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Artificial Intelligence and Emotions in a Learning Environment: A Systematic Literature Review

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Abstract

Artificial Intelligence (AI) has brought about numerous opportunities and challenges in education. Despite its transformative potential, the philosophical aspects related to integrating AI into learning, especially concerning emotional, moral, and human needs, remain largely unexplored. This article aims to bridge this gap by focusing on human-centered artificial intelligence (HAI), employing a systematic approach to review relevant literature. The goal is to advance research in the emotional and moral domains, ultimately enriching the human learning experience. The study reveals efforts within AI to embed human values across its design, development, and research phases. As a result, this research significantly contributes to existing literature by specifically addressing HAI in education. Importantly, the insights from this article are positioned to address key concerns within the scientific community regarding the impact of technology in AI. The findings have significant implications for researchers, educators, and AI specialists interested in HAI applications, providing a nuanced perspective on the intersection of technology and education.

Keywords: Artificial Intelligence; Emotion; Human-centered Intelligence; Learning, Technology

Introduction

Research in learning sciences and neuroscience provides fundamental insights into the complexities of learning, primary learning processes, and appropriate solutions to further refine learning. Applying such new insights into human learning in learning environments requires a much deeper knowledge of human cognition. One of the most flexible educational tools for human cognition is the use of artificial intelligence (AI) techniques to bring new vitality to education [1]. Today, the impact of AI on the field of education is also gaining momentum [2,3] and the education industry offers tremendous potential for the use of AI [4,5]. AI, with its potential, can be very effective in education and can be designed to fit learner needs.

AI can collect and analyze data from several different sources to facilitate learners' learning. Using AI, instructors have been able to perform different functions, such as reviewing and grading students' assignments more effectively and efficiently, and achieve higher quality in their teaching activities [6]. However, although AI can train and improve human performance [7], the existence of unique algorithms leads to ignoring human emotions, ideas, and conditions such as perpetuating existing systemic bias and discrimination, perpetuating unfairness and amplifying racism and other forms of injustice in learning [8].

Stanford University, Berkeley, and MIT have established human-centered artificial intelligence (HAI) research institutes in response to these concerns and dangers that their research strategies showed that AI is not only a technological phenomenon but also a human and moral one [9]. HAI is one effective approach that systematically considers AI algorithms through humanistic situation [10]. In this regard, HAI has been considered in this research due to human conditions and providing human well-being in learning. The learning environment in such a field should focus on valuesand human conditions. The human condition, is a term used to describe all the elements of human existence and what it means to be human, but also looks at the any ethical conundrums they might address [11]. In fact, as [7] state, to prevent and abuse of AI, it is necessary to introduce HAI to consider human conditions in programs related to AI and have a deep and meaningful conversation about improving the understanding of HAI. Accordingly, we hypothesize the necessity of considering humans when using AI in a learning environment.

However, most current discussions on AI technology has focused on how AI can enable human performance [12,13] and there is a dearth of scholarship on the HAI in education systems [14]. A lack of knowledge in HAI is worth examining as help improve the place of AI in teaching and learning. This improvement of the status and place of AI is formed from the fact that the rapid growth and profound impact of AI has created many debates and concerns about the principles and values involved in the use or AI has been developed [15]. To this end, due to the research gap in not addressing the issues related to emotional, moral, and human needs, and even values in the use of AI in learning, the need to address this issue has become more apparent. To close this gap, this article describes the theoretical foundations related to research and field studies and tries to examine the role and impact of HAI in learning.

Literature Review

Artificial Intelligence in Education

AI is a broad discipline that involves a fusion of “computer science, cybernetics, information theory, neurophysiology, psychology, philosophy, linguistics, and other disciplines” [16]. AI can be defined as “computing systems that are able to engage in human-like processes such as learning, adapting, synthesizing, self-correction and use of data for complex processing tasks” [17]. AI has many branches and sub-branches, such as Machine Learning (ML) and Natural Language Processing (NLP) [18].

