



AI-Driven Advancements in ESL Learner Autonomy: Investigating Student Attitudes Towards Virtual Assistant Usability

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Abstract

This research examines the impact of advanced machine learning-powered Virtual Assistants on promoting learner autonomy in English as a Second Language (ESL) education. It aims to assess the usability of Virtual Assistants like Alexa and uncover the challenges and opportunities associated with their integration into ESL learning environments. Employing a mixed-methods approach, this study evaluates the effectiveness of AI in enhancing ESL learner autonomy at the school level and compares AI-based learning with traditional classroom methods for ESL students aged 10 to 18. Data collection methods include feedback questionnaires, interviews, informal discussions, and an analysis of Alexa-based research. This research offers valuable insights for educators and learners, equipping them with innovative pedagogical tools to enhance the ESL learning experience. Ultimately, it explores how AI, specifically Virtual Assistants, can transform ESL education by fostering greater learner autonomy, enriching the educational landscape, and empowering students to take charge of their learning journeys.

Keywords: Virtual Assistants, Learner Autonomy, ESL Education, Artificial Intelligence, Technology Integration

1. Introduction

1.1 Overview of the Study

The continuous evolution of technology has been driven by humanity's desire for convenience and efficiency in daily life. While the roots of technology extend deep into the history of human civilization, its modern manifestation as electronic devices catering to contemporary societal needs has led to a surge in its integration into various sectors. According to Gençler (2015), education, in particular, has embraced technology's ascendancy due to its ubiquity and potential to prepare learners for the present and future dynamic demands. Integrating technology into educational paradigms necessitates meticulously examining its instructional efficacy, particularly concerning how it aids learning processes. Beyond mere academic enhancement, technology empowers learners to work more proficiently and to forge personalized learning environments. A captivating frontier within educational research is the intersection of Artificial Intelligence (AI) and virtual assistants (Alcorn, 2018). Unlike natural intelligence, these virtual entities harness machine intelligence, or AI, to serve as autonomous aides. This innovative realm harbors the potential to revolutionize learning methodologies, opening avenues to explore the deployment of AI in education. The ensuing study explores AI's multifaceted role in fostering learner autonomy, mainly focusing on acquiring English as a Second Language (ESL). This project aims to unveil opportunities for transformative educational practices by examining AI's integration into virtual learning environments.

The developing phase of this exploration was marked by Amazon's introduction of the Amazon Echo in 2015—a virtual assistant primarily available in the United States before expanding to numerous countries, including Pakistan. Harnessing voice-activated commands, the Echo proficiently executes tasks, constituting a symbolic instance of AI integration. The overarching objective of this research is to unravel the pivotal role AI plays in nurturing learner autonomy, a concept deeply entrenched in language learning. Over the past five decades, learner autonomy has been a cornerstone of education. Its pertinence in fostering effective language acquisition is acknowledged, stimulating practical research endeavors to comprehend and enhance this phenomenon. As AI penetrates diverse industries—ranging from finance to marketing to automotive—it beckons for its seamless integration into education and foreign language learning. While strides have been made in technological advancements within the e-learning sector, the fundamental delivery of education remains largely unaltered. This study seeks to metamorphose the conventional teaching and learning dynamics, leveraging AI's neural network capabilities to transform educators and learners. Notably, AI can empower corporations to bolster employees' language proficiency, enable individuals to engage in flexible, self-directed learning, and extend its reach to conventional educational institutions.

Crucially, the infusion of machine learning can revolutionize foreign language learning pedagogies. AI's potential to facilitate personalized pacing, nurture individualized competencies, and contemplate cultural contexts can elevate the efficacy of language acquisition. Furthermore, AI's predictive prowess—harnessed through the analysis of teacher-generated data—paves the way for anticipatory strategies to enhance students' future performance. Swift feedback mechanisms embedded in AI-powered language learning platforms present an unprecedented advantage, equipping students with real-time evaluations and corrective suggestions. Concomitantly, educators stand to benefit from AI's ability to discern curriculum gaps, thereby fine-tuning their instructional designs. While AI does not supplant teachers, it recalibrates their role from sage to guide, enabling them to scaffold learners on their educational journey. Baker and Smith (2019) find that teachers can devote more time to orchestrating diverse learning tasks with AI integration. Moreover, technologically adept individuals can evolve into data scientists, leveraging collected data to refine pedagogical approaches. Ilhan, Mušić, Junuz, and Mirza (2017) postulate that AI's transformative potential in foreign language learning is twofold: amplifying student autonomy and recalibrating teacher responsibilities. Consequently, this research envisions a paradigm shift in education, propelled by the integration of AI, fostering adaptable and enriched learning environments tailored to learners' diverse needs.



