.

Regarding content development, we asked ChatGPT to generate a formative assessment for the evaluation stage. Here is the answer:

Decomposition Reactions Quiz

Instructions: For each of the following decomposition reactions, identify the products that are formed.

1. $\text{CaCO}_3 \rightarrow$
2. $\text{H}_2\text{O}_2 \rightarrow$
3. $\text{NaClO} \rightarrow$
4. $\text{NH}_4\text{NO}_3 \rightarrow$
5. $\text{FeS}_2 \rightarrow$

Answers:

1. $\text{CaO} + \text{CO}_2$
2. $\text{H}_2\text{O} + \text{O}_2$
3. $\text{NaCl} + \text{O}_2$
4. $\text{N}_2 + 2\text{H}_2\text{O}$
5. $\text{Fe} + \text{S}_2$

ChatGPT Test Three: A lesson plan for Grade 7 English (Creative Writing)

Prompt One: I am teaching creative writing to students in Grade 7. Our topic is a story about an ant struggling not to be washed away by the rain. The aim is to teach students the value of perseverance to achieve success. Create a lesson plan within a 45-minute class period.

Title: Perseverance through Adversity - Writing a Story about an Ant

Objective: By the end of the lesson, students will be able to write a story about an ant struggling to survive in the rain and demonstrate an understanding of the value of perseverance.

Materials:

- Pencils/pens
- Paper
- Whiteboard and markers

Procedure:

I. Introduction (5 minutes)

- Introduce the topic of perseverance through adversity.
- Ask students if they have ever faced a difficult situation that required them to persevere to overcome it.
- Explain that today's lesson will focus on writing a story about an ant that perseveres through a challenging situation.

II. Brainstorming (10 minutes)

- Have students brainstorm ideas for their ant character, including their name, personality traits, and background.
- Write their ideas on the whiteboard.

III. Story Structure (5 minutes)

- Explain the basic structure of a story, including the beginning, middle, and end.
- Have students identify the different elements of a story, such as the setting, characters, and plot.

IV. Story Structure (5 minutes)

- Explain the basic structure of a story, including the beginning, middle, and end.
- Have students identify the different elements of a story, such as the setting, characters, and plot.

V. Writing Activity (20 minutes)

- Have students begin writing their own stories about an ant struggling in the rain.
- Encourage them to include elements such as dialogue, sensory details, and imagery.
- Provide assistance and support as needed.

VI. Sharing and Reflection (5 minutes)

- Allow students to share their stories with the class.
- After each student shares, ask the class to reflect on how the ant demonstrated perseverance and how it applies to their own lives.

Closure (5 minutes)

- Summarize the key points of the lesson, emphasizing the importance of perseverance in overcoming challenges.
- Encourage students to continue developing their writing skills and to persevere through any challenges they may face.

This time, we asked ChatGPT to evaluate the lesson plan it has created using the 5Es framework to check if it aligns with the 5Es framework and effectively engages students in the learning process.

Prompt Two: Use the 5Es framework to evaluate the effectiveness of the above-generated lesson plan.

Using the 5Es framework, we can evaluate the effectiveness of this lesson plan as follows:

Engagement:

- The introduction briefly captures students' attention by connecting the topic to their own experiences of persevering through difficult situations. However, it could be more engaging if it included a hook, such as a short video or a relatable anecdote.

Exploration:

- The brainstorming activity provides an opportunity for students to explore their creativity and develop their ant character. This stage could be improved by providing prompts to guide the brainstorming process.

Explanation:

- The explanation of story structure is brief but clear, providing a good foundation for the writing activity.

Elaboration:

- The writing activity is the most extensive stage of the lesson, providing ample opportunity for students to elaborate on their ideas and practice their writing skills. However, it could be improved by providing more specific guidelines for the story, such as a minimum word count or required elements.