Table 1: Selected Definitions of AI

Definition	Year	Source
AI is a constellation of various technologies that work together to assist machines to sense, comprehend, act, and learn with a level of intelligence that compares to that of humans.	2022	[66]
AI is as the science and engineering of problem-solving with technological innovations such as ML and neural networks.	2020	[67]

AI is essentially a computer system that reproduces human cognition using data which is accessed from a variety of different sources/systems to take decisions and learn from the resulting patterns.	2020	[68]
AI refers to machines' ability to learn from experience and adjust to new inputs.	2019	[69]
AI refers to a broad class of technologies that allows a computer to perform tasks that generally require human cognition, including adaptive decision-making.	2019	[70]
A broad discipline with the goal of creating intelligent machines, as opposed to the natural intelligence that is demonstrated by humans and animals.	2019	[71]

As Table 1 shows the selected definitions of AI offer a range of perspectives on what AI is and how it functions. In this regard, these definitions provide different perspectives on AI, including its nature as a system that learns and adapts, its technological underpinnings, and its role in mimicking human cognition to solve complex problems. These definitions collectively offer a multifaceted understanding of artificial intelligence and its implications in various domains and highlighting its technological, cognitive, and adaptive aspects in the quest to develop intelligent machines.

In education, AI supports and enhances learning environments by employing intelligent tutoring systems, intelligent agents, and intelligent collaborative learning systems [19]. Recently, the education sector has been significantly influenced by AI research [19]. Moreover, AI has the potential to change the education system [6]. AI have the potential to significantly transform the field of education, thereby benefiting all the stakeholders including students, teachers, administrative staff, and institutions [20]. Recent AI technologies provide several options for learning and educational services which can be summarized [21,22] as below:

- NLP for the use of AI to automatically interpret texts, including semantic analysis, used in translations, and for generating texts of learning contents, and supporting personalization processes.
- Speech recognition covers the application of NLP to speech, including its use in smartphones, and provides AI personal assistants within games and intelligent tutoring systems, and for conversational bots in learning platforms.
- Image recognition and processing employs AI for facial recognition (e.g., for electronic documents and processes in classroom situations), handwriting recognition, text analysis (e.g., to detect plagiarism), image manipulation (e.g., for recognizing deep fakes), and for autonomous scoring and grading.
- Autonomous agents use AI in computer game avatars, bots, virtual learning spaces, and smart robots.
- AI underlies data mining algorithms for predictive learning diagnoses, progress forecasting, financial predictions, and fraud detection.
- Artificial creativity uses AI in systems that can create new kinds and exemplars of photographs, music, artwork, or stories.

AI can improve the education by providing numerous benefits such as automatic curriculum creation, personalized engagement with students, interactive teaching, smart content, improved learning outcomes, simplified administrative tasks, and so on [23]. Governments and big private players are making huge investments in developing and implementing AI in the education system. With such initiatives, it is expected that AI will have a significant impact on education institutions in the near future [17]. Critical makers worldwide look at AI as a way to provide learning opportunities to meet needs [24]. However, human emotions and ethic within the field of AI have been overlooked, leading to the emergence of the term "HAI", as noted by [14].

Human-centered Artificial Intelligence in Education

HAI is about building intelligent systems to understand expectations (and often in terms of culture and value) and human needs and help humans understand them. Achieving HAI provides a research program that fundamentally improves our scientific understanding [25]. In fact, HAI requires observing humans as individuals with different experiences, needs, wants, ambitions, interests, irrational decisions, and stylization in specific cultural contexts [26]. [9], in a study that ex-

amines HAI as a perspective of human-computer interaction (HCI), points out that the third wave of AI can be characterized by technological advancement and application alongside a human-centered approach. The results show that, the first two AI waves failed, because they left human needs unsatisfied, while the third wave of AI is beginning to meet human needs and provide a positive UX for a variety of scenarios. It seems that AI functional aspect is represented in the world mirror [12] and still AI ethical aspect because the field is still in its infancy has been neglected and it will be one of the areas of interest in the future.