1.2 Research Background

Learner autonomy, a critical facet of effective language acquisition, transcends traditional learning models. Unlike conventional approaches that emphasize uniform outcomes, autonomous learning empowers individuals to assert agency over their learning trajectories. This phenomenon denotes the ability to shoulder responsibility for lifelong learning.

In the context of the 21st century, the ascent of digital technology has reconfigured various aspects of daily life, ushering in transformative changes in business, education, and trade. Information and Communication Technology (ICT) has emerged as a potent tool, ameliorating educational efficiency for both teachers and learners (Dockstader, 2008). This dynamic medium fosters seamless collaboration, catalyzing the exchange of ideas and expertise. ICT facilitates information presentation and fosters engagement and interaction, stimulating learning. Moreover, its integration has spawned communication tools—ranging from chat groups to discussion forums—that nurture collaboration among learners and educators.

1.3 Problem Statement

The acquisition of the English language has historically been seen as a time-consuming and challenging endeavor. Nevertheless, the emergence of AI-driven learning offers opportunities to mitigate these challenges, ultimately enhancing comprehension for both students and educators. This study thoroughly explores AI's role in fostering learner autonomy, with a specific emphasis on predicting the usability of virtual assistants. Throughout this investigation, the study aims to pinpoint the challenges linked to the integration of advanced virtual technology into contexts focused on acquiring a second language.

1.4 Objectives

This study outlines a comprehensive set of research objectives aimed at investigating the effectiveness of Alexa AI in promoting ESL learner autonomy, language accuracy, and fluency. These objectives are as follows:

- Assess the effectiveness of Alexa AI in promoting ESL learner autonomy, language accuracy, and fluency within the school environment.
- Investigate the challenges and opportunities associated with integrating the Alexa virtual assistant device, specifically the 'Eco Dot,' to enhance ESL learner autonomy using a mixed-methods approach.
- Explore the optimal application of Artificial Intelligence technology to benefit ESL learners and cultivate their autonomy in the classroom setting.
- Compare the impacts of AI-driven learning techniques and traditional classroom practices on advancing learner autonomy.
- Examine the relationship between AI-based teaching strategies and enhancing learner autonomy.

1.6 Significance

The significance of this study extends beyond academia, carrying implications for educators, learners, and the broader educational landscape. By investigating the interplay between Artificial Intelligence and learner autonomy within the context of ESL education, this research offers educators insights into innovative methodologies to enhance language acquisition. It equips them with a diversified toolkit to cater to individual learner needs, fostering more engaging and compelling learning experiences. This study's findings also contribute to the ongoing discourse on integrating technology into education, informing policymakers and administrators on leveraging AI to create adaptable and innovative learning environments. Ultimately, this research bridges theory with practice, potentially revolutionizing pedagogical approaches and enriching the educational journey for current and future ESL learners.

2. Literature Review

2.1 The Evolution of AI in Education

In recent years, there has been a significant surge in studies concerning the integration of AI into education. Initially, these efforts were primarily focused on structuring innovative teaching systems that emphasize individualized learning experiences derived from student feedback and performance. However, as technological advancements continue to grow at a rapid pace, AI has expanded its applications to various facets of education. With the emergence of AI-powered virtual assistants, the role of AI has become increasingly prominent in various educational sectors (Russel & Norvig, 2010). Studies in this field have demonstrated the successful implementation of AI-driven projects aimed at enhancing learner engagement, customizing classroom content to meet individual learner needs, and providing real-time responses (Popenici & Kerr, 2017). Within the realm of ESL education, these recent developments have prompted the creation of language learning approaches tailored to address the specific language needs and priorities of learners.

