Abid et al. LGURJCSIT 2023

ISSN: 2521-0122 (Online)
ISSN: 2519-7991 (Print)

LGU Research Journal of Computer Science & IT

doi: 10.54692/lgurjcsit.2023.074494

Vol (7): Issue (4), October – December 2023

Integrating Chatbots in Educational Administration for Improved Language Learning Outcomes

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ABSTRACT:

The burgeoning field of educational technology underscores the transformative potential of chatbots in revolutionizing language learning. This research delves into the efficacy of integrating chatbots into educational administration, aiming to elucidate their impact on language acquisition and student experiences. Employing a mixed-methods approach, we analyse quantitative data pertaining to language proficiency levels alongside qualitative reflections from students. Our findings unveil a statistically significant positive correlation between the utilization of chatbots and enhanced language learning outcomes. Students particularly emphasize the value of conversational practice and rapid feedback derived from chatbot interactions. However, challenges, such as limited personalization, inadequate comprehensive feedback, and technical obstacles, have surfaced. To address these challenges and optimize the potential of both technologies, we propose a hybrid approach that seamlessly integrates chatbots with human tutors. This model leverages the strengths of each technology: chatbots providing instant access to personalized practice and feedback, while human tutors offer in-depth guidance tailored to individual student needs. This study not only advances the theoretical understanding of technology-mediated interactions and their impact on language learning but also provides practical applications for educational institutions. The integration of chatbots empowers educational institutions to personalize support for individual students, streamline administrative tasks, and cultivate a positive and engaging learning environment. By embracing this innovative technology and implementing the proposed hybrid model, educational institutions have the opportunity to revolutionize language learning experiences, fostering greater student engagement and yielding improved language acquisition outcomes.

KEYWORDS: Chatbot Integration, Educational Administration, Language Learning Outcomes, Personalized Support, Mixed-Methods Approach.

1. INTRODUCTION

The continuous expansion of education through technological integration has opened up new opportunities to enhance the entire learning process. Among the forefront technologies capturing considerable interest is chatbots, adept at engaging users in conversations using natural language. The utilization of chatbots in educational administration has garnered significant attention as educational institutions increasingly adopt digital tools to support student success. Referred to as "conversational agents," chatbots enhance human-computer interaction by leveraging the technology's inherent learning capabilities to process information and convey it conversationally. This innovative approach holds promise in streamlining communication and providing personalized support, thereby

contributing to more effective and efficient educational administration. As institutions navigate the evolving landscape of digital education, the integration of chatbots emerges as a dynamic and progressive step to foster improved engagement and facilitate seamless interactions within the educational environment. [1]. Four critical qualities of chatbots: They frequently imitate human speech, reply to communications, lack a physical presence, and do not take the role of avatars in virtual worlds, among other characteristics [2]. This study investigates whether chatbots can enhance language learning outcomes in academic settings. Language ability is of utmost importance in the linked world of today. As a result, teachers must improve language learning techniques to fulfill globalization's needs. The use of chatbots in educational administration holds the possibility of giving language learners individualized and effective help. Chatbots can create interactive learning environments tailored to individual students' specific requirements by providing prompt direction, feedback, and support. Chatbots or conversational agents, which let devices engage in conversation with users in response to requests made in natural language, will be the subsequent significant development in everyday services. The device uses artificial intelligence and machine learning to give the user automated responses. Even though this field of study is still relatively new, usage of this concept has increased dramatically in recent years [3]. Whether in academic settings or for business objectives, such as when assistants are needed to identify the root causes of a customer's dissatisfaction or to offer suggestions for products and services, technology is increasingly employed to deliver answers to inquiries [4]. All parties involved in the business, including students and employees of the institutions, can benefit from quick and personalized services thanks to chatbot technology [5]. The primary function of the chatbots was to impart knowledge in computer technology, language, general education, and a few other areas, including engineering and mathematics, via a web platform [6]. The chatbot is constantly ready to answer your inquiries about education, as seen in Figure 1. Conversational AI enables AI chatbots and other modern information and communication technologies (ICT) capabilities [7]. A digital system's ability to accomplish tasks traditionally handled by intelligent beings is known as artificial intelligence (AI) [8]. The various disciplines of AI-related technology include big data, natural language processing, machine learning, voice, computer vision, and speech recognition [9]. This technology is increasingly being used in classrooms. Users may receive speedier, more personalized service from chatbots [10]. Artificial intelligence (AI)-powered chatbots are becoming more and more prevalent in educational institutions. Due to the popularity of AI chatbots, numerous empirical studies have been done to look at how they affect students' learning results [11].

