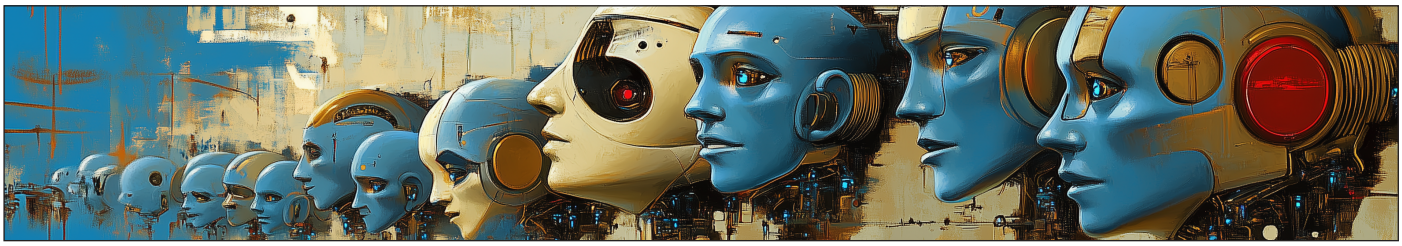
# Studies in Technology Enhanced Learning

Journal homepage: **stel.pubpub.org**

**Article type**
Full paper, double-blind peer review.

**Publication history**
Received: 11 July 2024. Revised: 16 October 2024. Accepted: 16 October 2024. Online: 28 October 2024.

**Cover image**
Badly Disguised Bligh via flickr.


**Special issue** Generative AI and education | **More at** https://doi.org/10.21428/8c225f6e.0390b853


# Assessing the effectiveness of Chatbots in providing personalized academic advising and support to higher education students: A narrative literature review


Manal Dawood [1, 2]

[1] College of Technological Innovation, Zayed University, Abu Dhabi, United Arab Emirates

[2] Department of Educational Research, Lancaster University, Lancaster, United Kingdom



**Keywords**
higher education; chatbot; conversational agent; literature review; human-computer interaction

**Citation**
Dawood, M. (in press). Assessing the effectiveness of Chatbots in providing personalized academic advising and support to higher education students: A narrative literature review. **Studies in Technology Enhanced Learning, 4**(1), 1-12.
https://doi.org/10.21428/8c225f6e.7140f8f4



## Abstract

Academic advising is essential for university and college students to achieve success since it provides guidance in many aspects of their academic journey. According to Drake (2011), having a solid relationship with an academic advisor is necessary for students to succeed in university settings. Students often have questions about university policies, processes, and resources, and they seek assistance from their academic advisors, who may be lecturers or other staff members. However, these demands can sometimes overwhelm the advisors. Although modern technology has reduced these demands (Ghonmein et al., 2023), advisors continue to face challenging tasks. Artificial Intelligence (AI) conversational agents or chatbots could help alleviate the problem, (Akiba & Fraboni, 2023). These multi-field technologies may respond to user requests utilizing input data. A personalized academic advising chatbot might provide accurate, timely, and convenient answers to typical student concerns. While integrating technology like chatbots into academic advising could streamline routine tasks and improve efficiency, it is essential to recognize the potential for these advancements to provide advisors with additional capacity to focus on intricate and multifaceted issues where human connection and personalized guidance are paramount. For instance, advisors may have more opportunities to delve into the nuanced personal circumstances, emotional challenges, or career indecision that some students face. These situations often require advisors to employ

https://doi.org/10.21428/8c225f6e.7140f8f4

their emotional intelligence, active listening skills, and ability to provide tailored, compassionate support – aspects that are challenging for technology to replicate effectively. Previous research (Akiba & Fraboni, 2023; Grites, 1979) has shown optimism about the role of chatbots in efficiently handling general inquiries. However, there is a consensus that existing AI systems need further development to manage complex advising scenarios effectively. This literature review examines the feasibility of developing a student-specific chatbot that can monitor academic goals and performance. The examination also aims to identify AI's limitations in academic advising.

## 1. Introduction

From the 1950s' innovations to today's AI-powered solutions, chatbots in education have undergone a dramatic evolution (Turing, 1950). A machine's ability to behave intelligently like a human was tested by Alan Turing in the 1950s, popularizing artificial intelligence. This landmark development set the stage for future advancements in the field. In the 1960s, Joseph Weizenbaum created ELIZA, the first chatbot, marking a significant leap forward in conversational agent technology (Wang, 2024). Building on this foundation, Kenneth Colby's PARRY chatbot emerged in the mid-1970s. Designed to mimic paranoid patients, PARRY became one of the earliest chatbots to contribute to the study of human behavior, paving the way for many modern conversational agents (Wang, 2024). The 1980s and 1990s saw rapid advancements in AI and natural language processing, leading to more sophisticated chatbots. For example, in August 1989, Jim Aspnes opened TINYMUD, an elegant reimplementation of Richard Bartle's multiuser dungeon (MUD) (Mauldin, 1994). Mauldin highlights chatbot developments in the late 1980s, particularly the introduction of ChatterBots in the TINYMUD environment. The integration of ELIZA, a 1960s chatbot, into the game is also noted (Mauldin, 1994). These advancements were mostly experimental during the 1980s, relying on simple rule-based systems and largely confined to specific digital environments like TINYMUD. Wired magazine's coverage in 1993 indicates that chatbots were gaining some public attention by the early 1990s, although the technology remained relatively primitive at that time (Mauldin, 1994). However, these remained largely confined to research laboratories. Online chatbots became more accessible in the 1990s and early 2000s, making them useful for customer service and personal assistants. Chatbots entered the educational realm in 2005 with early tutoring attempts. Since 2006, research into educational chatbots has grown exponentially, with a particular surge observed from 2017 onwards (Ina, 2017). Recent developments in AI and neural networks have enabled the creation of dynamic chatbots capable of providing intelligent feedback, rapid service, and alternatives to traditional learning management systems. Despite these technological strides, challenges persist in planning successful educational interactions and defining clear criteria for their execution, particularly in the realm of academic advising in higher education — the focus of this paper.