2.2 Learner Autonomy in Second Language Acquisition

Learner autonomy has remained a significant focus in language education over the years. Fenner (2000) defines learner autonomy as the ability of learners to take ownership of their learning process, make informed decisions, and self-regulate their learning. Research on learner autonomy has consistently highlighted its positive impact on learners' motivation levels, classroom engagement, and overall language proficiency. Benson (2001) underscores the importance of fostering learner autonomy in language classrooms, emphasizing its crucial role in developing sustainable learning skills. However, implementing learner autonomy in real-life classroom settings has proven to be challenging, requiring pedagogical techniques that can support self-guided exploration and informed decision-making throughout the learning journey. This sets the stage for an exploration of how AI can incorporate principles of learner autonomy to enrich the learning experience.

2.3 AI-Assisted Language Learning: Opportunities and Challenges

The integration of AI into language learning education presents numerous opportunities, particularly in the context of fostering learner autonomy. Dousay & Hall (2018) suggest that AI-based applications and platforms can offer customized learning content, adapt to learners' progress, and provide real-time feedback, thus promoting a personalized autonomous learning approach. Virtual assistants and chatbots can simulate authentic classroom interactions and enhance speaking and listening abilities. AI's data-driven insights also empower educators to monitor interventions that cater to unique learning needs. However, these models are not without challenges, including concerns related to data privacy protection, culturally sensitive materials, and the need to strike a balance between AI assistants and genuine human interaction. Understanding the opportunities and challenges associated with AI integration is crucial for the effective implementation of AI-based approaches.

2.4 The Cognitive and Socio-Cultural Factors of AI Integration in Language Learning

Research suggests that AI integration can stimulate cognitive development in language learners. The adaptability of AI-powered platforms, capable of assessing learners' strengths and weaknesses, facilitates personalized learning pathways. This adaptability aligns with cognitive theories that emphasize individualized learning, leading to improved memory retention and comprehension. The adaptive nature of AI contributes to constructing scaffolded learning experiences, enabling learners to progressively build on their existing language skills, in line with the principles of cognitive constructivism. These insights underscore the potential synergy between AI technology and cognitive learning theories, highlighting their joint impact on learner autonomy within ESL contexts.

Wolters, Kelly, and Kilgour (2016) emphasize that the integration of AI in ESL education does not exist in isolation but intersects with socio-cultural dynamics. Language learning is deeply rooted in cultural nuances, and AI platforms should be attuned to these intricacies. The cultural context significantly influences learners' language preferences, communication styles, and learning objectives. Recognizing and accommodating these socio-cultural factors in AI-driven language learning platforms ensures that technology enhances rather than diminishes the richness of language acquisition experiences. By exploring how AI platforms address socio-cultural dimensions, this study enriches our understanding of technology's impact on learner autonomy from a cultural perspective.

2.5 Empowering Educators in AI-Integrated ESL Environments

The role of educators in AI-infused ESL education is of paramount importance. While AI platforms can enhance learner autonomy, educators remain instrumental in guiding learners' interactions with these technologies. Horn (2018) argues that educators are transitioning from being mere transmitters of knowledge to becoming facilitators of technology-enhanced learning experiences. This paradigm shift necessitates equipping educators with the skills to leverage AI effectively. Research on professional development programs that empower educators to navigate AI-integrated environments is crucial for optimizing the potential of these platforms in promoting learner autonomy.

2.6 Key Findings and Research Gaps

While the literature recognizes AI's potential to promote learner autonomy in ESL education, a critical examination reveals gaps that warrant further investigation. There is a need for more research explicitly exploring how AI-powered virtual assistants influence the autonomy and language acquisition of ESL learners. Existing studies often focus on general AI applications or technical aspects, overlooking the nuanced interplay between AI and learner autonomy within the ESL context. Additionally, limited research delves into the perspective of educators, shedding light on their role in facilitating AI-supported autonomous learning. Furthermore, the impact of cultural factors on AI-driven language learning experiences still requires exploration. This study aims to address these gaps by examining the role of AI in enhancing ESL learner autonomy and identifying challenges and opportunities within this context.

This study assumes significance in the broader context of education by bridging the gap between AI technology and learner autonomy within ESL education. By investigating the role of AI-powered virtual assistants in promoting learner autonomy, this research contributes to the practical implementation of AI in education. Furthermore, it provides insights into the interplay between technological advancements and the pedagogical principles of autonomous language learning. The findings of this study will not only enrich our understanding of AI's potential but also guide educators, policymakers, and researchers in harnessing AI to create tailored ESL learning experiences that empower learners to take ownership of their language acquisition journey.