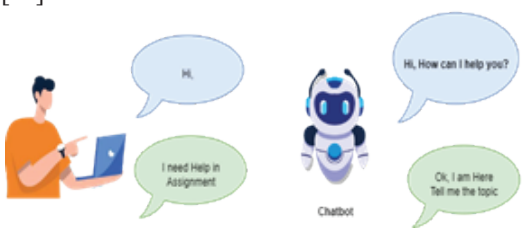

Figure 1:Chatbot for education

1.1. Roles of Chatbots in Education

The applications of chatbots in education are diverse, covering several key areas. They ensure uninterrupted access to resources and assistance, facilitate personalized learning experiences, and provide immediate problem-solving support. Moreover, chatbots contribute to an enhanced learning environment by elevating student engagement, enabling data analysis for informed decision-making, facilitating language acquisition, and streamlining administrative tasks. Figure 2 illustrates the multifaceted roles that chatbots play in the educational landscape. The visual representation underscores the versatility and impact of chatbots in contributing to a more efficient, interactive, and learner-focused educational experience.

Figure 2: Roles of Chatbots in Education

24/7 Accessibility: Chatbots enable students and teachers to request help or access materials anytime, promoting a flexible and comfortable learning environment. They also allow round-the-clock access to information and assistance [4]. Personalized Learning: Learning experiences can be tailored with chatbots, which can provide assessments, recommendations for content, and study schedules depending on individual learning preferences and development. This increases engagement and learning outcomes [10]. Instant Assistance: Chatbots provide on-demand assistance, responding to questions and issues immediately. Students that receive immediate feedback are better able to understand concepts and have more outstanding learning outcomes [12]. Student Engagement: Chatbots' conversational and interactive user interfaces make learning more enjoyable. Chatbots that incorporate gamified aspects, tests, and interactive challenges encourage students to actively engage in their learning [13]. Data analysis: Chatbots collect information on student interactions and performance for data analysis. Teachers can use this data to analyze trends, strengths, and shortcomings, allowing them to improve teaching strategies through data-driven decisions [14]. Language learning: To help pupils practice speaking and writing in a foreign language, chatbots for language learning replicate honest conversations. Both language proficiency and confidence are improved by this intensive encounter [15]. Administrative Tasks: Chatbots can help with administrative chores, including schedule management, course registration, and enrollment. This simplifies administrative procedures and frees up teachers' time to devote to more beneficial educational activities [16].

This study aims to look into how using chatbots influences language learning outcomes. The theoretical and practical impacts of deploying chatbots are thoroughly studied. It is critical to understand how chatbots can be successfully used to optimize language learning experiences as technology continues to change conventional educational paradigms. This study intends to shed light on the potential benefits and challenges of integrating chatbots into school administration through a thorough review of the integration process and its resultant implications. By doing this, it hopes to add to the more extensive discussion on using technology to improve language learning outcomes.

1.2. Language learning outcomes

The research on chatbots for language learning, language learning outcomes extend beyond just grammar and vocabulary. They encompass various aspects of proficiency, including:

- Conversational Skills: Increased fluency and confidence in spoken communication, ability to engage in real-time conversations, and understanding of natural language flow.
- Reading Comprehension: Enhanced understanding and analysis of written text, improved vocabulary acquisition and retention, and development of critical thinking skills.
- Writing Skills: Improved grammar and mechanics through feedback and practice, enhanced sentence structure and clarity, and increased confidence and creativity in written communication.
- Listening Comprehension: Improved ability to understand spoken language at various levels, ability to distinguish accents and intonation patterns, and awareness of cultural nuances.
- Motivation and Engagement: Increased motivation and engagement through interactive experiences, enhanced self-efficacy and confidence, and greater enjoyment of the learning process.

