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Original Article

Six-step approach for developing customized GPT in medical education

Mohammed Ahmed Hassanien[1]*, Ayman Zaky Elsamanoudy[2,3], Fatma Mohamed Ghoneim[4,5], Gehan Abdelfattah Hegazy[2,6], Hanan Ali Amin[7,8], Hesham Noaman Mustafa[7], Mahitab Younes[9], Nezar Abo-Halawa[10], Sherif El Saadany[11,12], Rasha Ahmed Abou Kamer[13]

[1]Department of Pharmacy Practice and Assessment Unit, Faculty of Pharmacy, King Abdulaziz University, Jeddah, Saudi Arabia. [2]Department of Clinical Biochemistry, Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia. [3]Medical Biochemistry and Molecular Biology Department, Faculty of Medicine, Mansoura University, Mansoura 35516, Egypt. [4]Department of Physiological Sciences, MBBS program, Fakeeh College for Medical Sciences, Jeddah, Saudi Arabia. [5]Medical Histology and Cell Biology Department, Faculty of Medicine, Mansoura University, Mansoura, Egypt. [6]Food, Nutrition, and Lifestyle Research Unit, King Fahd for Medical Research Centre, King Abdulaziz University, Jeddah, Saudi Arabia. [7]Department of Clinical Anatomy, Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia. [8]Department of Histology, Faculty of Medicine, Cairo University, Cairo, Egypt. [9]Faculty of Medicine, South Valley University, Egypt. [10]Department of General Surgery, Faculty of Medicine, South Valley University, Qena, Egypt. [11]Infectious diseases, Faculty of pharmacy, King Abdulaziz University, Jeddah, Saudi Arabia. [12]Tropical Medicine and Infectious diseases, Faculty of Medicine, Tanta University, Egypt. [13]Makkah National College, Makkah, Saudi Arabia and Ministry of Health, Egypt.

Correspondence: Mohammed Ahmed Hassanien, Department of Pharmacy Practice and Assessment Unit, Faculty of Pharmacy, King Abdulaziz University, Jeddah, Saudi Arabia. mohammedhassanien700@yahoo.com

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ABSTRACT

Incorporating generative AI into medical education is important nowadays. This study employs a six-step approach to establish guidelines for creating customized GPT models in this field. Following structured steps, we developed customized GPT models using ChatGPT Plus, ensuring these tools effectively meet specific educational and research needs. The research introduced a six-step approach for developing customized Generative Pre-trained Transformer (GPT) models that enhance constructivist learning by enabling students to engage actively with content through inquiry and immediate feedback, thus deepening their understanding and skills. Some GPTs were tailored to support faculty members in developing their courses, effectively managing student assessment, and enhancing the quality and accreditation process. In addition, two of these GPTs were specifically tailored for supporting researchers in developing and revising their research. A total number of fifteen customized GPT models were developed for these purposes and are currently in the pilot phase, with ongoing evaluation studies to assess their effectiveness. Developing these customized ChatGPT models marks a significant advancement in technology for medical education, promising substantial enhancements in teaching, learning, assessment, and research. These AI-driven tools, structured by a comprehensive six-step method, aim to improve educational outcomes, provide personalized learning experiences, and enhance scientific research and the quality and accreditation processes. Nevertheless, they also present technical, pedagogical, and ethical challenges that require careful management.

Keywords: Customized GPT, Generative AI, Medical education, Constructivist learning, Educational technology

Introduction

The integration, opportunities, and challenges of generative artificial intelligence (AI) into medical education institutions, particularly in the context of teaching and learning, have been paid significant attention over the last few years. Several studies highlighted and explored the main role of generative AI in teaching and learning, its application as an online assistant, and its contribution to academic research studies [1-6]. These studies have concentrated on the effectiveness of generative AI in

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improving teaching and learning methodologies and approaches. Furthermore, they highlighted the potential of AI in adaptive or personalized learning experiences, offering instant feedback and enhancing traditional teaching and learning strategies.

