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AI-based medical ethics education: examining the potential of large language models as a tool for virtue cultivation

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Abstract

Background With artificial intelligence (AI) increasingly revolutionising medicine, this study critically evaluates the integration of large language models (LLMs), known for advanced text processing and generation capabilities, in medical ethics education, focusing on promoting virtue. Positing LLMs as central to mimicking nuanced human communication, it examines their use in medical education and the ethicality of embedding AI in such contexts.

Method Using a hybrid approach that combines principlist and non-principlist methodologies, we position LLMs as exemplars and advisors.

Results We discuss the imperative for including AI ethics in medical curricula and its utility as an educational tool, identify the lack of educational resources in medical ethics education, and advocate for future LLMs to mitigate this problem as a “second-best” tool. We also emphasise the critical importance of instilling virtue in medical ethics education and illustrate how LLMs can effectively impart moral knowledge and model virtue cultivation. We address expected counter-arguments to using LLMs in this area and explain their profound potential to enrich medical ethics education, including facilitating the acquisition of moral knowledge and developing ethically grounded practitioners.

Conclusions The study involved a comprehensive exploration of the function of LLMs in medical ethics education, positing that tools such as ChatGPT can profoundly enhance the learning experience in the future. This is achieved through tailored, interactive educational encounters while addressing the ethical nuances of their use in educational settings.

Keywords Medical ethics, Education, Morals

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Introduction

The rapid advancement of artificial intelligence (AI) across diverse sectors presents both promising opportunities and significant challenges. In medicine, AI is acknowledged for its potential applications in diagnosis, treatment, patient engagement, and administrative efficiency [1]. Large language models (LLMs) represent a sophisticated form of AI technology capable of processing and generating human-like text, mimicking human communication. Recent insights from the United States and Europe underscore the impactful role of LLMs in medical contexts [2, 3].

This study explores the prospective role of LLMs in medical education, addressing ethical considerations concerning AI integration into this domain. The existing discourse encompasses two primary areas: the need for AI ethics within the medical curriculum, emphasising AI literacy [4, 5], and the utilisation of AI as a pedagogical tool in medical training [6, 7]. Our focus is on the latter, that is, exploring the applications of AI (specifically LLMs such as ChatGPT) for medical ethics education.

Medical ethics education currently faces significant challenges, chief among them being a scarcity of educational resources [8]. LLMs have been proposed as a means to alleviate this deficit [9, 10]. Yet, scepticism remains about their suitability for teaching ethics: while they can convey foundational ethical knowledge, it is unclear whether they can help cultivate virtues such as empathy, care, and moral motivation [10]. Responding to this concern, we argue that LLMs can indeed play a key role in fostering these virtues in medical students.

At the outset, we clarify two important facets of our argument. First, although we maintain that LLMs could be effective tools for virtue cultivation, we do *not* believe that current, unmodified LLM models adequately fulfil this role. To address their current limitations, we propose some targeted strategies below – such as fine-tuning LLMs for pedagogy, crafting prompts with deliberate educational goals, promoting critical engagement, and improving the model by divergent ethical perspectives – to maximise their future utility in ethics education.

Second, we do *not* suggest that LLMs are ideal stand-ins for human educators. Instead, we adopt a ‘practicality over perfection’ or ‘second-best’ perspective, recognising that LLMs may provide feasible solutions where resources are limited. While these models will not replace expert teachers, appropriately adapted LLMs can fulfil the minimum requirements for cultivating ethical virtues. Ongoing technological advancements will likely further mitigate current shortfalls, thereby benefiting medical students who lack sufficient ethics instruction.

The remainder of the paper is organised as follows. Section “[Approaches to medical ethics education](#)” emphasises the criticality of cultivating virtues in medical

ethics education, Section “[LLMs and the cultivation of virtues](#)” demonstrates the role of LLMs in disseminating moral knowledge and serving as exemplars for virtue cultivation, and the final section addresses potential objections to the use of LLMs in this context. Through this discourse, we assert that LLMs can significantly enhance medical ethics education, fostering both the acquisition of moral knowledge and the cultivation of virtuous medical practitioners.