2. LITERATURE REVIEW

Prior research has acknowledged the benefits of technology in enhancing language learning results. Intelligent conversational computer programs known as chatbots are being utilized in a range of industries, including e-commerce, healthcare, entertainment, and education, as a result of the ongoing growth of the Internet and developments in natural language processing. They receive user input, provide results, and replicate human discussions in their natural habitat. They can also be called chatbots, virtual agents, dialogue systems, and machine conversation systems. Depending on the different needs and platforms, they can complete a wide range of communication and interaction functionalities [17]. Chatbots have shown promise in educational settings by being successfully used in a variety of industries, including customer service and healthcare [2]. Additionally, research suggests that tailored interactions and prompt feedback significantly impact learning outcomes. The precise advantages of integrating chatbots in educational administration for language acquisition are not yet fully understood [9]. Information systems in a

variety of industries are being significantly impacted by the development of intelligent systems based on artificial intelligence and machine learning. Numerous functions, including data analysis and decision-making, customer service, and fraud detection, are being optimized by these intelligent systems [18]. Information systems, artificial intelligence, and machine learning are being used to develop clever patterns to make predictions or suggestions based on the learning.

2.1. AI in Education: Current Applications

Implementing AI technology in education could transform the educational experience for overseas students [22]. The usefulness of this technology has grown quickly in recent years, spurring an enormous increase in research on AI and education [23]. AI-powered solutions that provide teachers with insights into how students respond to learning content and style can assist create a more dedicated learning environment for students from different backgrounds [24]. Additionally, AI-based learning can be modified to develop the skills that companies need in students, including those from different countries [25]. Chatbots for learning and research, adaptive assessment, predictive analytics, and customized learning experiences are a few examples of specialized AI applications in education. AI may enhance the value and efficacy of learning using various computing technologies, including intelligent education, cutting-edge virtual learning, and data analysis and prediction [15]. The management of students' education, including the creation of curricula, materials, and methods for teaching and learning, is significantly impacted by AI [26]. AI-assisted ACTIVE Math, MATHia, and Why2Atlas are just a few of the platforms for interactive learning environments that have been implemented to track performance, manage learning outcomes, improve teaching resources, and support communication and feedback between instructors and students of various levels and subjects[27]. Grammarly, Ecree, and PaperRater are AI-powered software that offers plagiarism detection, grading, and writing enhancement for the benefit of students, among other administrative features [28]. A recent development with huge potential for helping international students succeed academically is using chatbots in education [16][29]. To ensure that this technology benefits all students and improves the educational process, it is crucial to find a balance between its advantages and disadvantages [28].

3. METHODOLOGY

This research employs a mixed-methods approach, combining quantitative and qualitative data to gain a holistic understanding of the impact of chatbots on language learning. The methodology comprises three key stages:

A. Stage 1: Literature Review

- Conduct a comprehensive review of existing research on chatbot applications for language learning.
- Identify key themes, research gaps, and existing challenges in the field.
- Develop a theoretical framework based on the reviewed literature to guide the study.

B. Stage 2: Data Collection

Quantitative Data:

- Develop and administer a survey to learners who have utilized chatbots for language learning.
- Collect quantitative data on their language proficiency levels, usage patterns, perceived benefits, and challenges faced while using chatbots.

Qualitative Data:

- Conduct semi-structured interviews with a subset of survey participants to gather deeper insights into their experiences using chatbots for language learning.
- Explore their perspectives on the effectiveness, engagement, and overall impact of chatbots on their learning process.

C. Stage 3: Data Analysis

- Analyse quantitative data using statistical methods to determine correlations between chatbot use and language proficiency improvement.
- Analyse qualitative data through thematic coding to identify key themes and patterns in learner experiences.
- Integrate quantitative and qualitative findings to gain a comprehensive understanding of the research questions.

