

Mini Review

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Current evaluation and recommendations for the use of artificial intelligence tools in education

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Abstract: This paper discusses the integration of artificial intelligence (AI) tools in education, delineating their potential to transform pedagogical practices alongside the challenges they present. Generative AI models like ChatGPT, had a disruptive impact on teaching and learning, due to their ability to create text, images, and sound, revolutionizing educational content creation and modification. However, nowadays the educational community is polarized, with some embracing AI for its accessibility and efficiency thus advocating it as an indispensable tool, while others cautioning against risks to academic integrity and intellectual development. This document is designed to raise awareness about AI tools and provide some examples of how they can be used to improve education and learning. From an educator's perspective, AI is an asset for curriculum development, course material preparation, instructional design and student assessment, while reducing bias and workload. For students, AI tools offer personalized learning experiences, timely feedback, and support in various

academic activities. The Turkish Biochemical Society (TBS) Academy recommends educators to embrace and utilize AI tools to enhance educational processes, and engage in peer learning for better adaptation while maintaining a critical perspective on their utility and limitations. The transfer of AI knowledge and methods to the teaching experiences should complement and not replace the educator's creativity and critical thinking. The paper advocates for an informed embrace of AI, AI fluency among educators and students, ethical application of AI in academic settings, and continuous engagement with the evolving AI technologies, ensuring that AI tools are used to augment critical thinking and contribute positively to education and society.

Keywords: artificial intelligence; ChatGPT; academic integrity; prompting; education; pedagogy

Introduction

Artificial intelligence (AI) tools and systems are tools and systems that learn from the data sets provided to them, gain experience by adapting to new inputs, and are able to perform tasks that humans do by imitating human intelligence. AI is mostly a pattern recognition algorithm that makes predictions and decisions based on information. Navigation tools, voice response systems, smartwatches, and search engines that we use in everyday life can be given as examples of AI systems (Table 1).

Generative AI tools, on the other hand, can generate a wide variety of content, primarily text, images, and sound [1]. These systems take AI technology one step further. By using deep learning strategies, generative models can produce new content from existing data sets that is difficult to distinguish from what humans can produce [2]. Current examples include tools like chatGPT (Generative Pre-trained Transformer) (<https://chat.openai.com/>) or Google Bard (<https://bard.google.com/chat>) which have functions like natural language processing (conversational ability similar to humans), translation, and text generation. Additionally, examples in this context can also

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Table 1: Important subfields of AI.

– Machine learning – a subfield of AI that enables computers to learn from data and make better decisions using this information. These algorithms are derived from the models designed by human beings
– Deep learning – a subfield of machine learning, deep learning involves artificial neural networks (algorithms modeled to work like the human brain) learning from a large amount of data and analyzing this data in real-time without the need for human intervention. Applications such as creating subtitles for YouTube videos or providing facial recognition for photos are examples of deep learning
– Natural language processing – models that have acquired the ability to communicate naturally, like humans, by speaking. Chatbots like ChatGPT fall into this category

include tools that can generate visuals from text content, such as DALL-E (<https://labs.openai.com/>), Midjourney (<https://discord.com/invite/midjourney>), or Stable Diffusion (<https://stablediffusionweb.com/#demo>). The data set and algorithm used in the training of these tools determine what they can generate. However, algorithms are constantly evolving, and data sets are expanding.

The widespread use of generative AI tools has had a disruptive effect on various fields, including education. The ability of educators or learners to generate literary or scientific content, drawings, or visuals in seconds without the need for high-end computers, expensive software, or coding knowledge, and the ability to modify existing content with feedback, brings various opportunities and threats. Therefore, the use of AI tools in education has had a swift and somewhat divisive impact. While one group strongly oppose them, others believe that education can no longer be conducted without these tools.

The top concern of educators is that students may engage in behaviors that could lead to violations of academic integrity or, more generally, plagiarism, while using AI tools. Some groups also have concerns that AI tools could potentially hinder students' intellectual development and lead to a decline in their knowledge and critical thinking skills. Some universities have already banned the use of AI tools in education due to such concerns.