As [26] states, AI systems and technologies such as ML, NLP, expert systems, and robotics have evolved over the last 80 years since Alan Turing proposed the Turing-Test, and in this evolution, two distinct philosophical perspectives have emerged in how humans and computers should interact. These are the "rationalistic" and "design" perspectives. From the rationalistic perspective, the term AI encompasses the theory and development of computer systems that mimic human abilities and focuses on mathematical and technological advancement. While the design perspective views AI as a tool to improve human capabilities and emphasizes the interaction between humans and computers. The design perspective focuses on the interaction or involvement of the human with the computer. This perspective sees human thought and human physical embodiment as inseparable [26].

This perspective, discusses various ethical principles and frameworks related to AI. The design perspective shows that AI as a tool to improve human capabilities faces several issues that are prominently discussed. In this regard, [27] discusses the concerns and considerations regarding the use of AI in relation to human emotions. It highlights the need to establish principles and guidelines to address potential issues and prevent the exploitation or manipulation of human emotions. The focus on HAI involves considering human emotions, reflective judgments, and their consequences [7]. [28] discuss the way of recognizing emotions and state that emotions can be recognized through speech, facial expressions, and text. In this regard, table 2 showed that different types of sensors are required to collect specific information.

Table 2: Comparison of emotion detection technologies from speech, facial expressions, and text

Emotion Detection Technologies	Name	API/ SDK	Requires Internet	Information returned	Difficulty of use	Free Software
Speech	Beyond Verbal	API	Yes	Temper Arousal Valence Mood (Up to 432 emotions)	Low	No
	Votakuri	SDK	No	Happiness, neutrality, sadness, anger, and fear	Medium	Yes
	EmoVoice	SDK	No	Determined by developer	High	Yes
	Good Vibrations	SDK	-	Happy level, relaxed level, angry level, scared level, and bored level	Medium	No
Facial expressions	Emotion API	API/ SDK	Yes	Happiness, sadness, fear, anger, surprise, neutrality, disgust, contempt	Low	Yes (Limited)
	Affectiva	API/ SDK	Yes	Joy, sadness, disgust, contempt, anger, fear, surprise	Low	Yes, with restriction
	nViso	API/ SDK	No	Happiness, sadness, fear, anger, surprise, disgust, and neutral	-	No
	Kairos	API/ SDK	Yes	Anger, disgust, fear, joy, sadness, surprise	Low	Yes, for personal
Text	Tone Analyzer	API	Yes	Emotional, social, and language tone	Low	No

	Receptiviti	API	Yes	See	Low	No
	BiText	API	Yes	Valence (Positive/Negative)	Low	No
	Synesketch	SDK	No	Six basic emotions	Medium	Yes

In accordance with the above, previous research conducted by [7,9,29] has emphasized the importance of developing coordinated and structured learning environments that prioritize HAI programs. These environments should focus on instilling values, ethical principles, and an understanding of human conditions. This can succeed in preparing learning environment to over-come the various challenges. Also, considering the human condition in the programs related to AI is a catalyst for improving the quality of this experience. Therefore, further research is necessary to gather evidence on the implementation of HAI in educational settings and to gain insights from previous experiences in AI development. In this regard, the authors suggest a novel approach to integrating AI in educational settings by utilizing a model that is grounded in human values. This model seeks to establish a strong foundation for AI applications in education. Given that the field of learning and attention to the values and emotion considerations in AI have not been sufficiently studied by researchers [30], in this study, we have taken the following question into consideration within the context of the learning environment:

RQ: How can HAI address the overlooked human considerations in AI technologies?

Method

This study is a systematic literature review (SLR). A SLR is a rigorous review of research results [31]. The purpose of this study is to investigate the role of HAI with descriptions of relevant theoretical foundations, conceptual research, and practical implementations. The research question is which how can HAI address the overlooked ethical and human considerations in AI technologies, and what impact can HAI have on fostering human development and ethical practices within learning environments? The steps in the method of SLR in the current research are influenced by the steps of [31] who documents the steps of a SLR as documented below.

- Purpose of the literature review: The researchers clearly identified the study's purpose to ensure clarity for readers. Following [32], the first step of the SLR involved defining the review's purpose and goals, which in this case focused on analyzing ethical considerations in AI-driven learning environments.