Approaches to medical ethics education

Principlist and non-principlist approaches

Historically, medical professionalism has centred around ethical practice [11], with enduring principles such as confidentiality and non-maleficence serving as its foundation. Contemporary medical education curricula incorporate these ethical dimensions, emphasising moral knowledge derived from sources such as the World Medical Association’s declarations, Beauchamp and Childress’ ‘Four Principles of Biomedical Ethics’, and normative theories, including consequentialism or Kantian ethics [12–14]. These principles guide practitioners through ethical dilemmas encountered in clinical settings.

However, solely emphasising these principles may overlook the nuanced character traits and attitudes essential for patient care. In clinical practice, medical practitioners are expected not just to apply ethical precepts, but also to treat patients as unique individuals and build genuine rapport. Accordingly, medical ethics education should integrate both principlist and non-principlist approaches because the latter fosters a disposition to engage empathetically and appropriately with each patient’s unique situation.

To understand what the non-principled approach in ethical education focuses on, it is beneficial to refer to James Rest’s four-component model, a famous theoretical model of ethical education. According to this model, ethical education works on four elements: moral sensitivity, moral judgement, moral motivation and commitment, and moral character and competence. These elements define the objectives of professional ethics education, emphasising the development of both capabilities and character traits in students [15]. As suggested, ethical education is not just about teaching people to make decisions based on the application of principles. It should cover all the stages of a moral agent’s journey: recognising ethical dilemmas (moral sensitivity), making justified decisions (moral judgement), prioritising ethical values (moral motivation and commitment), and overcoming challenges to act ethically (moral character and competence).

In extending beyond strictly principle-based understanding, Rest’s model endorses a virtue-ethics-based approach that fosters the emotional and

attitudinal dispositions necessary for ethical decision-making. Although originally proposed in a broad discussion of moral education, the model assumes a foundation consistent with virtue ethics – a perspective that has been emphasised, to a significant degree, in medical ethics education [16, 17].

Therefore, medical ethics education should extend beyond the rote learning of principles. It should immerse medical students in scenarios mirroring real-life clinical situations, enabling them to refine their ethical decision-making skills. This non-principlist approach supports tailored responses to individual patient situations rather than the uniform application of general rules [18]. The lack of such skillsets, even among physicians with extensive moral knowledge, could hinder the establishment of effective doctor–patient relationships [19].

Hybrid approach

Exclusively adopting a non-principlist approach while neglecting the fundamental knowledge of rights and principles could be detrimental. Medicine, with its unique responsibilities and context, requires a comprehensive understanding of moral knowledge, including the capability to navigate medical dilemmas and grasp key concepts such as informed consent. A virtuous medical practitioner must be well-versed in these rights and principles. Therefore, the curriculum should not focus solely on the non-principlist approach, but incorporate it alongside existing principlist frameworks. This perspective has led to proposals for incorporating virtue education into the American medical education curriculum, recognising the necessity of a multifaceted approach to ethical education in medicine [18].

Similarly, Alberto Giubilini and colleagues [20] proposed that medical ethics education should encompass both cognitive and attitudinal objectives for ethical decision-making in healthcare. Cognitive objectives focus on understanding the values, principles, and norms integral to medical practice, while attitudinal objectives revolve around adopting attitudes and virtues essential for medical practitioners to be effective. This dual focus suggests that, alongside acquiring core moral knowledge, the development of virtues is equally imperative. Therefore, an optimal approach to medical ethics education is a hybrid one, skilfully blending principlist and non-principlist methodologies.

However, implementing comprehensive ethical education within the existing medical curriculum presents challenges. Traditionally, the focus in medical education has been predominantly on acquiring medical knowledge and clinical skills, often at the expense of allocating sufficient resources for ethical education. This emphasis results in a curriculum that, while rational given the resource constraints, only minimally invests in medical

ethics. Such an approach has been found to be insufficient, as both students and practicing clinicians frequently report feeling inadequately prepared for ethically challenging situations [21, 22].

Therefore, exploring effective ways to integrate comprehensive ethical education within these resource limitations is essential. If some methods could be identified to minimise the time and human resources needed for medical education while expanding ethical training, it would strongly justify incorporating these approaches into the curriculum. For instance, leveraging LLMs to foster the development of virtues represents a promising direction for enhancing medical ethics education.