Evaluation:

- The sharing and reflection stage allows students to evaluate their own work and the work of their peers, as well as reflect on the value of perseverance. However, it could be more structured by providing specific criteria for evaluating the stories.

Overall, the lesson plan follows the 5Es framework and provides a solid foundation for students to practice their writing skills and learn about perseverance through storytelling. However, some stages could be improved by providing more guidance and structure for students.

Subsequently, ChatGPT was tasked with utilising its evaluation to improve the lesson plan it had produced under the 5Es framework.

Prompt Three: Can you improve the lesson plan based on your provided evaluation?

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| <p>Sure! Here's an updated lesson plan that aligns more closely with the 5Es framework:</p> <p>Title: Perseverance through Adversity - Writing a Story about an Ant</p> <p>Objective: By the end of the lesson, students will be able to write a story about an ant struggling to survive in the rain and demonstrate an understanding of the value of perseverance.</p> <p>Materials:</p> <ul style="list-style-type: none"> Pencils/pens Paper Whiteboard and markers Ant pictures or figurines (optional) <p>Procedure:</p> <p>I. Engage (10 minutes)</p> <p>Begin by asking students to brainstorm examples of challenges or obstacles they have faced in their own lives.</p> <p>Write their responses on the whiteboard.</p> <p>Ask students to share how they overcame these challenges or what they learned from them.</p> <p>Introduce the topic of perseverance and explain how it is an important skill to develop.</p> <p>Show a picture or figurine of an ant and ask students to think about how ants demonstrate perseverance.</p> <p>II. Explore (10 minutes)</p> <p>Have students work in pairs or small groups to research and discuss the behaviors and characteristics of ants.</p> <p>Encourage them to focus on how ants persevere through difficult situations.</p> <p>III. Explain (10 minutes)</p> <p>Lead a class discussion on the characteristics of a good story.</p> <p>Provide examples of story elements such as setting, characters, plot, and conflict.</p> <p>IV. Elaborate (15 minutes)</p> | <p>IV. Elaborate (15 minutes)</p> <p>Have students individually or in pairs develop a story map or outline for their own ant story, incorporating elements discussed in the previous section.</p> <p>Circulate around the classroom to provide feedback and assistance as needed.</p> <p>V. Evaluate (10 minutes)</p> <p>Have students begin writing their own stories about an ant struggling in the rain.</p> <p>Encourage them to include elements such as dialogue, sensory details, and imagery.</p> <p>Provide assistance and support as needed.</p> <p>VI. Extend (10 minutes)</p> <p>Have students share their stories with the class.</p> <p>After each student shares, ask the class to reflect on how the ant demonstrated perseverance and how it applies to their own lives.</p> <p>Closure (5 minutes)</p> <p>Summarize the key points of the lesson, emphasizing the importance of perseverance in overcoming challenges.</p> <p>Encourage students to continue developing their writing skills and to persevere through any challenges they may face.</p> |
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The evaluations conducted on ChatGPT revealed its ability to generate lesson plans that can be improved. ChatGPT demonstrated its capability to utilise user prompts and produce responses more tailored to the user's needs, as exemplified by the chemistry lesson plan illustration. Interestingly, ChatGPT automatically employed the 5E's framework to design the chemistry lesson plan without specific instructions, likely because of the previous request to create a math lesson plan using the 5Es. However, ChatGPT did not recognise the need to apply the framework when the prompts were not made simultaneously. This was evident when ChatGPT did not use the 5E's to develop the English lesson plan in the first trial, which can be attributed to the fact that the English Lesson plan was developed independently from the other two tests that focused on math and chemistry.