- Draft protocol: To maintain consistency, researchers agreed upon the procedures to be followed throughout the review process. As suggested by [31], a clear protocol was established, including search strategy, inclusion/exclusion criteria, and data extraction methods.

- Search for literature and screening: researchers clearly defined the studies deemed suitable for review and those excluded without further assessment. [33] highlighted the usefulness of screening methods in this context. In this study, researchers followed a systematic approach to select studies from various academic databases, based on predefined search terms and criteria.

- Extract data: After researchers identified all the studies to be included in the review, they systematically extract the applicable information from each study. In this regard, [34] states that the perhaps major challenge of conducting systematic reviews in educational research is the 'messiness', which is inherent in domains that use inconsistent terminology and multifaceted concepts. In such cases, it is crucial to find the right balance between comprehensiveness and relevance, or sensitivity and precision [35], in developing the search strategy. For this purpose in this study, the search strategy was based on article/publication type, publication dates, subject, and language, which retrieved the majority of studies assessed for eligibility and inclusion. In a systematic review, search strategy for data extraction is the process of capturing key characteristics of studies in structured and standardised form based on information in journal articles and reports [36].

- Quality appraisal: The researchers took great care in establishing detailed criteria to evaluate the quality of articles and determine which ones were not suitable

for inclusion in the review synthesis. In this regard, the researchers categorized the inclusion criteria based on the academic databases, time period of article publication, and articles keywords. The exclusion criteria included the language of the article (English), the field of study (education and AI) and those outside of the target population (unrelated journals, etc.). As per [37], non-content-related inclusion and exclusion criteria were defined to focus on specific publication outlets, time periods, and methods of finding research items.

- Synthesize studies: Appropriate qualitative techniques were used to analyze the data obtained from the studies. [38] stressed the importance of synthesizing information rather than merely summarizing articles. In this study, researchers employed qualitative content analysis approaches to interpret and organize the extracted data, following the guidelines proposed by Hsieh and Shannon (2005).

- Writing the Review: The SLR process was documented in detail, enabling replication by other researchers. [39] emphasized the importance of reporting findings systematically and smoothly. In this study, researchers meticulously documented the SLR process to ensure transparency and replicability of the review's findings.

In this regard, to locate, answer this question, and summarize relevant papers, they systematically extracted the applicable information from each study by going through three review phases explained below:

- The academic databases used to collect papers are Web of Science, Scopus, ScienceDirect, and JSTOR. The most relevant journals for the systematic review were chosen consistently from these databases. There are some recommendations regarding what databases to choose for such purposes [40,41]. Some authors, such as [42], recommend searching at least two individual databases to ensure adequate coverage when conducting a systematic literature review. Other authors conclude that researchers often use too few databases, which may endanger the generalizability and validity of review results [43]. However, in order to maintain a more comprehensive and balanced approach in selecting relevant studies from various sources, the authors expanded their search to include four different databases for examination. In this regard, a more structured overview of the databases is shown in Table 3.

- The keywords utilized in the literature search included "artificial intelligence" or "AI," "human-centered artificial intelligence" or "HAI," "intelligent tutoring system," and "learning." These keywords were chosen due to their relevance to the study's focus on AI, HAI, and their applications in educational settings. As highlighted by [44], systematic reviews rely on keyword searches in electronic databases to achieve a comprehensive and transparent review sample. In this study, the keywords were combined using the Boolean operators "AND" and "OR" to create a search string that effectively captured relevant studies from the selected databases.

- The review focuses on research published between 2000 and 2021. This time frame was chosen to capture the most recent advancements in AI and HAI, as the field has experienced rapid development and growth in the 21st century. Although earlier research exists, the selected period enables a focused examination of contemporary issues, challenges, and innovations related to AI ethics in learning environments. Additionally, by focusing on this specific timeframe, the review aims to provide an up-to-date understanding of the current state of the field and inform future research directions.