One of the most popular AI applications, ChatGPT, benefits lifelong learning. It can adapt teaching materials to recent advancements and rapidly transforming innovations. Besides, generative AI has also played a crucial role in assessment methodologies and approaches in medical education [5-13].

The principle of customized generative artificial intelligence, especially in Large Language Models (LLMs) like ChatGPT-4, includes fine-tuning the model on particular multimodal datasets, data, or with customized prompts to much better fit specific tasks. The LLM capability goes beyond the complexity of certain tasks, such as being an online educator. By fine-tuning the model, its behaviour is customized to make it fit and offer solutions to that specific task. This process is assumed to make these models much more efficient in specialized tasks, such as working as a digital tutor in a particular educational situation [13, 14].

Customized GPT is linked to learning theories, particularly constructivism [15] and the Community of Inquiry [16]. Using learning theories like constructivism and the Community of Inquiry framework, customized GPT technologies like ChatGPT are efficiently incorporated into medical education [17]. So, improving personalized learning and teaching methods while posing ethical issues and changing educational roles remains challenging.

According to the constructivist perspective, learning is developed actively by elements including students' requirements, accessible learning resources, used tools, and general learning surroundings. By addressing students' needs, providing appropriate learning materials, and providing useful tools, educators significantly influence the course of instruction [18]. Constructivist learning theory stresses the need for independent and active learning, unlike conventional education, which usually consists of passive knowledge acquisition from teachers [19]. Particularly concerning students' access to information and their ability to assess, evaluate, and arrange this material to extend their knowledge base, a technology-enhanced constructivist learning environment has shown to be helpful. Later, Rasul *et al*. underlined how relevant constructivist theory is for information flow. Consistent with the constructivist paradigm, incorporating technology in education helps students to assume responsibility for their competencies and knowledge, therefore enabling the resolution of deficits in their comprehension [20]. Customized GPT promotes a constructivist learning experience. This tool lets learners investigate ideas, ask questions, and get quick answers, therefore helping them to grow personally in knowledge and comprehension [21, 22].

Recently, Riapina N proposed a conceptual framework for including artificial intelligence-enabled business communication in medical education [21]. Based on accepted ideas from educational technology and business communication, the framework offers thorough direction for creating interesting learning opportunities. It underlines the need for social presence, cognitive load management, and constructivist learning ideas. Various activities and exercises help illustrate the principles of constructivist learning. These might involve role-playing with AI chatbots, analyzing nonverbal cues, engaging in communication simulations, evaluating interactive presentations, and collaborating on AI-supported group projects. Their study addressed pragmatic issues for implementation, including technology infrastructure, faculty development, ethics, curricular integration, and evaluation techniques [21]. Linking customized GPT as an example of a customized AI tool with the role of AI in education, learning theory, and applications is illustrated in **Figure 1**.

Figure 1. AI in Medical Education, linking with learning theories and its application:(Designed by Whimsical)

However, the present study in this field may not fully define how developing and integrating AI technology might affect educational and research outcomes step by step. Furthermore, how AI-based technology may be efficiently tailored to diverse academic disciplines and learning styles. Furthermore, there is a lack of awareness of these models' flexibility across disciplines and educational levels, as well as their usefulness in improving critical thinking and autonomous learning. Based on this gap, the current work intends to create guidelines for creating tailored GPTs in medical education utilizing the suggested six-step strategy.

Materials and Methods

Developing customized GPT models using ChatGPT Plus involved a series of structured steps to confirm that the generated customized AI tool effectively meets the specific educational and research needs. Initially, a needs assessment is conducted. It involved evaluating the requirements of educators, administrators, and students to identify the exact requirements. Moreover, a study of the needs depends also on the previous literature to a great extent. This needs assessment provided results that necessitate developing a customization strategy, integrating learning theories such as constructivism to shape the AI's interaction, community of inquiry, and learning delivery methods.

Using ChatGPT Plus, the model is then developed using the six-step approach described by [23].