Discussion

The current study aimed to investigate how using AI generative ChatGPT as a teacher assistant can help reduce teachers' workload and mitigate the risk of burnout. A review of the current body of literature revealed that significant demands characterise the teaching profession and is a prominent contributor to teacher burnout. This can be attributed to many factors, including but not limited to excessive workload, insufficient support, behavioural challenges exhibited by students, challenges in managing time effectively, and inadequate access to necessary resources (Bas, 2011; Denny et al., 2011; Diehl & Carlotto, 2014; Fernet et al., 2012; Shernoff et al., 2011). Teacher burnout has significantly impacted the attrition rates of experienced teachers, resulting in a shortage of qualified teachers (Fernet

et al., 2012; Ingersoll & Strong, 2011; Skinner & Jeffry, 2016). Therefore, it is critical to acknowledge and tackle the issue of teacher burnout to enhance teachers' well-being and guarantee high-quality education (Cozolino, 2017; Kaschka et al., 2011).

Through a comprehensive review of the literature, this study has revealed that teacher burnout is predominately influenced by two key factors: heavy workload and inadequate support (Brunsting et al., 2014; Hakanen et al., 2006; Lee, 2019; Leung & Lee, 2006; Skaalvik & Skaalvik, 2011). Previous studies have shown that these factors have a significant role in contributing to teacher burnout. Resolving these factors through supportive practices is crucial to improve teacher well-being, minimise workload, and prevent burnout. One notable approach is using AI technologies, such as ChatGPT, to function as teaching assistants and help teachers perform tasks that impose a substantial workload. Several research studies indicate that ChatGPT can support teachers differently (Farrokhnia et al., 2023). Teachers can use ChatGPT as a virtual assistant to receive quick and reliable answers to inquiries related to pedagogical approaches, subject-specific content, lesson planning, and classroom management strategies (Cotton et al., 2023; George et al., 2023; Mizumoto & Eguchi, 2023; Qadir, 2022; Zhai, 2022).

The results obtained from the ChatGPT testing align with the findings documented in the literature review. They provide evidence that ChatGPT has the potential to support teachers and mitigate specific challenges they encounter, ultimately resulting in an enhancement in their work-life balance (Kilinç, 2023). The results suggest that ChatGPT can provide personalised recommendations for lesson planning and preparation of teaching and learning materials. Providing teachers with a lesson plan generation tool allows them to allocate more time and attention to other salient facets of their profession. Empirical findings stemming from ChatGPT's testing in creating lesson plans for various subjects reveal that through the input of information on curriculum, learning objectives, learning theories, instructional models, and student requirements, ChatGPT can swiftly generate lesson plans and educational materials of high quality that are customised to address the particularities of each class and student which is also confirmed by previous studies (Farrokhnia et al., 2023; Kasneci et al., 2023; Qadir, 2022; Rahman & Watanobe, 2023).

Teachers can use ChatGPT to streamline the planning process, enabling them to devote their time to other important aspects of teaching, including classroom instruction and student support. Previous research on using artificial intelligence in education supports this finding by providing evidence that AI technology can provide teachers with practical tools to help them manage their workload (Papamitsiou & Economides, 2014). ChatGPT also allows teachers to provide their school's lesson planning templates so that ChatGPT can generate lesson plans based on the template. This was tested and proved successful in the current study when ChatGPT was asked to create a lesson plan using the 5Es template. The generated lesson plan can be customised by teachers based on their schools and student's

specific requirements and needs. This was supported by the research findings that stressed the importance of customisation (providing personalised instruction) in improving students' learning (Kirschner & Merriënboer, 2013).

However, it is noted that the quality of the lesson plans generated by ChatGPT was not achieved on the first attempt. It was completed after providing ChatGPT with many specific prompts. The reasons behind this might be that ChatGPT lacks a deep understanding of the questions asked, and its comprehension is limited, especially for tasks like lesson planning that necessitate a comprehensive understanding of domain-specific knowledge and context (Bogost, 2022; Borji, 2023; Gao et al., 2023; Gupta et al., 2023). These results are supported by an empirical study conducted by Sinha et al. (2023), who argued that ChatGPT lacked a deep understanding of the theoretical concepts, affecting its ability to generate quality responses to complex problems. The present research addressed this limitation by furnishing ChatGPT with detailed instructions that assisted it in acquiring a more profound and less surface-level comprehension, enhancing the meaningfulness of its prompts. However, if “such a process is lacking, the use of ChatGPT could lead to a kind of ‘dumbing down’ of the users” (Farrokhnia et al., 2023, p. 7).