Table 3: The search for selected databases

Database name	Main journals listed (#journal articles)
Web of Science	Computers Education (25)
	Journal of Science Education and Technology (32)
	IEEE Transactions on Learning Technologies (13)

	Educational Technology Society (14)
	Journal of Internet Technology (6)
	Computers in Human Behavior (37)
Scopus	Computers and Education (41)
	Educational Technology Research and Development (35)
	Education and Information Technologies (9)
	International Journal of Information and Education Technology (13)
	British Journal of Educational Technology (22)
	Australasian Journal of Educational Technology (29)
Science Direct	Computers and Education (81)
	Procedia-Social and Behavioral Science (60)
	International Journal of Child-Computer Interaction (42)
	Technology in Society (12)
	Learning, Culture and Social Interaction (18)
	Learning and Instruction (25)
	Computers in Human Behavior (47)
	Procedia Computer Science (17)
JSTOR	Educational and Training Technology International (57)
	Technology, Pedagogy and Education (68)
	Journal of Research on Technology in Education (31)
	Educational Technology Research and Development (29)

Results

Human-AI interaction is highlighted as an important aspect in this study. This interaction has been considered in two areas and the emotional and human needs of learners have been discussed.

Response to Negative Emotions

Ignoring the emotional and human needs of learners in AI--driven learning, the necessity of engaging HAI that is appropriate for each person and field study has been emphasized [30]. In fact, it is at this stage that we move beyond the instrumental aspect of using AI and consider AI from the perspective of civilization-building technology in influencing various human aspects, especially learning and lifelong learning, and show how technological advances and the understanding of human factors evolve together. One aspect that needs to be addressed by HAI is responding to negative emotions such as frustration, anxiety, and impatience in learning.

In recent years, the role of emotions in learning has received more empirical and theoretical attention [45]. However, more emphasis is placed on anxiety and other discrete negative emotions such as fear, frustration, anger, boredom, sadness, shame, guilt, and embarrassment, which are very important in academic fields [46]. For example, [47] in their study on emotion recognition in seven aspects (anger, disgust, fear, happiness, sadness, surprise, and neutrality) using Convolutional Neural Networks (CNN) found that the proposed approach will certainly help educational institutions in achieving an improved and innovative learning method. Understanding the impact of these and other negative emotions is critical to being aware of practical developments as well as developing strategies for managing such reactions in learning, which in turn can lead to improved learning outcomes.

Evidence highlights the negative impact of emotions on motivation, performance, and learning in academic contexts [48]. HAI are suggested as suitable tools for representing emotions

symbolically, as they offer descriptive tools at an appropriate level. An example of this is the Little Trees Technology in Hong Kong, which uses facial expressions to evaluate children's emotions in the classroom and predict scores. This helps teachers understand individual student reactions and psychological behavior towards specific subjects. Another example would be an eye tracker to track human emotions during interactions with robots, which can aid in determining communication. Overall, recognizing and addressing the emotional dimensions of learning within AI systems is essential for fostering a comprehensive understanding of the learning process. By considering values, interpersonal dynamics, and individual situational aspects, HAI offers a pathway to create emotionally responsive and ethically aligned learning environments.

Targeted Emotional Nature

This aspect discusses the focus on building a learning model based on human-AI interaction to help learners achieve their specific goals. The HAI system can update its response based on the learner's requests, interests, preferences, and purpose. Emotions are considered to be closely connected to individual goal structures. In this context, an AI model is considered effective when these goal structures are clearly defined and incorporated into the AI system's design [49]. The lack of a complete dataset containing human face, speech emotions, and conversation content between the AI system and the human is identified as a potential obstacle to achieving specific goals in activities [1]. [1] go on to refer to the belief tracker (e.g., dialogue state tracking), that is mentioned as a way to track the learner's intentions and purposes throughout the conversation. However, it is acknowledged that technology, including the tracker, may initially misjudge learners' statements and facial expressions, leading to incorrect answers. Despite this, recognizing emotions in learning is seen as a crucial step in the development of HAI systems.

In this regard, [25] discusses the importance of AI systems being able to understand humans and help humans understand them. The goal is for AI systems to understand human behavior and desires, which makes them more useful and safer to use. It is suggested that AI systems should be designed to receive instructions and goals from humans, but careful consideration of learning goals is necessary to avoid misunderstandings. One reason for the failure of these goals may be that AI systems lack the common knowledge that humans possess, leading to a literal interpretation of instructions [9]. As a result, research projects in human- AI interaction have focused on increasing human capabilities and developing the human aspects of AI rather than replacing humans.