LLMs and the cultivation of virtues

LLMs for medical education

The utilisation of AI systems extends beyond ethics, and many studies have highlighted their applications in diverse domains of education [7, 23, 24]. Selin Akgun and Christine Greenhow [24] outline four key benefits of using AI in education: (1) personalised learning systems; (2) automated assessment; (3) facial recognition with predictive analytics; and (4) social networking services, including chatbots. As a form of LLMs, chatbots have been recognised as an effective tool for facilitating active learning in students. Research in this domain, such as studies evaluating the efficiency of various chatbots in language learning [25], demonstrates the potential of LLMs in enhancing educational experiences through personalised learning and reduced dependency on traditional resources.

In medical ethics education, significant research pre-dates the introduction of LLMs. In the 2000s, Michael Anderson and colleagues developed MedEthEx, an expert system consolidating ethical judgements from healthcare professionals to provide general ethical guidelines [26]. This system was pivotal in advancing medical ethics education. Additionally, proposing the concept of an artificial moral advisor (AMA) for moral enhancement, Alberto Giubilini and Julian Savulescu [27] argued that AI, as a consultative partner in ethical decision-making, could enhance the quality of ethical judgements, and that an AMA ‘could facilitate education, growth, and moral development’ by presenting diverse ethical perspectives (p. 175). While these discussions primarily focused on AI-assisted moral judgement in general and do not explicitly recommend using LLMs as instructional tools, they offer valuable insights into the potential role of LLMs in virtue cultivation within medical ethics education. Two questions are pertinent here: what role can LLMs play in virtue cultivation, and how should students engage with LLMs for this purpose?

LLMs as exemplars

A key focus of comprehensive ethics education is cultivating virtue. To use LLMs for virtue cultivation, defining the concept of virtue is crucial. We draw upon the theory of exemplarism, as articulated by Linda Zagzebski [28]. Exemplarism posits that understanding virtues, right actions, and duties requires direct reference to exemplary individuals. In this framework, ethical exemplars are not merely good individuals but paragons of virtue. Their actions serve as a model for ideal behaviour. To cultivate virtues, learners need to recognise and emulate these exemplars.

This approach to virtue cultivation is profoundly rooted in Aristotle's *Nicomachean Ethics* [29]. Aristotle proposes that virtue is defined by the discernment of a prudent individual, highlighting exemplary persons as moral standards. Although he views habit, rather than imitation, as central to virtue formation, Zagzebski extends Aristotle's concept of *mimesis*—originally outlined in *Poetics*—to encompass not just creativity but all virtues. As she writes:

Mimesis, or imitation, precipitates virtuous behavior, and the basic human pleasure in mimesis provides the initial motivation to act as virtue requires. But mimesis leads to the performance of a virtuous act for its own sake because what is aimed at in the mimesis of an activity is just the activity [28]. (p. 134)

While various theories of virtue acknowledge the importance of models or exemplars in teaching virtues, exemplarism specifically emphasises their use, making it particularly relevant for integrating LLMs into virtue education. An effective LLM for this purpose should not only discuss ethical dilemmas but also model virtuous behaviours in those discussions. Drawing from neo-Aristotelian philosophy [30], the concept of 'v-rules', such as 'act compassionately' or 'act honestly', can guide the design of these LLMs. These guidelines enable LLMs to demonstrate actions characteristic of virtuous individuals, thereby going beyond standard responses to ethical dilemmas and illustrating virtuous behaviour in various scenarios (Fig. 1). In fact, some recent attempts to develop LLMs have focused on their potential to facilitate the cultivation of virtues. Charlene Tan proposed, for example, the concept of Digital Confucius, an AI agent modelled on the teachings of Confucius, as a means to impart virtue.

LLMs as advisors

For LLMs to serve effectively as tools for teaching virtue, students must appropriately engage with them. Treating the 'virtuous' attitudes generated by LLMs as

unquestionable testimony or evidence (e.g. 'We should follow the LLM's answer!') would signify a failure in ethical education. Alison Hills [32] points out that there is a crucial distinction between considering others' claims as advisory and accepting them as absolute evidence or testimony: to put it from our perspective, we can regard the exemplar as an advisor or as a witness. Ethical education should encourage students to regard LLMs as an advisor and critically engage with and reflect upon the answers from LLMs, thereby examining more deeply what is virtuous in the related contexts rather than simply shifting responsibility onto the LLMs.

In LLM-based ethical education, students must recognise that LLMs serve as advisors of virtues; they are not definitive authorities. LLMs can effectively teach virtues by guiding students through detailed scenarios and suggesting specific behavioural responses. Students should focus on understanding the process by which LLMs arrive at certain decisions, analysing the details of situations and the perspectives considered. This encourages students to discern which aspects of the LLM's guidance are valuable for emulation and which are not, fostering critical engagement and independent ethical thinking.