This study's results indicate that prompts significantly affect the effectiveness of generated lesson plans by ChatGPT. Specific and explicit instructions added to the AI model increase the lessons' relevancy and usefulness. A crucial component of using ChatGPT as a teacher's assistant is using thoughtfully designed and task-specific prompts. Through this approach, ChatGPT offers personalised recommendations tailored to each teacher's unique needs and challenges (Rudolph et al., 2023; Shen et al., 2023). ChatGPT can also produce unique responses in different tones and patterns to meet the needs of various teachers (Aljanabi, 2023).

Therefore, teachers are recommended to exercise caution when accepting the initial response (lesson plan) proposed by ChatGPT. Rather than implementing a proposed plan immediately, it is imperative to evaluate it comprehensively in terms of the criteria specified, the needs of students, and any other requirements. Likewise, to improve ChatGPT's accuracy and relevance, teachers should engage in a feedback loop with ChatGPT. This involves providing input to ChatGPT, then creating more precise prompts based on ChatGPT's responses. Moreover, teachers must provide ChatGPT with clear, accurate prompts tailored to their unique needs and pedagogical approach (Gilson et al., 2023).

Another significant finding from the current study is the potential of ChatGPT to learn and change its responses based on its engagement and interactions with human users (Shen et al., 2023). The current study also found that ChatGPT could learn and alter its responses based on interaction and engagement with human users (Shen et al., 2023). ChatGPT demonstrated the ability to recall and integrate previous interactions into its responses

when it was asked to generate a lesson plan without explicitly referencing the 5Es framework in the subsequent instance. As a result of this adaptive capability, ChatGPT can retain contextual information over time and maintain a cohesive conversation with users.

Implications for research and practice

The current study focused only on investigating and evaluating the potential benefits of AI generative ChatGPT in addressing teacher burnout. Therefore, further research is needed to understand the impact of AI integration in education and its influence on teaching and learning. More research is required to determine the effectiveness of AI as a teacher assistant and its effect on students' results.

In the context of the UAE, where the integration of AI technology in the education sector is of top priority, the study's findings provide important implications for policymakers and stakeholders. Due to UAE's partnership with Microsoft OpenAI and its goal to integrate AI technology (e.g., ChatGPT) in teaching and learning (Al Falasi, 2023), the results of this study are highly relevant to the problem of teacher burnout in the region. This study's results align with the UAE's goal of using advanced technology to improve teaching practices and students' results. This study's findings can guide educational policymakers and stakeholders in the UAE to determine the best ways to integrate AI technologies to reduce teacher burnout and enhance teacher job satisfaction and well-being.

The findings of this study showed that ChatGPT recommendations can assist teachers in developing personalised lesson plans, content, and student plans. AI technologies can improve education quality by empowering teachers with tools that make their daily tasks easier to manage. Schools should consider using artificial intelligence (AI) tools (such as ChatGPT) to reduce teacher workload and burnout. In addition, teachers need to balance the use of artificial intelligence and their human knowledge and input to the produced materials by ChatGPT.

The results of the current study also indicate that prompts play a vital role in using ChatGPT to produce effective lesson plans. This finding suggests that teachers need to use clear and precise prompts that maximise the benefits of ChatGPT as their assistant. Therefore, academic institutions should provide practical workshops to train teachers on using ChatGPT properly and how teachers can design clear and concise prompts that target specific activities.

Conclusion

This research aimed at studying the efficacy of AI generative ChatGPT as a teaching assistant to mitigate teacher workload and avert burnout. Based on the literature review, much critical evidence supports the claim that teaching is demanding and can cause burnout due to various tasks and requirements and the continuously stretchable profession's quality

standards. This research aligns with previous findings confirming the positive and significant relationship between workload and teacher burnout.