3. Research Methodology

3.1 Research Methods and Methodology

Research methods are essential tools that guide scientific inquiry and encompass various approaches, such as experimental studies, theoretical analyses, and statistical methodologies. Research methodology, as defined by Creswell, pertains to the systematic techniques employed to collect and evaluate data to address research questions. This study employs a combination of methods to comprehensively understand the phenomenon under investigation. Specifically, it adopts a one-group descriptive Classroom Action Research (CAR) approach, focusing on enhancing learners' autonomy through Alexa Artificial Intelligence. The research design follows a systematically planned process, involving classroom observations, diagnostic assessment tests, feedback questionnaires, quizzes, and a final test. Thirty matriculation students participate in English language learning facilitated by Alexa AI. The CAR approach ensures real-world application of concepts and emphasizes learners' active involvement in their education. By combining quantitative and qualitative approaches, grounded in positivism for empirical research and Classroom Action Research for real-world educational settings, this study investigates AI's impact on learner autonomy.

3.2 Sampling and Instrumentation

The research participants consist of 30 students from the 9th grade, including 14 male and 17 female students from a private sector school in Multan. These matriculation-level students, all from the same class, engage in English language learning using Alexa AI. The participants' diverse educational backgrounds and geographical origins contribute to the study's ecological validity.

A combination of research instruments is employed to ensure data validity and reliability. These instruments include diagnostic assessment tests, observation checklists, feedback questionnaires, quizzes, and a final test, designed to gather relevant data from various sources. However, for the purpose of this presentation, only the results of the feedback questionnaire will be included.

3.3 Delimitation of The Study

Several limitations were encountered during the research, including the restricted sample size of 30 participants and the exclusive focus on matriculation-level students. The study's scope is confined to teaching techniques and challenges arising from behavioral variations. The research timeline is intentionally kept short to maintain focus and precision. These delimitations were chosen to ensure the study's effectiveness and clarity in addressing specific research objectives.

3.4 Data Collection Procedure

Controlled techniques are employed to collect data, utilizing primary sources and interviews. Lesson plans emphasizing autonomous learning are designed and implemented through interactive classroom sessions. The research process includes classroom observations, feedback questionnaires, personal interviews, and a mix of quantitative and qualitative methods. Data analysis encompasses both methodologies to comprehensively explore the research questions.

In summary, the methodology adopted in this study combines experimental and Classroom Action Research approaches to investigate the effects of AI on learner autonomy. The use of various research instruments and techniques contributes to the robustness of the study's findings and conclusions.

4. Data Analysis

The data analysis and results regarding students' feedback are summarized as follows:

a) Feedback Questionnaire Analysis (Autonomous Learning Related Abilities Questions)

A response frequency table was generated based on respondents' answers to questions related to autonomous learning skills when using Alexa A.I. Table 1 shows the frequency and proportions of different responses. Each question had multiple options, such as "Slightly agree," "Moderately agree," and "Strongly agree." The percentages and cumulative percentages were calculated for each response. The analysis revealed that participants generally showed interest and positive reactions to using autonomous learning skills with Alexa A.I.

b) Univariate Analysis (Autonomous Learning Skills and Classroom Activities Questions)

Another response frequency table was created for questions about acquiring autonomous learning skills and classroom activities. Like the previous table, Table 2 displays different responses' frequency, percentage, and valid percentage. The analysis showed participants' preferences for various autonomous learning activities, with most respondents expressing interest in the activities presented.

c) Descriptive Analysis (Autonomous Learning Skills and Classroom Activities Scores):

The descriptive statistics were calculated for composite variables representing autonomous learning skills and classroom activity scores. The mean, median, mode, standard deviation, skewness, and other measures were presented (Table 3). This analysis provided an overview of the participants' overall scores concerning autonomous learning skills and classroom activities.