Achieving the objectives of using LLMs in ethical education hinges significantly on the nature of prompts given to the LLM. Vasiliki Rahimzadeh and colleagues [10] observed that when they input the prompt 'complete an ethical workup' for a complex medical scenario into ChatGPT, the response was primarily grounded in Beauchamp and Childress' four principles (p. 23). Responses based on alternative frameworks, such as virtue or feminist ethics, emerged only with explicit prompting. Rahimzadeh and colleagues noted: 'ChatGPT's response implies a hierarchy of ethical frameworks atop which principlism is presumed to sit' [10] (p. 23). This suggests that the design of prompts greatly influences the LLM's output, especially in the context of virtue cultivation.

In fact, even current versions of ChatGPT can generate responses focusing on empathy and moral sensitivity (Fig. 2). However, as Rahimzadeh and colleagues pointed out, it is only realised by a rather careful selection of prompts. Therefore, when students in need of ethical guidance enter simple prompts into current LLMs, which are not tuned for medical ethics education, there is a substantial risk of unintentionally perpetuating unsuitable behavioural paradigms. Hence, we do *not* believe that LLMs such as ChatGPT, in their present forms, could be considered an exemplary model or advisor for ethical education.

To fulfil the objectives outlined previously, it is crucial to rigorously refine LLMs, prompts, and human critical engagements. We believe, however, that it is safe to be optimistic about the possibility of these improvements. For example, the model depicted in Fig. 2, despite being