Academic advising is crucial for students' success providing essential guidance on course selection, career paths, and personal development (Drake, 2011). However, advisors are often overwhelmed by the volume of students they must assist, leading to significant pressure and numerous tasks (Ghonmein et al., 2023). This literature review explores the potential of artificial intelligence (AI) to improve academic advising through personalized chatbots. These chatbots can automate tasks, provide personalized guidance, and offer support. Nevertheless, specialized inquiries in particular often present chatbots with challenges. Previous authors are optimistic regarding general questions, but current models struggle with complex inquiries (Kuhail et al., 2023b). This review evaluates the effectiveness of chatbots in academic advising and proposes frameworks to improve AI capabilities and address challenges professionally.

## 2. The history of the chatbot in education

The history of chatbots in education reflects a fascinating evolution, beginning with early developments in the 1950s and progressing to the sophisticated AI-driven tools seen today. In 1950, Alan Turing addressed the question "Can machines think?" for the first time, opening up discussions on the definitions of "machine" and "think" (Turing, 1950). Turing popularized the notion of artificial intelligence with the Turing Test, a notable work that has been heavily referenced (Pinar et al., 2000). This test, which measured a machine's capacity to behave intelligently in a similar way as a human, marked the first introduction of the concept of AI. Despite its initial success, it later sparked discussions and encountered opposition (Pinar et al., 2000). During the 1960s, Joseph Weizenbaum developed ELIZA (Černý, 2022), a simple program that generates questions based on a user's announcement sentence. As one of the first chatbots, this marked a significant step in conversational agents, although ELIZA was limited to scripted responses. Advancements in AI and natural language processing in the 1980s and 1990s created more advanced chatbots capable of handling complex interactions, but they were primarily developed for research and experimental use. The increase of the Internet in the 1990s and early 2000s saw chatbots becoming more

accessible to the public, transitioning from purely academic experiments to practical applications, including customer service and personal assistants. The integration of chatbots into education began around 2005 (Heller et al., 2005), with initial experiments focused on providing information and basic tutoring. An example from this period is the Freudbot, which simulated conversations with Sigmund Freud for educational purposes (Heller et al., 2005). From 2006 onwards, there has been a systematic growth in studies investigating chatbots in education, with a considerable increase in research papers since 2017, showing increased adoption and incorporation into educational contexts (Winkler & Soellner, 2018).

Currently, chatbots are used in various educational settings, including history, health education, and language instruction (Černý, 2022). They offer intelligent feedback, instant support, and act as viable alternatives to learning management systems. Technological progress has resulted in a shift from simple scripted chatbots to ones that use powerful AI and neural networks, allowing for more dynamic and contextual conversations (Adiguzel et al., 2023). Chatbots are now part of a larger ecosystem of educational technologies that aim to supplement, rather than replace, established teaching techniques by providing personalized and quick assistance (Černý, 2022). Similarly, Dale (2016) emphasized the broad use of chatbots, including digital assistants like Siri, Cortana, Alexa, and Google Assistant, which are designed to assist with various tasks through conversational interfaces.

Despite these advancements, as discussed in Černý (2022), there are ongoing challenges and future directions to consider. There is a growing focus on designing educational interactions that are engaging and effective, ensuring chatbots are seamlessly integrated into educational environments to add value without causing frustration. Černý (2022) emphasizes the necessity for rigorous approaches and explicit standards to effectively utilize chatbots in education.

## 3. Research context and research questions

Academic advising is a continuous, comprehensive process that helps students clear up confusion and realize their full educational potential and benefits through conversation and information exchange with an advisor (Grites, 1979). Grites (1979) observed a significant shift in attitudes towards advising, driven by several factors: students' growing concerns about interpersonal relationships on campus; the increasing complexity of academic planning; and rising attrition rates in higher education. In response to these changes, Grites proposed a new definition of academic advising: "a decision-making process during which students realize their maximum educational potential through communication and information exchanges with an advisor" (Grites, 1979, p. 9).

Academic advising plays a crucial role in supporting students' academic success and personal growth in institutes and universities. According to Ghonmein et al. (2023), academic advising involves creating personalized study plans, providing information on policies and resources, monitoring academic performance, and serving as a primary point of contact for support. However, advisors often face challenges such as heavy workloads, lack of knowledge, hesitant students, and information dispersal across multiple systems (Ghonmein et al., 2023).