Table 1. Participants' response frequency table related to autonomous learning skills questions

	Responses	Frequency	Percent	Valid Percent	Cumulative %
Q-1	Slightly agree	14	46.7	46.7	46.7
	Moderately agree	7	23.3	23.3	70.0
	Strongly agree	9	30.0	30.0	100.0
	Total	30	100.0	100.0	
Q-2	Slightly disagree	7	23.3	23.3	23.3
	Slightly agree	9	30.0	30.0	53.3
	Moderately agree	11	36.7	36.7	90.0
	Strongly agree	3	10.0	10.0	100.0
	Total	30	100.0	100.0	
Q-3	Slightly disagree	2	6.7	6.7	6.7
	Slightly agree	14	46.7	46.7	53.3
	Moderately agree	11	36.7	36.7	90.0
	Strongly agree	3	10.0	10.0	100.0
	Total	30	100.0	100.0	
Q-4	Slightly disagree	1	3.3	3.3	3.3
	Slightly agree	13	43.3	43.3	46.7
	Moderately agree	12	40.0	40.0	86.7
	Strongly agree	4	13.3	13.3	100.0
	Total	30	100.0	100.0	
Q-7	Slightly disagree	1	3.3	3.3	3.3
	Slightly agree	12	40.0	40.0	43.3
	Moderately agree	12	40.0	40.0	83.3
	Strongly agree	5	16.7	16.7	100.0
	Total	30	100.0	100.0	
Q-12	Slightly disagree	4	13.3	13.3	13.3
	Slightly agree	7	23.3	23.3	36.7
	Moderately agree	12	40.0	40.0	76.7
	Strongly agree	7	23.3	23.3	100.0
	Total	30	100.0	100.0	
Q-15	Slightly agree	3	10.0	10.0	10.0
	Moderately agree	12	40.0	40.0	50.0
	Strongly agree	15	50.0	50.0	100.0
	Total	30	100.0	100.0	
Q-16	Slightly agree	10	33.3	33.3	33.3
	Moderately agree	16	53.3	53.3	86.7
	Strongly agree	4	13.3	13.3	100.0
	Total	30	100.0	100.0	

Table 2. Respondents' response frequency table related to autonomous learning activities questions

	Responses	Frequency	Percent	Valid Percent	Cumulative Percent
Q-5	Slightly disagree	2	6.7	6.7	6.7
	Slightly agree	18	60.0	60.0	66.7
	Moderately agree	10	33.3	33.3	100.0
	Total	30	100.0	100.0	
Q-6	Slightly disagree	2	6.7	6.7	6.7
	Slightly agree	11	36.7	36.7	43.3
	Moderately agree	16	53.3	53.3	96.7
	Strongly agree	1	3.3	3.3	100.0
	Total	30	100.0	100.0	
Q-8	Slightly disagree	2	6.7	6.7	6.7
	Slightly agree	5	16.7	16.7	23.3
	Moderately agree	16	53.3	53.3	76.7
	Strongly agree	7	23.3	23.3	100.0
	Total	30	100.0	100.0	
Q-9	Slightly disagree	1	3.3	3.3	3.3
	Slightly agree	8	26.7	26.7	30.0
	Moderately agree	15	50.0	50.0	80.0

	Strongly agree	6	20.0	20.0	100.0
	Total	30	100.0	100.0	
Q-10	Slightly disagree	1	3.3	3.3	3.3
	Slightly agree	10	33.3	33.3	36.7
	Moderately agree	16	53.3	53.3	90.0
	Strongly agree	3	10.0	10.0	100.0
	Total	30	100.0	100.0	
Q-11	Slightly disagree	2	6.7	6.7	6.7
	Slightly agree	11	36.7	36.7	43.3
	Moderately agree	15	50.0	50.0	93.3
	Strongly agree	2	6.7	6.7	100.0
	Total	30	100.0	100.0	
Q-13	Slightly agree	10	33.3	33.3	33.3
	Moderately agree	14	46.7	46.7	80.0
	Strongly agree	6	20.0	20.0	100.0
	Total	30	100.0	100.0	
Q-14	Slightly disagree	2	6.7	6.7	6.7
	Slightly agree	4	13.3	13.3	20.0
	Moderately agree	13	43.3	43.3	63.3
	Strongly agree	11	36.7	36.7	100.0
	Total	30	100.0	100.0	

Table 3. Univariate analysis for autonomous learning skills and classroom activities individual variables