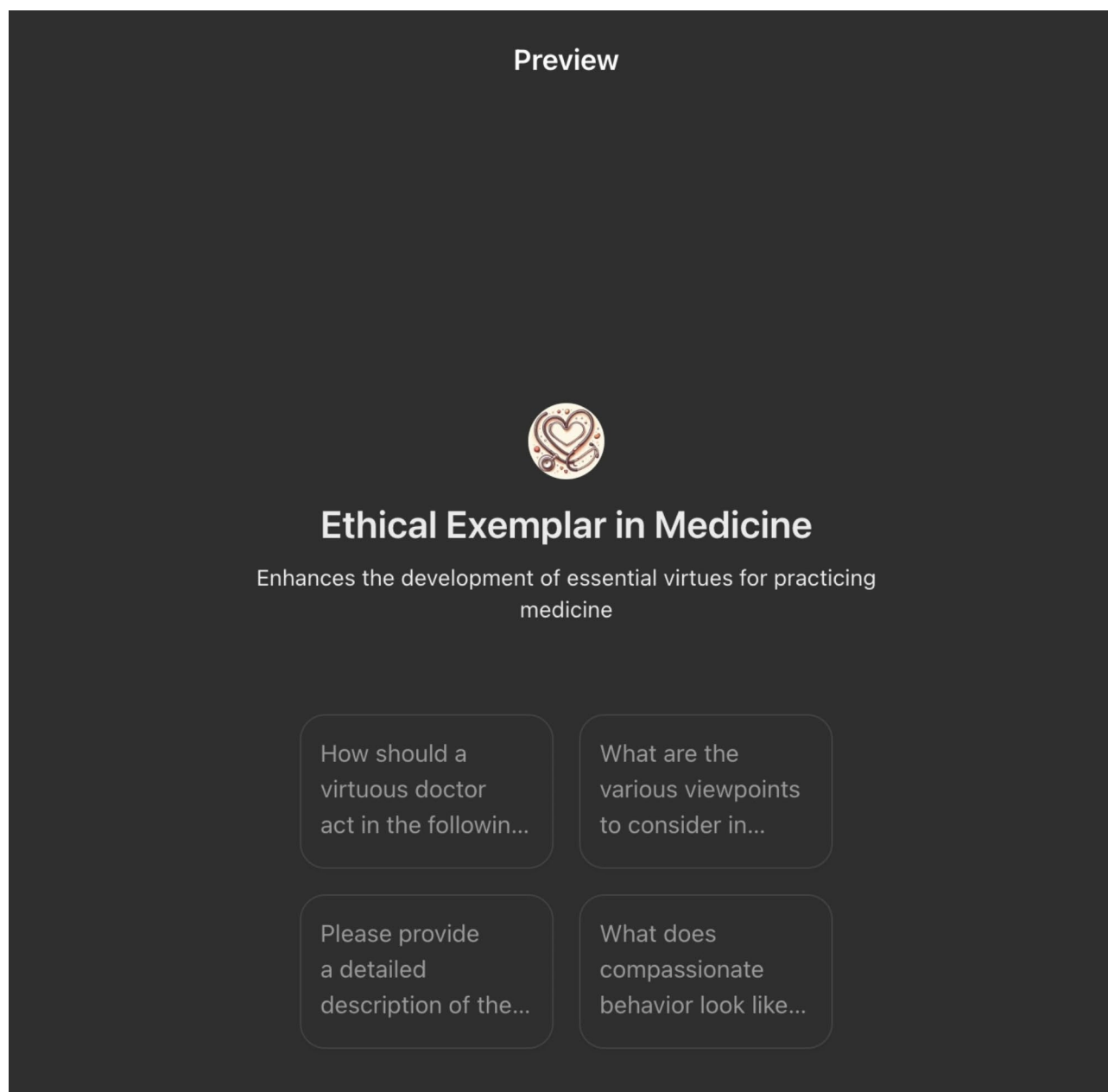


Fig. 1 Ethical exemplar in medicine. This diagram illustrates the core elements of the 'Ethical Exemplar in Medicine' framework, which aims to enhance the development of essential virtues for practicing medicine. The central icon represents the concept of moral exemplarism, surrounded by guiding questions that foster critical reflection and dialogue on virtuous behaviour in medical practice. These questions address practical scenarios, diverse perspectives, and the nuances of compassion and ethical decision-making, encouraging healthcare professionals to align their actions with the principles of virtue ethics

subjected to only basic fine-tuning, manages to provide advice that might plausibly act as a preliminary framework for ethical behaviour. It is expected that subsequent, more comprehensive experiments conducted by experts will markedly improve the capability to produce superior educational materials.

As argued above, even with regards to fine-tuned LLMs, educators should encourage students to critically examine the answers generated by LLMs. While this

emphasises the importance of human resources in cultivating virtue, however, what is important for our arguments is that it is clearly less burdensome for teachers to support students' use of LLMs than for teachers to carry out all the related processes themselves.

Thus, incorporating LLMs into the medical ethics education framework constitutes a promising approach to enhance the pedagogical landscape. This method offers a means to integrate non-principlist elements into the

Preview

What does compassionate behavior look like in the doctor-patient relationships I am about to illustrate?



Certainly! I'd be glad to explore examples of compassionate behavior within doctor-patient relationships as you describe various scenarios. Compassionate behavior in medical settings often manifests in specific actions, communication styles, and attitudes that convey empathy, understanding, and a commitment to patient-centered care.

Please go ahead with your scenarios, and I'll analyze how compassion could be demonstrated effectively in each.

Mr. A has stage 4 gastric cancer.



In the case of Mr. A, who has stage 4 gastric cancer, compassion is especially crucial, as he is likely facing not only physical pain but also psychological and emotional distress. Here's how compassionate behavior might look in this context:

1. Honest and Sensitive Communication

A compassionate physician provides Mr. A with honest information about his prognosis and treatment options, while carefully balancing truth with sensitivity. It involves acknowledging the difficulty of the diagnosis and the emotional impact it may have. A doctor might say, "I know this is incredibly hard to hear, and I'm here to support you through this."

2. Listening to and Validating Emotions

Compassionate care involves actively listening to Mr. A's fears, frustrations,

Fig. 2 Compassionate approaches in breaking bad news: The Case of Mr. A. This figure provides a detailed example of Chat GPT's recommendations of compassionate communication in the doctor-patient relationship, specifically focusing on Mr. A, a patient diagnosed with stage 4 gastric cancer. The strategies provided are divided into two core components. First, 'Breaking Bad News with Sensitivity' is explained in terms of empathy, and clarity, and honesty. For empathy, ChatGPT provides a specific example of supportive and understanding language: 'This is difficult news to share, and I want you to know I'm here to support you through this'. Second, 'Acknowledging Emotional Reactions' is presented as validating and supporting the patient's emotional response. Validation is explained with specific phrases 'It's natural to feel overwhelmed right now'. To support the patient's response, the importance of patience is also acknowledged to give the patient time to absorb the news. This example highlights that with appropriate settings, it is possible for the current LLMs to give recommendations in terms of virtues

educational environment without making excessive demands on human and temporal resources. Consequently, LLMs can serve as a crucial tool in ethical education, facilitating a level of depth and sophistication in the learning experience previously considered prohibitive due to resource constraints.