In addition to these concerns, there are other factors that contribute to the debate over the use of AI tools in education. Factors such as the lack of necessary protocols and rules, concerns about the use of personal data in the training of AI tools, the fact that these tools are only dependent on the provided data sets (which are primarily data sets dominated by advanced countries, with a bias towards white race and male gender) and are therefore susceptible to cognitive bias, inequality in access based on country (AI use is banned in some countries such as North Korea, Iran, China, Cuba, and Syria), language (especially for

languages spoken by few people or with rules that are very different from well-known language rules), or economic status, form the basis of the discussions about the use of AI tools [1, 3].

Despite this dynamic and controversial landscape at the beginning of the 2023–2024 academic year, AI tools, also known by its symbolic name ChatGPT, are widely used by students in Türkiye. Thus, during undergraduate and post-graduate education, students need comprehensive training that equips them with the skills to use AI tools effectively and ethically, preparing them for the future.

Purpose

The Turkish Biochemical Society (TBS) Academy, in light of the information provided above and without excluding ongoing discussions, is committed to helping colleagues and educators become AI literate and acquire some competencies in the field. This document is designed to raise awareness about AI tools and provide some basic examples of how they can be used to improve education and learning. The document is based on GPT-3.5, the latest free version of ChatGPT, which is one of the most widely used generative AI tools. The TBS Academy also recommends that educators closely follow the updates and changes in the field as it is a rapidly developing area. One of the main objectives of the document is to draw attention to the importance of AI in education at the beginning of the 2023–2024 academic year. The paper also provides a roadmap for educators to implement some suggestions that they can use at the beginning and throughout the academic year.

AI from educator perspective

The use of AI tools in education helps educators and administrators improve educational and administrative processes and thus improves the learning journey in the institution [4].

AI supports educators in writing the learning objectives of the course and developing the updated curriculum in the light of the latest developments in the field. Educators can benefit from AI in many areas, such as brainstorming to get new content or application ideas related to the subject, providing students with a clear summary and interpretation of a complex content, preparing presentations or other related course materials, or creating a draft of announcements or emails to be sent to students about the course [4]. Through appropriate prompts, educators can obtain adaptive data that can meet all these needs [5].

AI tools can also provide support in planning the course content and learning activities [4, 6]. For example, the educator can obtain relevant data from AI tools with appropriate prompts on topics such as which educational tools or techniques should be used in teaching important concepts or mechanisms, or which discussion questions should be asked in class. Prompts such as, *‘I am teaching a graduate course on “History and Current Applications of Stem Cell Use” within the Biotechnology program at the Institute of Health Sciences of a public university. Can you create a 16-week training plan that is appropriate for a group of 15 students who are generally medical graduates?’* can serve this purpose.

In recent years, especially after the distance education period during the COVID-19 pandemic, a major problem that is growing increasingly is the decrease in students’ interest in learning and attendance. ChatGPT and similar AI tools can remind instructors of appropriate educational games, interactions, and other learning tools that will increase student interest in the class and motivation. For example, it is possible to obtain some options by writing a prompt such as *‘In my 4 h nucleic acid metabolism course that I give to second-year Dentistry students, I would like to devote the last hour to team games and interactive techniques for a better understanding of the subject. The classroom where I teach is organized as a lecture hall and I have 60 students. What could be three educational games or strategies suitable for this environment?’*

AI systems also support educators and save time in determining and designing assessment–evaluation tools appropriate to the course content and learning objectives [6, 7]. For example, prompts like *‘For the course on the history of stem cell use and current applications, can you create case presentations for a better understanding of the ethical dimension of the subject and discussion questions through which I can evaluate the performance of the students in the training plan?’* or *‘Can you create 10 multiple-choice questions that question students’ basic knowledge of cell membrane and transportation systems for second-year medical students?’* would save a great deal of time, when the educator obtains the test and homework questions, quizzes or interactive course content from the AI with appropriate prompts, and then later arranges them according to his/her needs.

While manual assessment and grading can be affected by human error and bias, AI systems often do not have these limitations [6, 7]. Using AI in assessment also provide other advantages such as paraphrasing questions or creating alternative questions that do not coincide with previous years’ exams or developing online examination frameworks to reduce student malpractices.