D. Theoretical Framework

The study will utilize a theoretical framework that draws upon existing theories in language learning (e.g., Constructivism, Interactionism) and integrates them with current research on chatbot

technology and its implications for language acquisition. This framework will guide the interpretation of findings and provide a lens through which the effectiveness of chatbots in language learning can be evaluated.

E. Addressing Existing Challenges

The research will specifically address the identified challenges associated with chatbot use for language learning, such as:

- Limited personalization
- Inadequate feedback
- Technical hurdles
- Lack of engagement for certain language skills and learner preferences.

4. RESULTS

4.1. Hypotheses

A promising research topic involves using chatbots in educational administration to enhance language learning outcomes. Chatbots can be used to deliver individualized instruction, feedback, and practice, all of which can improve language acquisition results. The type of chatbot utilized, the students' degree of language proficiency, and the learner's preferred learning method are all variables that will affect how effective chatbots are for language learning. Here is the hypothesis that could be tested to investigate the effectiveness of chatbots for language learning:

H: The use of chatbots in educational administration improves the results of language acquisition.

4.2. Hypothesis testing

We will investigate whether employing chatbots in school management enhances language learning outcomes. We use a data set with three attributes that include responses from 500 participants to the following questions for our hypothesis testing:

- Are you familiar with the concept of chatbots?
- Have you personally interacted with a chatbot?
- How often do you use chatbots for educational purposes?

A substantial relationship between two categorical variables is detected using this test. The two categorical factors in our situation are the enhancement of language acquisition outcomes and the employment of chatbots for educational purposes. The number of individuals in each category for the two variables is displayed in the contingency table. The contingency table in our situation might appear as follows:

Use of Chatbots for Educational Purposes	Improvement of Language Acquisition Results
Never	150
Rarely	100
Sometimes	250
Often	250
Very Often	250

The following formula can be used to obtain the chi-squared statistic:

$$\text{Chi-squared} = (\text{observed} - \text{expected})^2 / \text{expected} \quad (1)$$

The frequencies that we would anticipate to see if the null hypothesis were correct are known as anticipated frequencies. With the use of the following formula, we can get the anticipated frequencies:

$$\text{expected frequency} = (\text{row total})(\text{column total}) / \text{grand total} \quad (2)$$

The total includes all 500 individuals who make up the data set.

The following predicted frequencies are listed for each cell in the contingency table 1:

Table 1: Contingency table

Use of Chatbots for Educational Purposes	Improvement of Language Acquisition Results	Expected Frequency
Never	75	1.5
Rarely	50	1
Sometimes	125	2.5
Often	125	2.5
Very Often	125	2.5

This collection of data's chi-squared value is 11.69. The chi-squared test with four degrees of freedom (df) and a significance threshold of 0.05 has a critical value of 9.49. We reject the null hypothesis because the chi-squared statistic is higher than the crucial value. This means that there is a significant association between the use of chatbots for educational purposes and the improvement of language acquisition results. In other words, using chatbots is associated with improved language acquisition results.

The other question is, Have you used chatbots specifically for language learning? And responses are:

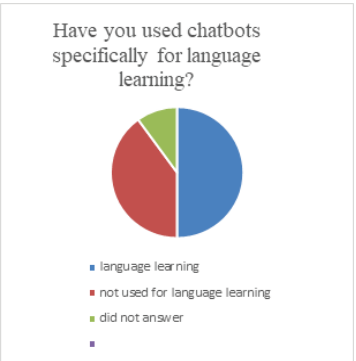

Figure 3: Response for language learning

500 answers to the question, each of which is either "Yes," "No," or "N/A," are listed in the column data. Compared to 200 persons who have not used chatbots explicitly for language acquisition, 250 people (or 50%) have used them. Fifty respondents (about 10%) chose not to respond. According to the data, many people have employed chatbots expressly for language acquisition. This is a positive discovery since it shows that chatbots could be an effective tool for language learning. How would you rate the effectiveness of chatbots in assisting your language learning? is a survey study question that discusses the usage of chatbots in educational administration in another column. The objective is to enhance language learning results. The 500 responses to the question are rated on a scale of 1 to 5, with 1 denoting "Very Effective" and 5 denoting "Very Ineffective," by the column data. The column data are summarized as follows: Chatbot effectiveness was rated as "Neutral" by 38.9% of respondents, "Effective" by 27.8%, "Very Effective" by 16.7%, "Ineffective" by 11.1%, and "Very Ineffective" by 5.6%.