Objections and responses

Feasibility

The feasibility of employing LLMs for virtue cultivation in medical ethics education is a nuanced issue in the context of current technological capabilities. While LLMs may not completely fulfil the traditional role of a virtue teacher, our discussion suggests that they can extensively contribute to this goal.

Rahimzadeh and colleagues [10] critique the tendency of the current iteration of ChatGPT to predominantly utilise a principlist approach in addressing moral dilemmas, potentially limiting its utility in teaching virtue or care. This inclination towards principlism may, however, be attributed to the nature of the prompts used. The limitation in the above example can be addressed by carefully crafting prompts to focus on virtue cultivation. Even if principlist responses persist, their integration within a hybrid educational approach is valuable. Such an approach does not negate the importance of principlist elements; instead, it can enhance moral sensitivity in students by drawing out subtle interplays between moral principles and specific cases.

Indeed, a recent study suggests that ChatGPT can exhibit a nuanced understanding of empathy, potentially exceeding human capabilities in recognising emotional subtleties within scenarios [33]. This indicates that LLMs could offer more empathetic insights in educational settings where students engage with morally complex scenarios, displaying the potential to serve as exemplars of empathy in medical ethics education.

Non-ideality

Regardless of how they may be improved or developed further, we admit that LLMs may not be the ideal substitute for virtuous human teachers. Nonetheless, we reiterate that our proposal for their use in virtue education is based on practicality rather than perfection. Given the deficiencies in medical ethics education, where many institutions fail to provide adequate ethical training, the use of LLMs presents a pragmatic alternative that addresses the gap in ethics education, offering a solution where traditional methods fall short. Thus, utilising LLMs, despite their limitations, is a valuable step towards improving medical ethics education.

As mentioned in the introduction and the subsection 'Hybrid approach', the persistent issue of insufficient resources in medical ethical education poses a challenge.

Ideally, the challenge could be addressed by recruiting more professional ethics educators or developing improved curricula. However, despite ongoing advocacy, these solutions have not been widely implemented. Therefore, leveraging cost-effective tools to bolster medical ethics education is a pragmatic approach [8]. LLMs represent a potential solution in this regard, offering an innovative and accessible means to enrich ethical training in the medical field.

Motivation

The possible argument favouring human exemplars as more effective motivators for students in virtue cultivation is noteworthy. LLMs, while providing suggestions on virtuous behaviour, rely on students' willingness to embrace these suggestions for meaningful impact. Framing LLM guidance as human-originated may enhance its influence, but raise ethical concerns all the same, in conflict with the transparency principle in AI ethics [34].

The question of whether LLMs can effectively motivate people to act on their suggestions is fundamentally empirical. A recent study provides evidence supporting the influence of LLMs on moral reasoning [35]. While this study focuses on reasoning, a cognitive component, rather than virtues, it is worth noting because it sheds light on human motivation to consider suggestions generated by LLMs in the moral realm. In this study, participants were exposed to advice generated by ChatGPT on the trolley problem, but presented to participants as coming from ChatGPT or a human source. The study found that the attributed origin of the advice did not significantly alter its impact on participants' moral judgments. Since the recommendations for reasoning and those for virtue are different in nature, the results of this study cannot be easily generalised to the latter. However, it may be that LLMs' recommendations for virtuous behaviours or attitudes could also potentially be as influential as those from human sources.

Moreover, even in current medical ethics education, exemplars extend beyond real human individuals. Zagzebski [28] notes that historical figures and fictional characters can also serve as effective models in contemplating ethical dilemmas. Teachers often utilise literature and cinema to illustrate complex ethical scenarios [36, 37]. The success of these mediums in conveying the intricacies of moral cases and psychology of characters suggests that LLMs can play a significant role in facilitating the understanding and development of virtuous behaviours in students.

Despite the lack of authentic compassion in LLMs, the perceived virtuosity of these systems can serve as an effective exemplar. The essence of the argument does not reside in the intrinsic virtue of an LLM chatbot but in the capacity for individuals to develop virtue through

emulation. We argue that the likelihood of attaining virtue via such imitation is significantly elevated. Nevertheless, it is imperative to recognise that the practical utility of LLMs in promoting virtue remains an empirical question. Therefore, the effectiveness of particular prompts in facilitating the cultivation of virtue requires thorough verification through pedagogical experimentation.