Pilot testing of the customized GPT in a controlled setting was carried out. This testing trial gave initial feedback and provided constructive results regarding the accuracy of the developed model. Finally, the customized GPT will be rolled out in the educational setting, with continuous monitoring for further knowledge and feedback confirming the tool's effectiveness.

A detailed description of building customized GPT models and another set of six steps was proposed to use ChatGPT Plus to develop customized GPTs and is presented in the next section.

Building customized GPT models

A six-step approach for creating a customized GPT model in medical education was established [23]. This approach is based on an educational conceptual framework and Artificial Intelligence Techniques for training, tuning, and evaluating the proposed model.

This six-step approach for developing customized GPT includes the following steps, illustrated in **Figure 2**:

1. *Identify the needs/challenges for developing a customized GPT model:* different issues may require AI intervention in medical education. These issues include, and are not limited to, the adaptive learning experience, automation of different educational processes, developing question banks, standardization of assessment process, etc.
2. *Collecting different resources and data required for building the model:* Based on the need/challenges, other data or resources are required to create the model. For example, guidelines, policies and procedures, checklists, learning resources like textbooks, guideline, etc.
3. *Crafting specific prompts for the specific ' 'model's tasks:* a well-crafted set of stimuli must cover all the functions required by the model. Certain criteria are needed for these prompts, including clarity, specificity, context, command, tone, length, and avoiding bias. The prompts should also guide users in asking for it to achieve the best results.
4. *Piloting the model:* It is essential to pilot the model before its full implementation. This could be done by giving its link to an expert to try it. Based on experts' opinions and feedback, the model will be fine-tuned, followed by its full implementation by different stakeholders.
5. *Full implementation of the model:* In this step, the model link is to be given to stakeholders to try it, just observing their rating of the GPT on its platform as a preparation for its evaluation.
6. *Evaluating the model:* It is essential to evaluate it after its implementation. The evaluation process includes usability, accuracy, bias, saving time and effort, and overall evaluation.

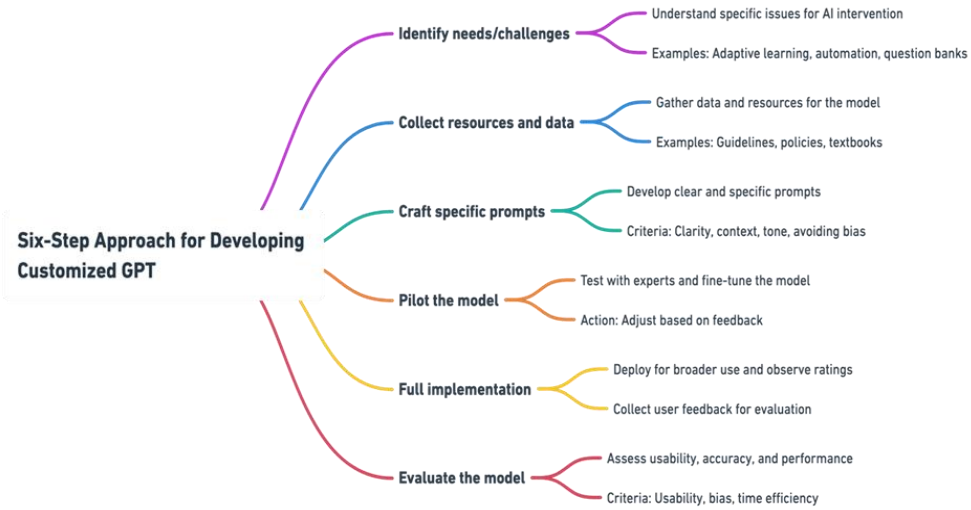


Figure 2. Six-Step Approach for Developing Customized GPT (Designed by Whimsical).

Using ChatGPT Plus as an AI tool to build a customized GPT

Based on the previously developed approach, another set of six steps was proposed to use ChatGPT Plus to develop customized GPT as the following, illustrated in **Figures 3 and 4**:

1- *Select the appropriate GPT model:* From the main ChatGPT page, select GPT-4 or GPT-4o as the most advanced ChatGPT model.