As Akiba and Fraboni (2023) affirmed, AI tools, such as chatbots, can help alleviate these challenges by automating tasks, integrating information from different sources, providing insights to improve the quality and efficiency of academic advising, and supporting students more effectively. The use of chatbots in academic advising has the potential to enhance the overall advising experience for both students and advisors (Akiba & Fraboni, 2023). Chatbots could handle routine inquiries, freeing up advisors' time to focus on more complex and personalized advising tasks (Ghonmein et al., 2023). Additionally, chatbots can be available 24/7, providing students with access to support and with information whenever they need it (Akiba & Fraboni, 2023).

### 3.1 Research questions

This research explores the integration of AI-based chatbots into academic advising, focusing on how these technologies can enhance traditional methods and address limitations and challenges. The study aims to contribute to the development of more efficient, responsive, and comprehensive advising systems that effectively meet the evolving needs of students in higher education.

To achieve this objective, the research addresses two primary questions:

1. How can traditional advising methods be enhanced or supplemented by incorporating AI-based technologies (chatbots) to better support students in their academic and non-academic pursuits?
2. What are the limitations and challenges of using AI-based technologies (chatbots) in academic advising, and how can these limitations be addressed to maximize their effectiveness and usefulness?

https://doi.org/10.21428/8c225f6e.7140f8f4

This research employs interpretivism paradigms to collect qualitative data. It focuses on "understanding the way individuals interpret the world from where they find themselves" (Cohen & Manion, 1994, p. 8). An interpretive perspective regards human activity as significant and something that may be interpreted in order to comprehend it. According to Scott and Usher (1996, p. 18): "human action is given meaning by interpretive schemes or framework". Cohen et al. (2007, p. 21) demonstrated that an interpretative paradigm is defined by the individual's concern. To further interpret it, gathering specialized information from experienced individuals adds more credibility to the research.

Therefore, this literature review uses interpretivism for qualitative data analysis to understand the current state of chatbot integration into academic advising systems and its potential and challenges.

## 4. Methodology and structure

This literature review adopts a narrative approach, aiming to address research questions by critically analyzing previous investigations. As highlighted by Baumeister and Leary (1997), narrative reviews act as a bridge, synthesizing extensive and dispersed articles for readers who lack the time or resources to access them individually. These reviews provide a broader scope and theoretical depth than individual empirical studies, revealing gaps in the field. Initially, 84 papers were found examining the evolution of chatbots in academic advising, but the number was reduced to focus on the latest papers discussing developments in this field. From this study, this paper reviews the findings of 20 current research papers, published between 2020 and 2024, focusing on the integration of conversational agents (chatbots) in academic advising.

The research employed Lancaster University OneSearch and Google Scholar to find relevant material, targeting the search on "higher education", "academic advising", "chatbot", "conversational agent" and "academic support".

Given the emerging nature of chatbots in academic advising, publications from 2020-2024 were prioritized. Non-academic chatbot literature, such as course learning or business material, was excluded owing to its lack of relevance.

## 5. Literature review

A chatbot, also referred to as a conversational agent, is a dialogue system capable of understanding and generating natural language content across various modalities such as text, voice, or hand gestures, including sign language. This definition, as outlined by Allouch et al. (2021), emphasizes the ability of a chatbot to comprehend and respond to sentences in natural language.

Since their inception in 1960, chatbots have been used increasingly across diverse applications (Kuhail et al., 2022). In particular, their integration into educational settings gained traction as pedagogical agents in the early 1970s (Laurillard, 2013). However, research on chatbots in education has primarily focused on language learning and computer-assisted instruction, with less emphasis on broader academic support services until 2005. Before 2020, several studies explored the use of chatbots for general tasks in academic advising. Assiri et al. (2020) conducted a systematic review of 30 papers, revealing a majority focused on generic advising functions rather than multi-tasking chatbots. Similarly, Kuhail et al. (2023b) analyzed 36 publications, highlighting that a significant proportion of educational chatbots serve as instructional aides rather than peer assistants. The review emphasizes their application in fields such as computer science, language learning, and general education, noting that most chatbots are deployed on web-based platforms. These chatbots typically serve as teaching or peer agents, utilizing both personalized and predefined conversational paths. Additionally, the findings indicate that chatbots can enhance learning outcomes and student engagement. However, the review also identifies challenges, including limited datasets and usability issues. To address these gaps, future research should focus on aspects such as chatbot personality, localization, and the development of more sophisticated interaction techniques.

This study investigates both the potential and challenges of implementing personalized chatbots in academic advising within higher education. Despite the growing body of literature on chatbots in academic advising, there remains a significant gap in understanding the development and implementation of personalized chatbots in this field. This literature review addresses this gap by examining existing research and identifying key insights. The findings of this research are presented in response to the study's research questions, detailed in the following section and sub-sections.

# 6. Findings

## 6.1 Findings relating to RQ1

> "How can traditional advising methods be enhanced or supplemented by incorporating AI-based technologies (chatbots) to better support students in their academic and non-academic pursuits?"