The study revealed ChatGPT's potential to support teachers in various tasks covered in previous research. It highlighted AI's role in improving teaching and learning practices, thus relieving teachers of burdensome major time-consuming tasks. By getting effective planning support, teachers can allocate more time to improve teaching practices, assessment for learning, and student engagement. Although ChatGPT's initial answers might lack depth, careful, precise, and detailed instruction can enhance comprehensibility, reducing the risk of oversimplification. Skilfully created prompts prove the efficiency and quality of generated responses, showcasing the importance of collaboration between AI and human expertise to retain the context of the task given to ChatGPT while processing it. In other words, the study emphasises the importance of balancing ChatGPT and teachers' input, acknowledging teachers' indispensable and substantial roles in integrating AI into lesson planning and preventing burnout.

There are many implications for research, and further exploration into AI's impact on the teaching profession and its required tasks, responsibilities and student achievement is warranted. As UAE encourages and promotes AI integration in learning and teaching, stakeholders and policymakers can use the findings to feed into potential educational reform movements, as the study highlights ChatGPT's potential for designing personalised and customised learning experiences and effective lesson planning. Educational institutions should consider ChatGPT as an assistive tool, which requires them to provide proper training on creating generative prompts for quality responses in light of ethical use. The careful and ethical use of ChatGPT as a supportive tool promotes excellence in education.

Limitations and directions for future research

This research includes certain limitations that should be considered. The highlighted ChatGPT testing in this research might not entirely reflect the complex real classrooms, affecting the ability to generalise the results. While the study focused on lesson planning and teaching content development, teaching includes many responsibilities, which this research did not cover holistically. Qualitative analysis and subjective evaluation of ChatGPT-generated content could result in a variable quality assessment reflecting different teaching standards. Furthermore, the study focuses on ChatGPT, one type or tool from a broader range of AI models. Integrating AI tools such as ChatGPT in education should comply with ethical use, including data privacy and data biases, as Abu Khurma et al. (2023) highlighted that ChatGPT depends on the data it was trained on, which requires further exploration. In summary, while discussing insights about the potential benefits of the AI tool (ChatGPT), this study acknowledges the need for further research to refine AI's

tool (ChatGPT) role in the teaching profession while addressing these limitations. In addition, it is beneficial to conduct more research on ChatGPT potential to improve motivation and drop-out prevention from online professional development platforms, such as and not limited to MOOCs, where ChatGPT could address the drop-out discussed by Badali et al. (2022) and related to the following motivational types: “Fulfillment of the need for competence, usefulness, personal growth, etc.”, as ChatGPT has a potential of streamlining the completion requirements of these courses and detecting possible learning gaps for teachers as professional learners.

Abbreviations

AI: Artificial Intelligence; AIWBES: Adaptive and Intelligent Web-Based Educational Systems; GANs: Generative Adversarial Networks; GPT: Generative Pre-trained Transformer; ILEs: Interactive Learning Environments; ITS: Intelligent Tutoring Systems; IWBE: Intelligent Web-Based Education; LA: Learning Analytics; MOOCs: Massive Open Online Courses; NCES: National Center for Education Statistics; NLP: Natural Language Processing; UAE: United Arab Emirates; VR: Virtual Reality.

Authors' contributions

Conceptualization, Reem Hashem (RH), Nagla Ali (NA), Farah El Zein (FZ) & Patricia Fidalgo (PF); methodology, NA & PF; software, Othman Abu Khurma (OAK); validation, RH, FZ & PF; formal analysis, PF & RH; investigation, NA & PF; resources, RH & FZ; data curation, RH & NA; writing—original draft preparation, RH, NA, FZ, PF; writing—review and editing, RH, NA, FZ, PF & OAK; visualization, NA & FZ; supervision, RH; project administration, OAK.

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