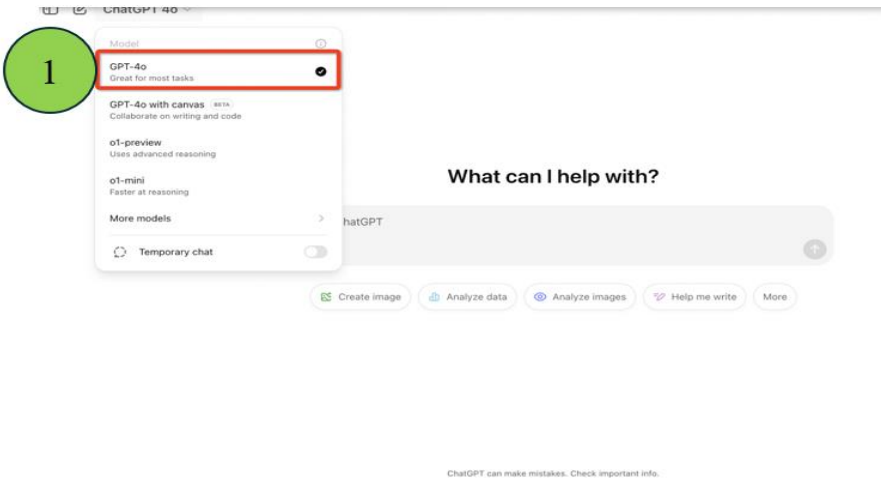
2- *Create a new customized GPT model from the "My GPTs" page:* Select a new GPT from the "My GPTs" page and start to create or configure your customized GPT. It is preferred to start with the "Create" option, as ChatGPT will directly build a draft of the new customized GPT. This step is followed by the "Configure" option for specific instructions.

3- *Select the model name and add its description:* Select an attractive name for the model that closely reflects its main goal and target and add a short description about it.

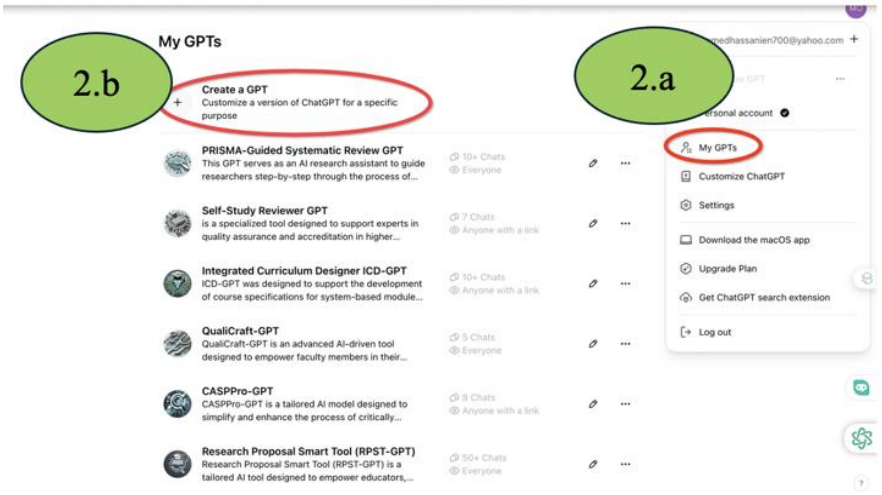
4- *Write clear instructions for the model and add conversation starters:* In this step, use the prompt crafting technique, as mentioned in the previous section, to ensure that the model will respond appropriately. These instructions will be written in the instructions box and tailored to describe the model's response by adjusting its tone, explanation depth, and interaction style. Then, write three to four well-crafted prompts as conversation starters to guide the user in using the model effectively.

5- *Add required resources:* In the knowledge section, upload the required resources based on model requirements.