### 6.1.1 User experience

Several studies have laid the groundwork for future advancements in academic advising chatbots. Kuhil et al. (2023a) focused on essential tasks within the advising process, such as improving GPA (Grade Point Average) and major changes, based on real-life scenarios. Despite limitations, their study reported a promising student satisfaction rate of over 85%. Notably, the significance of their work lies in its examination of user satisfaction levels, a relatively rare focus in recent research. In a similar vein, Lizarraga et al. (2023) introduced a Peer Advisors chatbot model, with 92% of respondents strongly affirming the competency of peer advisors in providing support, particularly regarding failed courses. Moreover, 84% of students viewed the integration of chatbots into their advisory support system as feasible. Likewise, Balqees et al. (2023) found compelling evidence suggesting that the perceived ease of use significantly impacted on students' readiness to adopt chatbots' advice and their satisfaction rate. Additionally, Setiyani (2023) confirmed the potential of chatbots to enhance the efficiency of academic services and improve overall student experience. However, Pesonen (2021) emphasized the need for students' trust with chatbots, which positively correlates with their satisfaction and willingness to engage with the technology. These studies collectively contribute to understanding user perceptions and the acceptance of advice from chatbots, paving the way for future developments in the field.

### 6.1.2 Tackle critical advising role

As academic advising research progresses, the importance of theoretical frameworks becomes apparent, yet practical validation through empirical studies remains essential. Models proposed by Bilquise and Shaalan (2022) tackle critical aspects such as personalized study plans and identifying at-risk students. Similarly, Abdelhamid and Alotaibi (2021) delve into advising roles, including study plans and semester schedules. Additionally, Gnana et al. (2023) contribute models that assist with various advising tasks, ranging from basic queries to providing students with their graduation plans, and recommending courses for grade improvement. While their findings are significant, bridging the gap between research and implementation is crucial for the practical application of chatbots. These proposals lack practical testing to validate their outcomes, highlighting the need for further validation through real-world application.

### 6.1.3 Promising results that sometimes surpass human accuracy

With the same emphasis on the need for further practical testing, several studies have demonstrated promising results that sometimes surpass human accuracy. However, researchers have cautioned that these results may not hold true in all cases, necessitating additional research to validate the experimental findings. For instance, in the study by Akiba and Fraboni (2023), ChatGPT exhibited its potential by offering limited personalized responses, particularly in complex cases, outperforming human capabilities only occasionally. Similarly, the study conducted by Assiri et al. (2020) underscored the need to address individual cases separately due to the absence of systems capable of accurately understanding students' information requirements. Expanding on this notion, Alkhoori et al. (2020) and Ismail et al. (2021) introduced personalized model systems tailored to student inquiries, encompassing areas such as course selection and grade system queries. Whereas prior studies have treated course selection as a generic task, it often demands special consideration, taking into account factors like semester-specific courses and ensuring a seamless progression in study plans. Therefore, future research endeavors should prioritize the implementation of these models and the collection of user feedback to refine their effectiveness.

### 6.1.4 Career orientation

In a related context, the study conducted by Lee et al. (2021) demonstrated promising outcomes concerning the effectiveness of a specialized chatbot designed to provide career orientation information for students, particularly within Science, Technology, Engineering, and Mathematics (STEM) programs such as computer architecture, computer design and engineering, and theoretical computer science. Despite some limitations, the encouraging outcomes suggest potential for further development and broader application.

### 6.1.5 Different models

Some studies have presented different models for academic advising enhancement. For example, the study by Nguyen et al. (2023) proposed incorporating additional student characteristics relevant to academic advising, such as a follow-up feature enabling students to schedule appoint-

https://doi.org/10.21428/8c225f6e.7140f8f4

ments with their human advisor. This feature offers several benefits, including instilling confidence in students that their academic advisor is readily available, especially for matters requiring socioemotional support. Additionally, in Lim et al.'s study (2021), the authors introduced a notification form within an application designed to track students' academic performance and classroom attendance. The model also sends notifications to academic advisors if students fail to respond to repeated notifications. However, this model has not been tested yet, and practical experience is required to evaluate its effectiveness and gather feedback from both students and advisors. Moreover, Bilquise et al. (2022) aimed to create a bilingual chatbot for academic advising in Arabic and English. While the study highlighted the potential of chatbots in Arabic-language advising, it also revealed limitations in their functionality, with approximately 20% of interactions resulting in a standard "Contact your advisor" response. This underscores the need to broaden the chatbot's database enough to handle a wider array of queries.

Lucien and Park (2024) developed a framework showcasing the effectiveness of using chatbots as a rapid communication tool between students and their academic advisors. They found that 67% of inquiries were answered within the expected timeframe. However, the study also revealed that only 38% of the questions fell within the chatbot's database.

Additionally, Pesonen (2022) studied the potential of chatbots based on students' behavior, confirming that they contribute to creating an inclusive environment, particularly beneficial for shy students. However, Bilquise et al. (2023) discovered that students' readiness to interact with chatbots is highest when they possess both technological proficiency and psychological preparedness.

The analyzed literature on chatbot potential is summarized in Table 1 to answer the first research question.