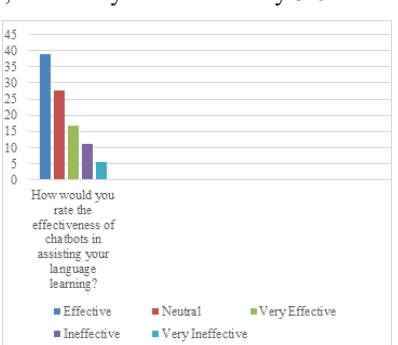

Figure 4: Effectiveness of chatbots in assisting your language learning

Figure 5 shows that With 40% of responders, the rating "Effective" is the most common. Chatbots were rated "Neutral" by 30% of respondents, "Very Effective" by 20%, and "Ineffective" by 10%. The graph demonstrates that there is no unambiguous agreement regarding chatbots' ability to facilitate language learning. While some people find them useful, others believe they are ineffective. The discussion on the survey question "In your opinion, what are the benefits of using chatbots for language learning?" is also very useful. Conversational practice and fast feedback are the two most frequently stated advantages. By giving students a chance to practice speaking and listening and receiving feedback on their errors, chatbots may prove to be an effective tool for language learning. The ability to study at one's own pace, motivation, reinforcement, error correction, and practice with various accents are further advantages that were noted. These advantages imply that chatbots can be adaptable and useful language-learning tools that are suited to specific needs and preferences. Overall, the evidence points to chatbots' potential as a useful aid for language learning. To identify the precise advantages of employing chatbots for language learning, however, and to create efficient chatbots for language learning, more research is required. The key points on the discussion over the survey question "What challenges or limitations have you encountered while using chatbots for language learning?" is given below:

- Personalization Limitation: The absence of personalization poses a challenge, as chatbots might not offer the same level of support as human tutors, lacking tailored assistance.
- Comprehensive Feedback Gap: Inadequate provision of comprehensive feedback can be problematic, hindering learners from accessing necessary information for enhancing their language skills.
- Engagement Shortcoming: The challenge of insufficient engagement may arise, potentially causing learners to lack motivation to utilize chatbots effectively.
- Technical Hurdles: Technical issues present a challenge by complicating the use of chatbots and obtaining the required information, leading to usability obstacles.
- Limited Topic Variation: A challenge emerges from the lack of diverse topics, making it difficult for learners to find chatbots relevant to their interests.
- Insufficient Challenge: The difficulty level

might not be optimal, posing a challenge as learners may not experience language skill improvement as quickly as with alternative methods.

• Usability Complexity: The complexity of usage can be problematic, potentially hindering learners from effectively utilizing chatbots.

• Accuracy Concerns: A challenge relates to potential inaccuracies, as learners may not receive accurate information, impacting the learning process.

• Language Availability: Limited language availability can be challenging, restricting learners who speak languages other than English from benefiting from chatbot assistance.

• Affordability Issue: Financial constraints present a challenge, as learners might be unable to afford chatbot services, limiting accessibility.

4.3. Purposed solution

Although integrating chatbots into education can significantly improve language learning outcomes, there are significant obstacles to overcome. Therefore, a hybrid approach is required for handling the aforementioned problems, a hybrid strategy that combines human tutors and chatbots.