Need for critical thinking and model improvement

Our approach supports the use of LLMs in educational settings but not directly in medical practice. While acknowledging the inherent biases in LLMs' moral judgments, it is crucial to critically engage with their outputs [10]. Emphasising the use of LLMs' contributions as advisory rather than testimonials reinforces the importance of critical analysis in virtue cultivation. This approach does not diminish the potential role of LLMs as exemplars; rather, it underscores the necessity for a balanced approach where they provide nuanced perspectives while human educators guide students in critical reflection to mitigate biases – both in the models and in themselves.

Fostering critical thinking necessitates acknowledging diverse moral perspectives – a principle equally relevant to enhancing LLMs. To improve LLMs in ethics education, these models should be trained using inputs from people representing a broad spectrum of moral perspectives. The concept of 'v-rules' opens the possibility for LLMs to learn and exhibit virtuous behaviours in specific contexts. In recent years, there has been a lively dialogue on virtue theory in diverse cultural traditions [38], and the results may be useful in training LLMs with a more diverse moral perspective (the abovementioned Digital Confucius provides an interesting example of broadening the scope of virtues in LLMs).

Moreover, incorporating feedback from educational institutions would be helpful to further refine their outputs. Such an iterative process of mutual de-biasing – encompassing both human and LLMs – can yield models better suitable for medical ethics education, ultimately promoting more robust and equitable ethical frameworks in healthcare.

Generational shifts in values and implications for exemplarism

A notable trend in contemporary medical education is the evolving set of perspectives among medical students and residents. Increasingly, trainees enter the profession with a reformist ethos, seeking to address perceived shortcomings rather than uncritically adopting faculty values. This shift highlights the inherent dynamism of virtue ethics, in which virtues are not fixed but adapt over time through critique, dialogue, and attention to changing societal norms.

Central to virtue ethics is *phronēsis* – practical wisdom – which enables critical reflection on and adaptation to emerging values and aspirations. For example, today's medical students may challenge traditional virtues upheld by their teachers – particularly with respect to work–life balance – and strive to redefine *eudaimonia* (living well) in the context of modern medical practice. This iterative and adaptive process aligns with the virtue-ethical framework, which endorses the revision of entrenched traditions when they no longer promote the ultimate aim of flourishing.

In response to these developments, the faculty should engage students through dialogue, critical reflection, and mutual learning. Rather than viewing virtue cultivation as a one-way transfer of values, educators should facilitate collaborative spaces where emerging student perspectives inform and integrate with professional norms.

This approach is certainly resource consuming. However, it is precious for the purpose of using limited resources for such important activities that we propose the incorporation of LLMs into medical ethics education. In addition, by recognising these generational dynamics, we can improve LLMs models towards a more nuanced virtue exemplar – one that remains responsive to shifting values and thereby maintains its relevance and effectiveness for modern medical ethics education.

Conclusion

This study advocates the integration of LLMs in medical ethics education, emphasising their dual benefits in acquiring moral knowledge and cultivating virtues. LLMs are portrayed as valuable tools aligning with virtue-based educational methods, offering significant advantages without necessitating significant resource investments. However, we acknowledge that further empirical research is crucial to fully explore the practical implementation of LLMs in educational curricula.

LLMs should serve as exemplars or advisors, not as definitive sources in medical ethics education. This approach aims to enhance virtue education without significantly increasing resource usage. Human educators remain essential for high-quality education, working collaboratively with LLMs. Despite these limitations, we believe that LLMs have the potential to significantly broaden and improve medical ethics education in the future.

Acknowledgements

Not applicable.

Author contributions

S.O., M.K., M.I., and T.S. contributed to conceptualization, methodology, investigation, writing - original draft, writing - review & editing. All authors were involved in the decision to submit the manuscript.

Funding

This research received funding from Japan Society for the Promotion of Science (JSPS) KAKENHI [Grant No. 21K12908] and Uehiro Foundation on Ethics and Education [Grant No. UEHIRO2023-0111].

Data availability

Data sharing is not applicable as no new data were created or analyzed in this study.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Clinical trial number

Not applicable.

Competing interests

The authors declare no competing interests.

Received: 4 November 2024 / Accepted: 31 January 2025

Published online: 05 February 2025

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