Discussion

AI technologies have great potential for innovation in various fields, particularly in education. Such systems currently have the highest level of applications [50] but as mentioned, these systems ignore the emotional and human needs of learners in learning and this has affected the need for HAI. According to the authors, recognizing these emotions can provide valuable insights for teachers and educators, enabling them to identify students' needs and potential obstacles that may hinder the quality of their learning experience. Therefore, it is very important to study emotions to assess mental health status [51]. In this study, emotional modeling based on HAI is an example of understanding the learners-technology interaction. Such modeling helps us to design a model that reflects a technical and critical perspective with human-centered and value-sensitive strategies and participatory design.

A key dimension or goal of creating HAI in learning and shaping emotional models is to enable AI to respond to negative and inactive emotions such as learners' impatience and frustration. In this case, HAI can support learners who are lagging behind other learners due to their learning background and are anxious or confused, which can greatly affect learning outcomes [52]. For example, [28] used the EmoTEA application as an example of using automatic face-based emotion detection to support emotional skill development. Recognizing and addressing these emotions can assist teachers and educators in identifying students' needs and improving educational quality. Dealing with negative emotions contributes to maintaining healthy behavior and helps educators understand learners' emotions. Chatbots and conversational systems can be helpful for disabled people to communicate with other students or for survivors of sexual assault, who for various reasons hesitate to disclose their stories to teachers or other people, and to engage with the person's feelings to help the person. This is where conversational systems and chatbots have gained much attention as potential counsellors [53]. Because they have characteristics (e.g., anonymity) that could mitigate various difficulties of human-human interaction.

On the other hand, automatic diagnosis of goals particularly

in the context of plan, activity, and intent recognition [54] is a major challenge in the discussion of AI [55]. Recognizing users' goals is important for informing and supporting learners, as well as increasing their ownership of their learning. The use of LSTM models has been shown to effectively identify targets in game-based learning environments [56]. Within educational settings, understanding students' implicit goals and minimizing negative goals is crucial. Designers and developers must consider how to identify goals in AI to help learners and enhance learning. Learners have access to various activities and technology-based resources throughout the day, making it important for AI to identify their implicit and unspoken goals to improve learning outcomes [57].

In this approach, the goal is to integrate human values as part of the process of design, development, and research in the field of technology [58]. This kind of modeling is a significant promise for understanding the feelings and emotions of learners. Although the fear of AI worries teachers and educational institutions [17], this type of modelling provides tools and methods to measure the main aspects of learners that can inform teachers and educators to effectively understand the learning process. In addition, it can lead to identifying atrisk students as soon as possible and providing timely intervention based on teaching and learning experiences.

Although, limited attention has been paid to the role of human values in developing AI; however, various researchers [7,27,59] are currently trying to develop approaches that focus on it, forming promising pathways for research on design, development, and review of HAI for learning. HAI has been widely studied in education and entertainment [6,59,60]; nonetheless, little work has been done compared to their application in learning [50,54]. Studying how HAI can be used in learning environments can be the future direction of research in this field. This necessitates the creation of new models and methods for research and development of HAI in learning and the validation of HAI techniques in learning programs. In this regard, a model based on AI has been designed in this study, which is an example of understanding the HCI (Figure 1).