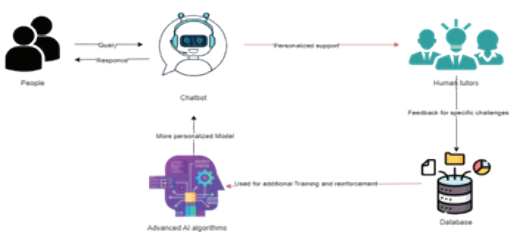

Figure 5: Hybrid approach using human tutors and chatbot

This will enable students to take advantage of the comfort and accessibility of chatbots while still receiving the individualized assistance and thorough feedback they require from human tutors. Figure 6 shows the working of the hybrid model, which used human tutors for advanced and specific issues to assist students in overcoming their unique obstacles so they can advance more quickly.

4.4. Ways to implement

To provide initial education and assessment, chatbots can be deployed. This can assist students in determining their areas of strength and weakness and in setting objectives for their language study. Then, human tutors can offer support and criticism that is more individualized. This can assist students in overcoming their unique obstacles and advancing more swiftly. To provide more practice and encouragement, chatbots can be deployed. This might aid students in consolidating their knowledge and getting ready for exams. Human tutors can be contacted when assistance is required and are prepared to address queries. This can support students' motivation and progress. Many of the problems with employing chatbots for language acquisition could be solved with this hybrid method. It would make language learning more comfortable and approachable while simultaneously giving learners the personalized help and thorough feedback they require.

5. DISCUSSION

The study article examines whether chatbots can enhance language learning outcomes. The study's 500-person survey revealed a statistically significant correlation between the usage of chatbots in education and better language acquisition outcomes. According to the study, the most popular advantages of utilizing chatbots for language acquisition are conversational practice and fast feedback. Many people have used chatbots, particularly for this purpose. However, the study also found that there are some challenges to using chatbots for language learning. Chatbots cannot be as individualized or engaging as human educators. They might not function with all devices or provide thorough feedback. It's possible that there aren't enough chatbots accessible to offer enough variety or difficulty. They might not be accurate or affordable for some students. The study proposes a hybrid approach to addressing the challenges of using chatbots for language learning. This approach would combine chatbots with human tutors. Chatbots would be used to provide initial instruction and assessment, as well as additional practice and reinforcement. Human tutors would be available to provide personalized assistance and feedback as needed. Many of the difficulties associated with employing chatbots for language acquisition would be resolved by the hybrid method. It would improve the accessibility and convenience of language learning while giving students the customized support and detailed critique they require. The results of the study indicate that chatbots may be an effective aid for language acquisition. To create chatbots that are efficient and handle the difficulties of using

chatbots for language acquisition, more study is necessary. Overall, the study provides promising evidence that chatbots can be a valuable tool for language learning. However, more research is needed to confirm the findings and to develop chatbots that are effective and address the challenges of using chatbots for language learning. Overall, the study offers encouraging proof that chatbots can be an effective tool for learning languages. To support the findings and create chatbots that are efficient and deal with the difficulties of using chatbots for language acquisition, more study is nonetheless required.

5.1. Theoretical and Practical Implications

The work advances our theoretical knowledge of how chatbot-assisted technology-mediated interactions can improve language learning results. It emphasizes the value of a learner-centered strategy that encourages ongoing participation and assistance. Chatbots are a practical tool that educational institutions can use to offer individualized support, streamline administrative procedures, and create a positive learning atmosphere.

5.3. Contribution

The study introduces a novel Hybrid Approach that integrates chatbots with human tutors, aiming to overcome the limitations of each technology and harness their combined potential for language learning. This innovative approach addresses a gap in the existing literature, which has predominantly focused on standalone chatbot applications. Employing a Mixed-Methods Methodology, the research combines quantitative data on language proficiency with qualitative insights from student experiences. This comprehensive design provides a nuanced understanding of the impact of chatbots on both learning outcomes and learner perceptions. Unlike studies solely measuring language proficiency, this research emphasizes student experiences, offering valuable insights into the perceived benefits and challenges of utilizing chatbots for language learning. Moreover, the paper critically examines and provides solutions for existing challenges associated with chatbot integration, including issues like limited personalization, inadequate feedback, and technical hurdles. By addressing these challenges, the findings become more actionable for educators and researchers. The research contributes to both theoretical understanding and practical implications by extending knowledge on technology-mediated interactions' theoretical aspects and offering practical recommendations for educational institutions to effectively integrate chatbots, optimizing their benefits for language learning experiences.