Question no.	N	Minimum	Maximum	Mean	Std. Deviation
Q1	30	3	6	4.33	.959
Q2	30	4	6	4.83	.874
Q3	30	3	6	4.50	.777
Q4	30	3	6	4.63	.765
Q7	30	3	6	4.70	.794
Q12	30	3	6	4.73	.980
Q15	30	4	6	5.40	.675
Q16	30	4	6	4.80	.664
Q5	30	3	5	4.27	.583
Q6	30	3	6	4.53	.681
Q8	30	3	6	4.93	.828
Q9	30	3	6	4.87	.776
Q10	30	3	6	4.70	.702
Q11	30	3	6	4.57	.728
Q13	30	4	6	4.87	.730
Q14	30	3	6	5.10	.885
Valid N (list-wise)	30				

The data analysis section extensively examined students' feedback regarding the integration of autonomous learning skills with Alexa A.I. This analysis encompassed response frequency tables pertaining to questions about autonomous learning abilities and classroom activities. These tables unveiled the distribution of responses and participant preferences. Moreover, the descriptive analysis offered valuable insights into participants' scores related to independent learning skills and classroom activities, including measures such as mean, median, mode, and standard deviation. Furthermore, frequency distribution tables depicted the distribution of scores within specific ranges for both skill categories.

The results strongly indicated that students displayed positive attitudes and a keen interest in utilizing autonomous learning skills with Alexa A.I. and actively participating in associated classroom activities.

5. Findings

The objective of this study was to address the research questions and achieve the study's goals. The findings from the data analysis are summarized below:

- Enhancing Learner Autonomy:** The primary goal was to enhance and assess learners' autonomy using Amazon Echo Dot technology. It was observed that traditional teaching methods in private schools limit cognitive development, while public colleges' emphasis on rote learning hampers language mastery.
- Lack of Autonomous Learning Practice:** Students often need more opportunities for autonomous learning due to the absence of interactive learning environments. This deficiency hampers the development of essential independent learning skills.
- Positive Impact of Amazon Alexa:** The study revealed that the integration of Amazon Alexa and its associated activities significantly contributed to developing autonomous learning skills. The challenging tasks engaged students' critical thinking abilities and motivated them to participate actively.
- Improved Language Skills:** Participants' feedback questionnaires indicated a notable improvement in language skills and self-confidence. Learners reported enjoyment and engagement with the tasks, which enhanced their language competence.
- Group Activities and Interaction:** Group activities facilitated interaction and improved student communication skills. Participants became more capable of handling diverse opinions and engaging in meaningful group discussions.
- Enhanced Cognitive Abilities:** The study's outcomes demonstrated enhanced critical and creative thinking abilities among participants. The integration of new teaching methods further supported cognitive development.

7. **Beneficial Impact of Fusion Lessons:** Fusion lessons were found to be particularly effective in fostering cognitive abilities. Students enrolled in these lessons demonstrated better autonomous learning skills, contributing to improved performance and self-confidence.
8. **Positive Classroom Environment:** The infusion of innovative lessons positively influenced the learning environment. Students reported heightened engagement and expressed satisfaction with their performance.
9. **Long-lasting Effects:** The study suggested that the benefits of the implemented strategies are likely to endure over time as learners continue to refine their skills.

The study highlights the critical importance of enhancing learner autonomy. It emphasizes that traditional teaching methods employed in private schools may inadvertently limit cognitive development, while public colleges' heavy reliance on rote learning can hinder language mastery. This observation underscores the need for educational institutions to prioritize strategies that foster autonomous learning, allowing students to think critically and independently.

A significant issue identified in the study is the lack of autonomous learning practice. The absence of interactive learning environments was found to hamper the development of essential independent learning skills among students. This deficiency indicates a pressing need for educational reforms that create more opportunities for autonomous learning, preparing students for self-directed learning in real-world scenarios. The positive impact of Amazon Alexa and associated activities on developing autonomous learning skills is a noteworthy finding. The integration of this technology was found to engage students' critical thinking abilities and motivate active participation. This suggests that technology-enhanced learning can be pivotal in cultivating autonomous learners by providing challenging and interactive learning experiences. Another positive outcome of the study was the improvement in language skills and self-confidence reported by participants. Learners' enjoyment and engagement with tasks involving Amazon Alexa technology enhanced their language competence, highlighting the potential of such immersive and enjoyable learning experiences. The study also emphasizes the benefits of group activities in improving student communication skills. Participants became more adept at handling diverse opinions and engaging in meaningful group discussions, emphasizing the importance of collaborative learning in fostering autonomous learners.