**Table 1. An overview of potential personalized chatbots by category**

| Potential | Research paper | Note |
|---|---|---|
| User Experience | Kuhil et al. (2023a) | These studies help to study user attitudes and acceptability of advising chatbots, paving the way for future advances in the field. |
| | Lizarraga et al. (2023) | |
| | Balqees et al. (2023) | |
| | Setiyani (2023) | |
| | Pesonen (2021) | |
| Tackle critical advising role | Bilquise and Shaalan (2022) | The proposed models do not include actual testing to evaluate their outcomes, stressing the need for additional validation through real-world applications. |
| | Abdelhamid and Alotaibi (2021) | |
| | Gnana et al. (2023) | |
| Promising results that sometimes surpass human accuracy | Akiba and Fraboni (2023) | To improve the effectiveness of these models, the authors proposed that future studies prioritise and expand their implementation, as well as the collection of user input. |
| | Assiri et al. (2020) | |
| | Alkhoori et al. (2020) | |
| | Ismail et al. (2021) | |
| Career orientation | Lee et al. (2021) | Despite the model's limitations in certain sectors, the results were very positive. |
| Different models | Nguyen et al. (2023) | Proposed follow-up feature |
| | Lim et al.'s (2021) | Academic performance and classroom attendance |
| | Bilquise et al. (2022) | The study demonstrated the potential of chatbots in the Arabic language. |
| | Lucien and Park (2024) | Rapid communication tool. |
| | Pesonen (2022) | Student behaviour |

### 6.2 Findings relating to RQ2

> "What are the limitations and challenges of using AI-based technologies (chatbots) in academic advising, and how can these limitations be addressed to maximize their effectiveness and usefulness?"

#### 6.2.1 Deficiencies in applications

The challenges in implementing an effective academic advising system revolve around several key factors. Thottoli et al. (2022) raised concerns about the potential of chatbots to replace human advisors, highlighting the need for cautious consideration. Moreover, the study itself pointed to deficiencies in applications in this area, given its novelty. Consequently, not carrying out thorough testing may result in inaccuracies that impact student performance and academic advancement, and also raise privacy and ethical concerns about including student information in unvalidated databases for non-accredited programs.

#### 6.2.2 Lack of ability to cover critical tasks

One of the main challenges highlighted, particularly by writers Kuhail et al. (2023a) and Assiri et al. (2020), is the lack of personalization in academic advising systems. Recognizing the diverse needs of students, it is crucial to develop flexible and accurate advising systems that can cater to various requirements while ensuring ease of use and minimizing complexity. However, addressing this challenge is compounded by the limitations of understanding in AI systems.

#### 6.2.3 AI systems understanding limitations

Bilquise et al. (2022) and Lucien and Park (2024) identify limitations in AI systems' understanding. These systems often struggle with nuanced inquiries, leading to inaccurate or incomplete responses, a concern further emphasized by Demaeght et al. (2023). They discuss the frustration experienced by users due to the complexity of machine interfaces, especially when keywords are not accurately interpreted, prolonging the information retrieval process. Additionally, user training is highlighted by Kuhail et al. (2023a) as essential for effectively using chatbots underscoring the impact of user proficiency on information accessibility.

#### 6.2.4 AI maintaining user interest and involvement over time

Lee et al. (2021) emphasized the challenge of maintaining user interest over time, stressing the need to support design decisions with evidence of learning outcomes.

#### 6.2.5 Need for human oversight and intervention

Despite the remarkable progress in AI technology, Akiba and Fraboni (2023) underscore the ongoing necessity for human oversight and intervention to ensure the accuracy and effectiveness of chatbot interactions, especially in academic advising. They advocate for ChatGPT to play a complementary role, providing a comprehensive perspective rather than relying on its capabilities alone. The study emphasizes the importance of accessing specialized dialogue that may not be readily available, while also recognizing that ChatGPT has limited intelligence when it comes to handling complex cases in academic advising in certain contexts. This highlights the need to integrate human input, particularly in situations requiring information confirmation.

#### 6.2.6 AI difficulties in mutual understanding

Nguyen et al. (2023) addressed various challenges related to integrating a human advisor feature (book an appointment with your human advisor) within the Lilo chatbot. Their study revealed that only half of the participants engaged with human advisors through Lilo, indicating low use. This stemmed from difficulties in establishing mutual understanding between users and advisors, with some perceiving advisors as arbitrary individuals. Moreover, the desire for a human connection conflicted with the initial concept of interacting with anonymous advisors or peers. The absence of mechanisms for building rapport exacerbated this issue. Additionally, enhancing social presence in online interactions was deemed essential for improving user experience and interactions.

#### 6.2.7 Lack of trust

Understanding individual usage patterns and preferences is crucial for informing the design and development of advising chatbots like Lilo. Kuhail et al. (2022) highlighted trust as one of the key factors for successful user relationships, while Moran (2024) found that 60% of the sample do not prefer interacting with machines.

https://doi.org/10.21428/8c225f6e.7140f8f4

The literature on challenges in creating chatbots is summarized in Table 2, addressing the second research question.

One of the major limitations of the reviewed research is the lack of generalizability, as the majority of studies have been conducted on a small scale, limiting the broader applicability of the findings. Furthermore, the integration of chatbots into university databases presents significant unexplored challenges. In the broader literature examined, aspects related to privacy or the potential integration of such chatbots into university or institute systems were not explored. It is essential to thoroughly examine the privacy and security protocols to ensure that sensitive student information is protected during interactions with AI-driven systems. In future research endeavors, it is essential to prioritize the protection of student data access. Additionally, scholars should explore the ethical implications of integrating chatbots into academic services. Key issues, such as data security and the transparency of chatbot interactions, require thorough examination to ensure that the implementation of this technology adheres to ethical standards and effectively safeguards students' rights and privacy.