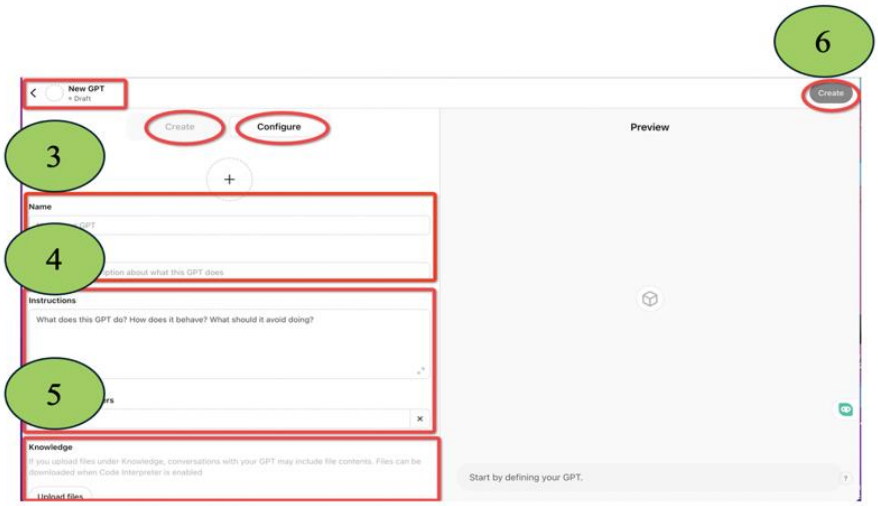
6- *Create and share the model:* The final step is to create and share the model. At this stage, make the sharing through a private link sent to the concerned expert as a piloting process for the model.



a)



b)



c)

Figure 3. Using ChatGPT Plus to build a customized GPT (Screenshot from ChatGPT)

Figure 4. Using ChatGPT Plus to build a customized GPT (Designed by Whimsical).

Results and Discussion

Fifteen customized GPTs have been developed using the six-step approach

Fifteen customized GPTs were developed using the six-step approach mentioned earlier in this research. All these GPTs are in the pilot stage, and some are in the research team's scope of an evaluation study. These customized GPTs are categorized into the following categories:

1. Curriculum.

2. Assessment.
3. Student support.
4. Research.
5. Quality and Accreditation.
6. General utility.
7. Well-being.

The following **Table 1** summarizes these customized GPTs, including their names, brief descriptions, and links.

Table 1. Fifteen customized GPTs developed by the six-step approach.