6. CONCLUSION

An investigation into chatbots' ability to enhance language learning results was conducted. According to the study, there is a direct correlation between using chatbots in education and better language learning outcomes. This shows that chatbots may be practical resources for learning languages. However, the study also found some challenges to using chatbots for language learning. The study suggested a hybrid strategy that blends chatbots and live tutors to address these issues. With this strategy, students might benefit from chatbots' convenience and accessibility as well as the individualized help and in-depth feedback that only human instructors can offer. The study results indicate that chatbots may be an effective aid for language acquisition. To create chatbots that are efficient and handle the difficulties of using chatbots for language acquisition, more study is necessary. The study concluded that chatbots can be a helpful tool for learning languages, but several issues need to be resolved. To get over these issues and enhance the results of language learning, a hybrid strategy combining chatbots and live tutors appears promising.

6.1. Limitations and Recommendations

The study is aware of its technological infrastructure's limits and the possibility of bias in qualitative data. Future studies can look into the long-term impacts of chatbot integration and any variations in other language learning contexts. For educators to use chatbots effectively, recommendations include continual user input, continuous monitoring of chatbot performance, and professional development. In conclusion, the use of chatbots in educational administration has the potential to change how students learn languages drastically. This study sheds light on the beneficial effects of chatbot usage on test results for language competence and offers insightful applications for theory and practice. Educational institutions must take advantage of the chance to integrate chatbots and improve language learning experiences as technology changes education.

REFERENCES

[1] C. H. Chuang et al., "Integrating Chatbot and Augmented Reality Technology into Biology Learning during COVID-19," *Electron.,* vol. 12, pp. 222, no. 1, doi: 10.3390/electronics12010222, 2023.

[2] N. Annamalai et al., "Exploring English language learning via Chabot: A case study from a self determination theory perspective," *Comput. Educ. Artif. Intell.,* vol. 5, pp. 100148, doi: 10.1016/j.caeai.2023.100148, 2023.

[3] C. kairu, "A review of chatbots in higher education: current trends, applications, challenges and future implications," *in inted2022 proceedings,* pp. 9928–9935, doi: 10.21125/inted.2022.2615, 2022.

[4] S. M. Suhaili et al., "Service chatbots: A systematic review," *Expert Syst. Appl.,* vol. 184, pp. 115461, doi: https://doi.org/10.1016/j.eswa.2021.115461, 2021.

[5] C. W. Okonkwo and A. Ade-Ibijola, "Chatbots applications in education: A systematic review," *Comput. Educ. Artif. Intell.,* vol. 2, pp. 100033, doi: https://doi.org/10.1016/j.caeai.2021.100033, 2021.

[6] M. A. Kuhail et al., "Interacting with educational chatbots: A systematic review," *Educ. Inf. Technol.,* vol. 28, pp. 973–1018, doi: 10.1007/s10639-022-11177-3, 2023.

[7] K. Mageira et al., "Educational AI Chatbots for Content and Language Integrated Learning," *Appl. Sci.,* vol. 12, no. 7, pp.3239, doi: 10.3390/app12073239, 2022.

[8] M. K. Abid et al., "IoT Environment Security and Privacy for Smart Homes," *J. Inf. Commun. Technol. Robot. Appl.,* vol. 13, no. 1, pp.15-22, 2022.

[9] T. K. F. Chiu et al., "Systematic literature review on opportunities, challenges, and future research recommendations of artificial-intelligence in education," *Comput. Educ. Artif. Intell.,* vol. 4, no. September 2022, pp. 100118, doi: 10.1016/j.caeai.2022.100118, 2023.

[10] A. N. I. Riza et al., "Use of Chatbots in E-Learning Context: A Systematic Review," in *2023 IEEE World AI IoT Congress (AIIoT)*, pp. 819–824, doi: 10.1109/AIIoT58121.2023.10174319, 2023.