## 7. Discussion

Existing reviews make it evident that previous studies have not yet introduced a theoretical or practical model capable of comprehensively addressing all individual academic queries. Instead, the focus has primarily been on models limited to responding to general or university policy-related questions, as typically found in student handbooks. However, these models fall short in providing tailored academic advice. They often concentrate on areas like course selection, career path inquiries, or notifications to academic advisors. While relying on readily available information from the university database accessible through the student's page, this approach lacks the personalized guidance necessary for students. For instance, in addressing how to improve one's GPA, as explored by Kuhail et al. (2023a), the provided answer — retaking failed courses — although technically correct, lacks nuanced guidance. Individualized advice, such as suggesting a spread-out workload for students struggling with specific subjects like mathematics, could significantly impact on their academic journey, especially for those at risk of repeated failures or program withdrawal. Similarly, while Balaqis and Shaalan's study (2022) covers various aspects of

**Table 2. An overview of the challenges of personalized chatbots discussed in the research articles for this review**

| Challenge | Research paper | Note |
|---|---|---|
| Deficiencies in applications | Thottoli et al. (2022) | Must carry out tests |
| Lack of ability to cover critical tasks | Kuhail et al. (2023a) | Flexible Advising System Development<br>• Recognizes diverse student needs.<br>• Maintains ease of use and minimizes complexity. |
| | Assiri et al. (2020) | |
| AI Systems Understanding Limitations | Bilquise et al. (2022) | The comprehension of AI systems is currently limited. |
| | Lucien, and Park (2024) | |
| | Demaeght et al. (2023) | |
| Maintaining user interest and involvement over time. | Lee et al. (2021) | The importance of supporting design decisions with evidence of learning outcomes was emphasized. |
| Need for Human Oversight and Intervention | Akiba and Fraboni (2023) | Fall short to process some advanced cases. |
| Difficulties in Mutual Understanding | Nguyen et al. (2023) | • Desire for human connection conflicted with anonymity.<br>• Absence of rapport building mechanisms worsened issue. |
| Lack of trust | Kuhail et al. (2022) | Trust is key for successful user relationships |
| | Moran (2022) | |

academic advising, its reliance on readily available student information fails to offer the specific guidance that students require. The findings highlight the limitations of the current model and its reliance on information sources restricted to the university's database, which may lead to inaccurate outcomes. Formation must be explained and applied to students' individual conditions and context. An example of this is advising a student not to enroll in a high-level course when they are still in their elementary years, even if they have completed the prerequisite course. Addressing this issue requires implementing an interpretative database for individual student cases, enabling AI to analyze them and provide more precise responses. However, experimentation is necessary to ascertain the accuracy and manner in which AI processes these inputs.

Despite current models having limitations in fully supporting academic advisors, their role in shaping future chatbots is crucial. These studies pave the way for chatbots capable of providing more accurate and interactive responses. Guiding students on university policies, support resources, career paths, or sending notifications regarding coursework constitutes a significant part of student inquiries. Expecting advisors to possess all this information and to respond comprehensively to a large number of students is unrealistic. Additionally, new advisors may struggle to amass the necessary knowledge to provide accurate answers to varied inquiries.

## 8. Conclusion

Integrating chatbots into academic advising holds transformative potential, with the capacity of a revolution in support systems and the creation of a more adaptable and precise advising framework. However, it is evident that there are several critical areas that require further exploration. For example, the complexities of transitioning between majors, which heavily rely on a comprehensive understanding of academic programs and policies. Additionally, the effectiveness of chatbots in interpreting students' information and academic records accurately to meet their individual needs poses a major concern that requires further in-depth research in the future.

Effective academic advising necessitates interaction between students and advisors, extending beyond mere information exchange. While personalized chatbots excel at handling routine inquiries, advisors remain essential for addressing complex human perspectives and concerns. Nonetheless, the potential for chatbots to enhance the efficiency of academic services is undeniable.

In conclusion, building trust and rapport is a critical component of successful academic advising. Students are more likely to open up, candidly share their challenges and aspirations, and actively seek guidance from advisors with whom they have cultivated a personal connection. This human-to-human interaction fosters a profound sense of belonging, encouragement, and motivation, which can profoundly impact a student's overall academic experience and personal growth trajectory (Drake, 2011). Advisors bring a wealth of expertise, empathy, and emotional intelligence to the table, enabling them to truly understand the unique circumstances, strengths, and areas for growth of each individual student. Through insightful conversations and probing questions, they can uncover the underlying factors influencing a student's academic journey and provide tailored guidance that considers their personal interests, career aspirations, and any potential barriers they may face (Akiba & Fraboni, 2023).