AI tools have become quite advanced providing personalized feedback. This is possible with prompts like *‘Can you evaluate this student’s answer regarding the methods used in the determination of hemoglobinopathies and give a paragraph of feedback?’* or *‘Can you give feedback appropriate to the student’s answer to this problem that requires the calculation of the ion gap?’* or *‘With this student research paper on the use of nanoparticles in drug design, can you give feedback to improve the writing skills of the relevant student?’*

Instructors can also use data sets containing assignment or exam scores to have AI tools analyze student participation and overall class performance and accordingly suggest areas for improvement and suggestions for changes that can be made [4, 6–8].

AI systems can also provide real-time translation services to make educational materials accessible to a wider audience (this is possible with a prompt such as *‘Can you translate this educational material from English to Turkish?’*). This is a very important and useful feature for the relationship between the university and society.

Lastly, not only for translation but educators can also use AI tools to check the originality of the text. These tools can also answer the question *‘Is this piece originally written in this language or translated from another language?’*

AI from student perspective

Students studying at undergraduate and graduate levels benefit from AI tools in many different aspects, including writing, comprehension, mathematics, coding, research, and visual production [4, 6].

One of the most important effects of AI tools is that they provide students with personalized learning opportunities [3, 6, 9, 10]. These tools can be used by students at their own convenience, in a way that is tailored to their individual needs and learning styles. By using computer–human dialogue, AI tools can identify a student’s strengths and weaknesses, as well as their preferences, and then adapt the content accordingly. For example, a dialogue initiated by a student with a prompt such as *‘I am a first-year medical student. I am having difficulty understanding acid–base balance and the relationship between buffering systems in the body. Can you help me?’* would proceed with an AI tool such as ChatGPT, asking various questions to assess the student’s knowledge of the topic, providing personalized reading materials and other learning resources, and providing feedback.

AI tools are also able to provide students with feedback on their writing, assignments, or presentations that is often

faster and more detailed than what instructors can provide. This allows students to get timely feedback and have a chance to improve themselves. This is also an important factor in increasing students' motivation to learn [4, 6].

AI tools can also provide students with exercises to help them learn and reinforce the topic [5, 8]. For example, a prompt such as *'Can you give me two practice exercises to help me better understand the Henderson–Hasselbalch equation?'* is very suitable for this objective. It is also possible for a student to have an AI tool such as ChatGPT generate questions in different formats to assess their knowledge before an exam; for example, *'I want to measure my knowledge of metabolic acidosis. It is very important that I have fully understood the concepts and clinical applications. Can you evaluate my knowledge by presenting me with two cases?'*

Similarly, a prompt such as *'What are five potential social media strategies that can be implemented by the Ministry of Health or Commission of Higher Education to encourage students in biochemistry specialization and PhD studies in Turkey to adopt the green laboratory concept?'* could provide a starting point for discussion in a team. Prompts such as *'Can you rewrite this paragraph in a clearer and more scientific language?'* or *'Can you revise this sentence to be more engaging?'* can also help students improve their grammar and spelling skills and get feedback on how to express the content in other words. In this way, tools such as ChatGPT can be used to support learning, not for one-to-one copying.

Generative AI tools (led by ChatGPT, Notion, and Quillbot) [3, 11] provide students with a starting point for a draft when writing any text, such as an assignment or project. They also help students brainstorm ideas (individually or as a team), organize their writing, and improve the structure and flow of their text. For example, a medical intern writing a project on the impact of the medical education curriculum on public health would be provided with a starting point for their writing by a prompt such as *'Can you give me a flow plan for a presentation on how the inclusion of courses on healthy lifestyle adoption in the medical education curriculum would affect public health?'*

Some generative AI tools (like DALL-E, Midjourney, and Canva) also allow students to create visually appealing images, improve their presentations and projects.

Generative AIs are also particularly useful in the education of students whose native language is not English. These students can clarify the meaning of words and images using automatic spelling and translation features to improve their understanding of complex concepts.

It is important to note that AI tools behave like a 'tutor' in all these learning processes and enable the student to

progress more in control of their own learning process with the feedback they provide. A good example of this approach is Khanmigo, which was recently developed by Khan Academy, an educational institution that advocates a technology-supported but human-centered education approach. This AI software is a chatbot that approaches students like a 'tutor', while also supporting instructors as a helpful assistant [12].