No	GPT's Name	Category	Brief Description	Link
1.	**Complete Course Management GPT (CCM-GPT)**	Curriculum	**(CCM-GPT)** A specialized AI assistant designed to streamline course management, including generating course specifications, learning outcomes, and teaching and assessment strategies based on standardized guidelines and documents.	https://chatgpt.com/g/g-i8wITV9tD-complete-course-management-gpt-ccm-gpt
2.	**Curriculum Mapper GPT (CM-GPT)**	Curriculum	**(CM-GPT) is** designed to assist users with curriculum mapping, creating matrices, aligning objectives with standards, and organizing content into cohesive educational plans.	https://chatgpt.com/g/g-BaIJgTWMC-curriculum-mapper
3.	**Full Exam Management GPT (FEM-GPT)**	Assessment	**(**FEM-GPT) is a specialized AI tool designed to support course instructors in developing, evaluating, and managing assessments effectively, including CLOs, exam blueprints, test items, and item analysis.	https://chatgpt.com/g/g-1nYE4Yi9u-full-exam-management-gpt-femgpt
4.	**Question Bank Generator (QB-GPT)**	Assessment	**(**QB-GPT)A GPT tool designed to assist educators in generating course specifications, CLOs, SLOs, topics, and a variety of assessment questions, ensuring alignment with program goals and NCAAA standards.	https://chatgpt.com/g/g-baT2pmarY-question-bank-generator
5.	**Clinical Skills Assessment GPT (CSA-GPT)**	Assessment	**(CSA-GPT)** A specialized GPT designed to create and support clinical assessment tools, such as OSCE stations, Mini-CEX, DOPS, and case-based discussions, following the principles of Macleod's Clinical Examination.	https://chatgpt.com/g/g-pZOJeI5dn-clinical-skills-assessment-gpt-csa-gpt
6.	**Clinical Biochemistry Personal Tutor (CBPT-GPT)**	Student support	**(CBPT-GPT) is** A 24/7 AI-based personal tutor for 2nd-year medical students, specialized in carbohydrate metabolism.	https://chatgpt.com/g/g-xFhOEiTyE-clinical-biochemistry-personal-tutor
7.	**SurgiMentor GPT (SM-GPT)**	Student support	**(SM-GPT)** A specialized AI tutor designed for sixth-year medical students, focusing on the biliary and esophageal surgery topics. Provides tailored explanations, quizzes, and clinical scenarios for learning.	https://chatgpt.com/g/g-6731e81f58008190bdc0b15831b7dc2d-surgimentor-gpt
8.	**Research Proposal Smart Tool (RPST-GPT)**	Research	**(RPST-GPT)** A tailored GPT to assist researchers in writing educational research proposals through structured frameworks, resources, and actionable feedback.	https://chatgpt.com/g/g-673a3384a810819182bd4fd12ec79087-research-proposal-smart-tool-rpst-gpt
9.	**PRISMA-Guided Systematic Review GPT (PGSR-GPT)**	Research	**(PGSR-GPT)** A specialized AI assistant designed to help researchers conduct systematic reviews and meta-analyses efficiently.	https://chatgpt.com/g/g-67619bddddec819196d3f6483464b9da-prisma-guided-systematic-review-gpt
10.	**CASPPro-GPT (CASPPro-GPT)**	Research	**(CASPPro-GPT)** A GPT tailored to assist users in critically appraising medical literature using CASP checklists.	https://chatgpt.com/g/g-674704fa928c81919939157896d66cac-casppro-gpt
11.	**QualiCraft-GPT (QUA-GPT)**	Quality and Accreditation	**(QUA-GPT)** A specialized GPT designed to analyze self-study reports, evaluate them against accreditation standards, and provide actionable feedback for improvement.	https://chatgpt.com/g/g-674704fa928c81919939157896d66cac-casppro-gpt
12.	**Clinical Chemistry Test Interpretation GPT (CCHTI-GPT)**	Health care	**(CCHTI-GPT)** A tool designed to interpret clinical biochemistry lab test results. It provides structured differential diagnoses, evidence-based analysis, and recommendations for further investigations.	https://chatgpt.com/g/g-wKMi8FL9v-clinical-chemistry-test-interpretation
13.	**Trial Version: Diabetes Prediction in Pregnancy (DPP-GPT)**	Health care	**(DPP-GPT)**This GPT is designed to analyze patient data and predict diabetes likelihood during pregnancy using user-provided health metrics. It provides results as binary outcomes (0 or 1) with a likelihood percentage.	https://chatgpt.com/g/g-koOcx2389-trial-version-diabetes-prediction-in-pregnancy
14.	**AI for ALL course support-GPT (AI4ALL-GPT)**	General utility	**(AI4ALL-GPT)**A GPT designed to support participants of the *AI In Action* course by assisting with pre/post assessments, providing tutoring on AI topics, and evaluating knowledge gained through AI tools.	https://chatgpt.com/g/g-LWVlFOtVk-ai-for-all-course-support-gpt-ai4all-gpt
15.	**Trip Planner – GPT (TP-GPT)**	Well-being	**(TP-GPT)**A customized GPT that creates detailed, full travel plans for vacations.	https://chatgpt.com/g/g-LGkJG3xP1-trip-planner-gpt

The customized Chat GTP name, brief description, and code, as well as the created QR code for each of them, are presented under the title of Customized GPTs in Medical Education is provided in Supplementary(1) (Designed by Whimsical).