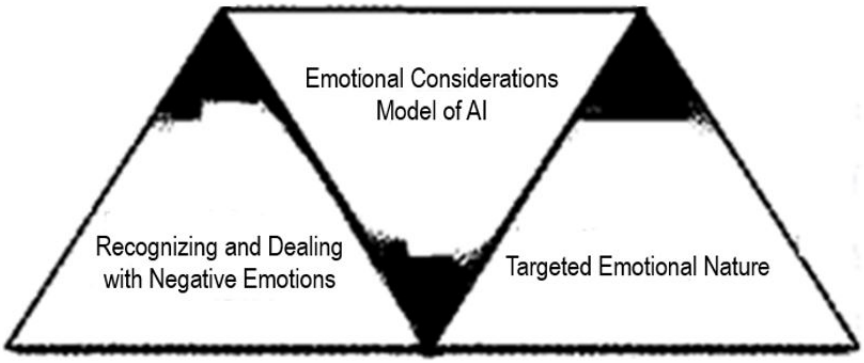

Figure 1: Emotional Modeling in HAI

There are various models in the discussion of HAI, which have not yet been codified and shared discourse at the international level. One of the reasons is the issue of geographical location or cultural difference, which causes the type of difference in emotional - ethical considerations [26,61]. Because as said, non-western cultures and low socioeconomic countries have different emotional - ethical systems [63]. Therefore, it is necessary to make sure that the applied models of AI are guided in such a way that they correspond to the cultural and moral values of the future society. On the other hand, HAI has been a complex, multi-dimensional discussion and is dependent on the development of this technology [64,65], and any regulatory framework can quickly evolve and even become obsolete. As a result, in dealing with this issue, we should move from a reactive approach to an active and forward-looking approach. All these factors require that a model based on AI be designed that is an example of understanding the human consideration in learning environments (Figure 1). With these desiderata, we break HAI into two critical capacities: (a) reading/interpreting emotional responses, and (b) dealing with the challenging aspect of interpreting ethical responses. There may be other critical capabilities that this article does not address. However, it seems that many of the desired attributes that interact with users can be derived from these two capabilities. As mentioned, although, this model may only consider some aspects of HAI, it will help to make and

change it in the future. Such modeling can reflect human-centered strategies sensitive to values. This not only helps us understand our intellectual blind spots but can also create new spaces for design and research.

Conclusion

Our goal is to identify and understand the critical issues related to human considerations of learning in AI. Drawing from the conceptual framework established through research (Figure 1), a set of HAI domains in learning is proposed to gather essential information about emotions within such environments.

The results of this framework represent insights that can be used to improve students' learning. The results showed that the emergence and change of different emotions is an important indicator of students' emotions and affects students' learning. Identifying and reducing the intensity of these emotions through teachers or educators and targeting students' activities provides insight into emotions that can be very effectively used to improve the actions and activities of students in similar crises. Also, this insight can be used in future planning to improve students' emotional health. Furthermore, humanistic-AI design methodologies will aid in the achievement of the United Nations' sustainable development goals. This study shows that in the era of the introduction of AI to educational institutions and organizations, the study of human behavior and emotions using AI is very useful or even necessary.

The above overview, this study grappled with various limitations both in its review process and in its endeavor to address the central research question. The sheer volume of published papers posed a challenge, potentially resulting in the inadvertent omission of pertinent works—a common dilemma encountered in extensive literature review studies. Moreover, the meticulous construction of a search strategy, entailing the identification of keywords, emerged as a pivotal yet intricate aspect of the search process. The formidable task of navigating through this process within a constrained time frame introduced the possibility of overlooking articles, either by omitting vital information or neglecting nuanced keyword combinations. These challenges underscore the complexity inherent in conducting a comprehensive and time-sensitive review, warranting careful consideration of the study's findings and conclusions.

Recommendations

There are several most important recommendations for practitioners and future researchers who need to study and apply HAI to improve the quality of teaching and learning.

Firstly, map out the Learning Trajectory not only on performance, but also use the learner's feelings and emotions as a basis for learning, and based on the systematic analysis of the present study, consider three basic principles of HAI.

Secondly, for further research, "how to organize HAI-based learning activities so that teachers can support students' feelings and emotions as much as possible" and "how to make teachers aware of HAI" are ideas that researchers can continue to implement.

Third, to assess the long-term impact of HAI on teaching and learning outcomes, future studies could conduct longitudinal research that tracks the progress and development of students over an extended period. By examining the sustained effects of HAI interventions, researchers can gain valuable insights into the efficacy and scalability of these approaches.

Finally, it can be said that practitioners and researchers can with the incorporating emotional-ethical considerations into the design and implementation of AI systems, ensure responsible and transparent practices that prioritize the well-being and autonomy of learners. This paper represents the state of emotion in AI, which helps to better understand the many challenges of this topic.

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