## References

Abdelhamid, A. A., & Alotaibi, S. R. (2021). Adaptive multi-agent smart academic advising framework. *IET Software*, *15*(5), 293–307. https://doi.org/10.1049/sfw2.12021

Adiguzel, T., Kaya, M. H., & Cansu, F. K. (2023). Revolutionizing education with AI: Exploring the transformative potential of ChatGPT. *Contemporary Educational Technology*, *15*(3), ep429. https://doi.org/10.30935/cedtech/13152

Akiba, D., & Fraboni, M. C. (2023). AI-Supported academic advising: Exploring chatgpt's current state and future potential toward student empowerment. *Education Sciences*, *13*(9), 885. https://doi.org/10.3390/educsci13090885

Alkhoori, A., Kuhail, M. A., & Alkhoori, A. (2020, April). UniBud: A virtual academic adviser. *2020 12th Annual Undergraduate Research Conference on Applied Computing (URC)*. http://dx.doi.org/10.1109/urc49805.2020.9099191

Allouch, M., Azaria, A., & Azoulay, R. (2021). Conversational agents: Goals, technologies, vision and challenges. *Sensors*, *21*(24), 8448. https://doi.org/10.3390/s21248448

Assiri, A., AL-Malaise, A., & Brdesee, H. (2020). From Traditional to Intelligent Academic Advising: A Systematic Literature Review of e-Academic Advising. *International Journal of Advanced Computer Science and Applications*, *11*(4). https://doi.org/10.14569/ijacsa.2020.0110467

Baumeister, R. F., & Leary, M. R. (1997). Writing narrative literature reviews. *Review of General Psychology*, *1*(3), 311–320. https://doi.org/10.1037//1089-2680.1.3.311

Bilquise, G., Ibrahim, S., & Salhieh, S. M. (2023). Investigating student acceptance of an academic advising chatbot in higher education institutions. *Education and Information Technologies*, *29*(5), 6357–6382. https://doi.org/10.1007/s10639-023-12076-x

Bilquise, G., Ibrahim, S., & Shaalan, K. (2022). Bilingual ai-driven chatbot for academic advising. *International Journal of Advanced Computer Science and Applications*, *13*(8). https://doi.org/10.14569/ijacsa.2022.0130808

Bilquise, G., & Shaalan, K. (2022). AI-based academic advising framework: A knowledge management perspective. *International Journal of Advanced Computer Science and Applications*, *13*(8). https://doi.org/10.14569/ijacsa.2022.0130823

Černý, M. (2022). The history of chatbots: The journey from psychological experiment to educational object. *Journal of Applied Technical and Educational Sciences*, *12*(3), 322. https://doi.org/10.24368/jates322

Cohen & Manion. (1994). *Research methods in education (4th ed)*. Routledge.

Dale, R. (2016). The return of the chatbots. *Natural Language Engineering*, *22*(5), 811–817. https://doi.org/10.1017/s1351324916000243

Demaeght, A., Walz, N., & Müller, A. (2023). Chatbots in academic advising: Evaluating the acceptance and effects of chatbots in German student-university communication. In *Lecture Notes in Computer Science* (pp. 18–29). Springer Nature. http://dx.doi.org/10.1007/978-3-031-36049-7_2

Drake, J. K. (2011). The role of academic advising in student retention and persistence. *About Campus: Enriching the Student Learning Experience*, *16*(3), 8–12. https://doi.org/10.1002/abc.20062

Ghonmein, A. M., Al-Moghrabi, K. G., & Alrawashdeh, T. (2023). Students' satisfaction with the service quality of academic advising systems. *Indonesian Journal of Electrical Engineering and Computer Science*, *30*(3), 1838. https://doi.org/10.11591/ijeecs.v30.i3.pp1838-1845

Gnana Rajesh, D., Tamilarasi, G., & Khan, M. E. (2023). Voice and text-based virtual assistant for academic advising using knowledge-based intelligent decision support expert system. In *Advances in Intelligent Systems and Computing* (pp. 483–491). Springer Nature. http://dx.doi.org/10.1007/978-981-19-5443-6_36

Grites, T. J. (1979). *Academic advising: Getting us through the eighties* (AAHE-ERIC/Higher Education Research Report No. 7). ERIC Clearinghouse on Higher Education, The George Washington University. Published by the American Association for Higher Education.

Heller, B., Proctor, M., Mah, D., Jewell, L., & Cheung, B. (2005, June). Freudbot: An investigation of chatbot technology in distance education. In *EdMedia + Innovate Learning* (pp. 3913–3918). Association for the Advancement of Computing in Education (AACE).

Ina. (2017, October 12). *The history of chatbots – from ELIZA to chatgpt - Onlim*. Enterprise Conversational AI. https://onlim.com/en/the-history-of-chatbots/

Ismail, H., Hussein, N., Elabyad, R., & Said, S. (2021, August 25). A serverless academic adviser chatbot. *The 7th Annual International Conference on Arab Women in Computing in Conjunction with the 2nd Forum of Women in Research*. http://dx.doi.org/10.1145/3485557.3485587

Kuhail, M. A., Al Katheeri, H., Negreiros, J., Seffah, A., & Alfandi, O. (2023a). Engaging students with a chatbot-based academic advising system. *International Journal of Human–Computer Interaction*, *39*(10), 2115–2141. https://doi.org/10.1080/10447318.2022.2074645

Kuhail, M. A., Alturki, N., Alramlawi, S., & Alhejori, K. (202b). Interacting with educational chatbots: A systematic review. *Education and Information Technologies*, *28*(1), 973–1018. https://doi.org/10.1007/s10639-022-11177-3

Kuhail, M. A., Thomas, J., Alramlawi, S., Shah, S. J. H., & Thornquist, E. (2022). Interacting with a chatbot-based advising system: Understanding the effect of chatbot personality and user gender on behavior. *Informatics*, *9*(4), 81. https://doi.org/10.3390/informatics9040081

Laurillard, D. (2013). *Rethinking university teaching: A conversational framework for the effective use of learning technologies*. Psychology Press.