General recommendations for educators on AI

- Become familiar with AI concepts and tools. Educators do not need to master all the tools, but being AI literate is now a must ... You've made a start by reading this document! The next step is to read relevant resources and follow current development.
- Try using at least one AI tool if you haven't tried it yet. Be sure that your students will have tried these. It is important that you have experience in order to speak a common language in the classroom. Trying the most popular ChatGPT might be a good start; just create a free account at <http://www.openai.com> and start your questions in the chat interface ... Getting to know the different outputs of different programs will give you new ideas on how you can use AI tools in education (and in your professional and personal life).
- Use AI tools to lighten your load in education! While writing course learning objectives, designing educational activities, looking for examples of the topic you will teach, creating a rubric ... You can save a lot of time in all these tasks with AI tools.
- Talk to other educators. With peer learning, you can benefit from your colleagues' knowledge on the subject and adapt to this process more easily.
- Ask for help from the Medical Education or Educational Technology units in your institution. These units can provide you with tips on integrating AI technology into education.
- In your higher education institution, disseminate the idea that AI tools can be used to support education and training in many fields related to education, especially to create personalized learning experiences in education, and help raise awareness on the subject among administrators.
- Remember that AI tools do not have creativity and critical thinking, which are the most important characteristics of a good educator. Therefore, they cannot replace educators, but they can support education to the extent of the

data sets we provide them. Both educators and students should always evaluate the accuracy and appropriateness of responses provided by AI tools such as ChatGPT, using their critical thinking skills and knowledge. The correct use of AI in education is an educational strategy that also develops critical thinking in students. Remind yourself and your students of this point often!

- Don't be pessimistic about the change in technology! Every new technology that comes into our lives creates anxiety at first, this is natural. But remember that active use is only possible with a positive approach towards new technologies. Many studies in this field emphasize the importance of accepting and adapting to new technologies. If we use AI tools like ChatGPT effectively and ethically according to pedagogical rules, we will benefit from them to their full potential.
- Remember: AI is here to change our lives and it's not going anywhere!

Special suggestions for educators on AI at the beginning of the 2023–2024 academic year

- Emphasize AI tools in your first lessons and talk about these tools with your students. Ask what they know, which ones they use, what they do. Discuss honestly the benefits of AI, the reservations about the subject, and the harmful aspects. Your openness and humility on these issues, but more importantly your openness to learning, will also affect your students.
- Give your students clear rules regarding the use of AI tools in your course. How and when can they use tools like ChatGPT? When can't they use it? etc. Share these rules with students in your first lesson.
- Explain the role of using AI tools in achieving the learning objectives and educational outcomes for your course. This way, your students can better understand how tools like ChatGPT will support their learning process and what you expect from them.
- Find ways to support your students in using AI tools thoughtfully, ethically, and creatively to help them learn, rather than for quick-fix or cheating purposes. The most important rule when doing this is that you do not use an assessment chain where students can directly access the answers with AI tools. Instead, you should plan assignments such as creating a writing-project or discussing an article that allow AI tools to be used to support learning, subject them to gradual evaluation (formative evaluation), and develop interpretation/synthesis/analysis skills

even though students access information piecemeal with AI tools. It is a convenient way to do educational activities that combine these parts in the classroom.

- Educate your students on the appropriate and ethical use of AI tools. AI tools such as ChatGPT become more useful the more carefully the information and prompts they are given are prepared and presented. For this reason, it is extremely important that students express themselves well in the prompts and questions they write to the system, provide detailed information and act in accordance with ethical rules. Emphasize this approach, which will also increase the student's writing and expression skills, in your first lessons.
- For students to be successful in their future professional lives, it is the most basic duty of educators to ensure that students acquire basic knowledge and skills in fields such as reading, mathematics, science and history, as well as to teach them ways to access and learn information. Because only in this way can students develop better problem-solving skills and better critical thinking methods. Thus for all students to be successful in their future lives, they must be AI literate, develop basic AI usage skills, know the ethical framework regarding AI ('bias', data privacy and security, etc.) and be aware of current technical, social and ethical developments on the subject. It is important that they follow up. Share these points with students, encourage them to use AI tools, and structure your program to achieve these goals in your training.

Conclusions

We wish all educators and students embrace this new era of technology with enthusiasm and with high awareness. We hope that these tools, which have been developed through years of studies, will be used for a more equal and better education. Our aim is to raise students who use effective critical thinking approaches to evaluate the knowledge produced by AI, for developing a better world.

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