The development of 15 customized ChatGPT models represents a significant innovation in educational technology that benefits medical education and research. In the current study, we used the six-step approach for customization. This approach has been confirmed, ensuring that each ChatGPT model is finely tuned to meet the learning objectives and aligned with the learning theories, including constructivism and the community of inquiry. Creating these 15 customized ChatGPT models in medical education highlights the critical role of the six-step approach in their development. Moreover, the successful implementation of these models demonstrates the potential ability of AI to upgrade teaching and learning practices to be more engaging, personalized, and effective. Besides, it is also helpful for medical students and even faculty members in dealing with up-to-date teaching and learning strategies. Faculty members will greatly benefit from them in managing student assessment, generating question banks, and enhancing the process of quality and accreditation. In addition, they are of great help to researchers in developing and revising their research.

The practical implications of these AI-driven customized models include the following: They can facilitate an interactive and engaging learning environment and consequently enhance student motivation and participation [24]. Students in remote areas can access high-quality, personalized educational experiences and be supervised by AI-based tutoring**.** Another important implication is the significant cost reductions in medical education by minimizing the cost of the class-based teaching resources [25]. Furthermore, customized AI tutors can improve educational outcomes by consistently delivering previously loaded knowledge during customization [26]. Besides the previously mentioned implications, customized ChatGPT models can facilitate a more personalized learning experience by raising the student-centred learning process and empowering students to take on many learning responsibilities**.**

Despite these benefits of developing customized Chat GPT models, we can face some potential challenges during implementation. These challenges can be classified into technical, pedagogical, and ethical challenges.

Technical challenges are one of the primary technical challenges in developing customized GPT models: the critical need for fine-tuning specific multimodal datasets. This essential process is important for customizing the model's actions to fit specific educational purposes, such as working as an online instructor or giving constructive and individualized feedback to students. The complexity of the fine-tuning process needs considerable computational resources and experience in different artificial processes, especially machine learning, which may not be conveniently available in all medical education institutions [27]. Additionally, the assimilation of these customized models into existing educational and instructional innovations can present compatibility issues, demanding extra efforts and initiatives to enhance the performance of these models [28].

The second change is Pedagogical Challenges. From the educational and instructional point of view, introducing customized GPT models raises questions regarding assessment methods and the overall effect on teaching and learning strategies. The complete reliance on AI for educational and instructional purposes can significantly alter current students' assessment methods, possibly threatening the integrity and stability of evaluations if not carefully managed. Faculty members should adjust their teaching and learning strategies to integrate customized GPT and other AI tools effectively and efficiently. This adaptation may require continuous professional development and training to ensure faculty members are well-prepared to use these innovations to enhance the learning outcomes [29].

Furthermore, there is a threat that over-reliance on AI can decrease critical thinking, clinical reasoning, problem-solving, and analytic skills among university students, as they might become familiar with getting immediate responses instead of being engaged deeply with the material [30].

Ethical challenges are an important concern. Ethical considerations additionally play a substantial role in the challenges related to developing customized GPT models in medical education. Data privacy and security concerns are significant, particularly when dealing with sensitive student information, throughout the training and implementation of AI models [31-34].

Moreover, these AI models might also present challenges in quality control and the need for continuous validation to revise the current contents and resources. These require ongoing assessment methods to ensure their effectiveness and relevance to the educational settings.

Several recommendations have been proposed to maximize the benefit of customized ChatGPT medical education models. These include developing vigorous digital infrastructure to ensure good access to the AI platforms and regularly updating the training data to ensure the accuracy and relevance of the content. In addition, fostering collaborative research and providing personalized professional development for educators are mandatory recommendations. Finally, a further longitudinal study is required to investigate the effectiveness of the customized Chat GPT models and users' perceptions.

Conclusion

In conclusion, developing customized ChatGPT models in medical education implies a major technological innovation, offering extensive improvements in teaching, learning, and assessment. These AI-driven tools, developed through a detailed six-step approach, promise to enhance educational outcomes and personalize learning experiences, extending educational access and streamlining processes. However, challenges such as technical, pedagogical, and ethical considerations require precise management. Future research should continue improving these customized AI models, ensuring they remain effective, relevant, and accessible to all learners. By addressing the challenges, AI can

intensely facilitate and upgrade medical education, preparing a new generation of medical professionals and fostering a more adaptive, inclusive, and effective educational landscape.

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Ethics statement: None

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