Lee, T., Zhu, T., Liu, S., Trac, L., Huang, Z., & Chen, Y. (2021). CASExplorer: A conversational academic and career advisor for college students. *The Ninth International Symposium of Chinese CHI*, *4*, 112–116. http://dx.doi.org/10.1145/3490355.3490368

Lim, M. S., Ho, S.-B., & Chai, I. (2021). Design and functionality of a university academic advisor chatbot as an early intervention to improve students' academic performance. In *Lecture Notes in Electrical Engineering* (pp. 167–178). Springer. http://dx.doi.org/10.1007/978-981-33-4069-5_15

Lizarraga, C., Aguayo, R., Quiñonez, Y., Reyes, V., & Mejia, J. (2022). A new proposal for virtual academic advisories using chatbots. In *Lecture Notes in Networks and Systems* (pp. 233–242). Springer International Publishing. http://dx.doi.org/10.1007/978-3-031-20322-0_16

Lucien, R., & Park, S. (2023). Design and development of an advising chatbot as a student support intervention in a university system. *TechTrends*, *68*(1), 79–90. https://doi.org/10.1007/s11528-023-00898-y

Mauldin, M. L. (n.d.). *Chatterbots, TinyMUDs, and the Turing test: Entering the Loebner Prize competition.* Carnegie Mellon University, Center for Machine Translation.

Moran, M. (2024, September 17). 25+ top chatbot statistics for 2024: Usage, demographics, trends. *Ecommerce Bonsai*. https://startupbonsai.com/chatbot-statistics/

Navarro Sada, A., & Maldonado, A. (2007). Research Methods in Education. Sixth edition- by Louis Cohen, Lawrence Manion and Keith Morrison. *British Journal of Educational Studies*, *55*(4), 469–470. https://doi.org/10.1111/j.1467-8527.2007.00388_4.x

Nguyen, H., Lopez, J., Homer, B., Ali, A., & Ahn, J. (2023). Reminders, reflections, and relationships: Insights from the design of a chatbot for college advising. *Information and Learning Sciences*, *124*(3/4), 128–146. https://doi.org/10.1108/ils-10-2022-0116

Pesonen, J. A. (2021). 'Are you OK?' Students' trust in a chatbot providing support opportunities. In *Lecture Notes in Computer Science* (pp. 199–215). Springer International Publishing. http://dx.doi.org/10.1007/978-3-030-77943-6_13

Pinar Saygin, A., Cicekli, I., & Akman, V. (2000). *Minds and Machines*, *10*(4), 463–518. https://doi.org/10.1023/a:1011288000451

Scott, D., & Usher, R. (1996). *Understanding educational research*. Routledge.

Setiyani, L. (2023). Increasing the effectiveness of higher education academic services through the implementation of the chatbot platform using the SVM machine learning algorithm. *Jurnal Pedagogi Dan Pembelajaran*, *6*(2), 231–237. https://doi.org/10.23887/jp2.v6i2.62611

Thottoli, M. M., Alruqaishi, B. H., & Soosaimanickam, A. (2024). Robo academic advisor: Can chatbots and artificial intelligence replace human interaction? *Contemporary Educational Technology*, *16*(1), ep485. https://doi.org/10.30935/cedtech/13948

Turing, A. M. (1950). I—Computing machinery and intelligence. *Mind*, *59*(236), 433–460. https://doi.org/10.1093/mind/lix.236.433

Wang, K. (2024). From ELIZA to ChatGPT: A brief history of chatbots and their evolution. *Applied and Computational Engineering*, *39*(1), 57–62. https://doi.org/10.54254/2755-2721/39/20230579

Winkler, R., & Soellner, M. (2018). Unleashing the potential of chatbots in education: A state-of-the-art analysis. *Academy of Management Proceedings*, *2018*(1), 15903. https://doi.org/10.5465/ambpp.2018.15903abstract

https://doi.org/10.21428/8c225f6e.7140f8f4

## About the author

Manal Dawood is an experienced academic advisor with over twenty years in the field of education/higher education guidance and student support. She currently serves as an academic advisor at Zayed University in the United Arab Emirates (Abu Dhabi), where she provides personalized academic and career counselling to a diverse student body. Manal is dedicated to helping students navigate their academic journeys, select courses, and make informed career decisions. She works closely with faculty and administration to optimize advising services and improve students' overall university experiences. Manal's extensive experience in academic advising drives her passion for integrating technology into student support services, particularly through the use of chatbots. She is enthusiastic about exploring how AI-driven tools can enhance the advising process, making guidance more accessible and personalized for students at Zayed University and beyond.

manal.dawood@zu.ac.ae

0000-0003-0566-5370

m.dawood@lancaster.ac.uk

## Open Access (CC BY 4.0)

© 2020 The Authors. This article is distributed under Creative Commons Attribution 4.0 International licence.

You are free to

- Share — copy and redistribute the material in any medium or format
- Adapt — remix, transform, and build upon the material for any purpose, even commercially.

Under the following terms:

- Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.
- No additional restrictions — You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.

The full licence conditions are available at: **https://creativecommons.org/licenses/by/4.0/**