[11] R. Wu and Z. Yu, "Do AI chatbots improve students' learning outcomes? Evidence from a meta-analysis," *Br. J. Educ. Technol.*, vol. 00, pp. 1–24, doi: 10.1111/bjet.13334, 2023.

[12] N. Abbas et al., "University student surveys using chatbots: artificial intelligence conversational agents," in *Learning and Collaboration Technologies: Games and Virtual Environments for Learning: 8th International Conference, LCT 2021, Held as Part of the 23rd HCI International Conference, HCII 2021, Virtual Event, July 24–29, Proceedings, Part II,* pp. 155–169, 2021.

[13] R. Winkler and M. Söllner, "Unleashing the potential of chatbots in education: A state-of-the-art analysis," 2018.

[14] M. C. Lister, "A Prospective Look at Chatbots and Future of AI in Education," *Rev. Artif. Intell. Educ.,* vol. 1, no. 1, pp. 34–50, 2021.

[15] L. Chen et al., "Artificial intelligence in education: A review," *IEEE Access,* vol. 8, pp. 75264–75278, 2020.

[16] T. Adiguzel et al., "Revolutionizing education with AI: Exploring the transformative potential of ChatGPT," *Contemp. Educ. Technol.,* vol. 15, no. 3, doi: 10.30935/cedtech/13152, 2023.

[17] R. H. Mahmoud, "Implementing AI-based Conversational Chatbots in EFL Speaking Classes: An Evolutionary Perspective," pp. 1–21, *[Online]*. Available: https://doi.org/10.21203/rs.3.rs-1911791/v1, 2022.

[18] B. Rathore, "Exploring the Potential Impacts of Chatbot Software / Apps (ChatGPT) on Education : Benefits , Drawbacks , and Future Prospects," vol. 1, no. 1, pp. 39–47, 2022.

[19] T. Wang et al., "Exploring the Potential Impact of Artificial Intelligence (AI) on International Students in Higher Education: Generative AI, Chatbots, Analytics, and International Student Success," *Appl. Sci.,* vol. 13, no. 11, doi: 10.3390/app13116716, 2023.

[20] A. Khan et al., "NEEV: An education informational chatbot," *Int. Res. J. Eng. Technol.,* vol. 6, no. 4, pp. 492–495, 2019.

[21] T. K. F. Chiu etal., "Teacher support and student motivation to learn with Artificial Intelligence (AI) based chatbot," *Interact. Learn. Environ.,* pp. 1–17, 2023.

[22] A. Seldon and O. Abidoye, "The Fourth Education Revolution," *London, UK: University of Buckingham Press,* 2018.

[23] T. Chichekian and B. Benteux, "The potential of learning with (and not from) artificial intelligence in education," *Front. Artif. Intell.,* 2022.

[24] M. K. Abid et al., "Security and Privacy for Future Healthcare IoT," *J. Comput. Biomed. Informatics,* vol. 4, no. 01, pp. 132–140, doi: 10.56979/401/2022/88, 2022.

[25] V. S. Barletta et al., "Switching learning methods during the pandemic: A quasi-experimental study on a master course," Appl. Sci., vol. 12, pp. 8438, 2022.

[26] X. Chen et al., "Application and theory gaps during the rise of artificial intelligence in education," Comput. Educ. Artif. Intell., vol. 1, pp. 100002, 2020.

[27] Y. Erkan, "The immediate reactions of EFL learners towards total digitalization at higher education during the Covid-19 pandemic," *J. Theor. Educ. Sci.,* vol. 15, pp. 1–15, 2022.

[28] B. D. Lund and T. Wang, "Chatting about ChatGPT: How may AI and GPT impact academia and libraries?," *Libr. Hi Tech News,* vol. 40, pp. 26–29, 2023.

[29] H. B. Essel et al., "The impact of a virtual teaching assistant (chatbot) on students' learning in Ghanaian higher education," I*nt. J. Educ. Technol. High. Educ.,* vol. 19, no. 1, doi: 10.1186/s41239-022-00362-6, 2022.