In summary, these findings underscore the multifaceted nature of enhancing learner autonomy and the positive impact of technology, group activities, and innovative pedagogical approaches in achieving this goal. The study provides valuable insights for educators and institutions seeking to create effective and engaging learning environments that empower students to become autonomous and lifelong learners.

6. Conclusion

The conclusions drawn from this study have profound implications for education, specifically highlighting the crucial role that autonomous learning strategies play in elevating language education and fostering cognitive growth. The successful integration of Amazon Echo Dot technology alongside innovative pedagogical approaches yielded positive outcomes and actionable insights. It serves as a catalyst for improving language proficiency, enhancing critical thinking skills, and promoting active participation within the classroom. Importantly, the implications of this study go beyond its immediate scope, shedding light on the broader challenges inherent in the Pakistani education system. It underscores the urgency of revamping teacher training methodologies to align with modern language teaching research, paving the way for more progressive and effective educational practices. In the ever-evolving landscape of education, these findings serve as a call to embrace innovative strategies to enhance learning outcomes and promote the holistic development of students.

6.1 Recommendations

Based on the study's findings, several recommendations can be made:

- **Integration of Modern Technology:** Educational institutions should explore the integration of modern technology, such as virtual assistant devices, to enhance autonomous learning opportunities and student engagement. This could involve the incorporation of AI-driven tools into the curriculum to create interactive and dynamic learning experiences.
- **Teacher Training Programs:** Adequate training programs should be designed and implemented to equip teachers with the latest language teaching methodologies and technologies. Teachers need to be prepared to create dynamic and interactive learning environments that leverage technology effectively.
- **Promotion of Autonomous Learning:** Educational institutions should actively encourage autonomous student learning practices. This can be achieved by designing progressive and engaging activities that promote self-directed exploration and learning. Providing students with opportunities to take ownership of their learning journey is crucial.
- **Long-term Impact Assessment:** Ongoing research should be conducted to assess the long-term impacts of autonomous learning strategies and technology integration on language proficiency and cognitive development. This will help in understanding the sustainability and effectiveness of these approaches over time.

In summary, this study offers valuable insights into the potential of autonomous learning strategies and technology integration in education. Implementing the recommendations mentioned above can contribute to more effective and student-centered language education in Pakistan and beyond.

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Bio-note:

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References

- Alcorn, A. M. (2018). Blending human and artificial intelligence to support autistic children's social communication skills. *ACM Transactions on Computer-Human Interaction (TOCHI)*, 25(6), 35.

- Baker, T., & Smith, L. (2019). Educ-AI-tion rebooted. Exploring the future of artificial intelligence in schools and colleges. Available online at [media.nesta.org.uk \(www.media.nesta.org.uk/documents/Future_of_AI_and_education_v5_WEB.pdf\)](http://media.nesta.org.uk/documents/Future_of_AI_and_education_v5_WEB.pdf)
- Benson, P. (2001). *Teaching and researching autonomy in language learning*. London: Longman.
- Creswell, J. W. (2009). *Research design: Qualitative and mixed methods approach*. London and Thousand Oaks: Sage Publications.
- Dockstader, J. (2008). Teachers of the 21st century know the what, why, and how of technology integration. Available online at the-tech.mit.edu (<http://the-tech.mit.edu/Chemicool/>)
- Dousay, T. A., Hall, C. (2018). *Alexa, tell me about using a virtual assistant in the classroom*. In *EdMedia + Innovate Learning* (pp. 1413–1419). Association for the Advancement of Computing in Education (AACE)
- Fenner, A-B. (2000). Learner autonomy. In A-B Fenner & D. Newby (2000) *Approaches to materials design in European textbooks: Implementing principles of authenticity, learner autonomy, cultural awareness*. Strasbourg: Council of Europe Publishing.
- Gençlter, B. (2015). *How does technology affect the language learning process at an early age?* *Procedia Social and Behavioral Sciences*, 199, 311–316.
- Horn, M. B. (2018). *Hey Alexa, can you help kids learn more?* *Education Next*, 18(2), 82-83.
- Ilhan, K., Mušić, D., Junuz, E., Mirza, S. (2017). Scarlet-artificial teaching assistant. Paper presented at *International Conference on Control, Artificial Intelligence, Robotics & Optimization (ICCAIRO)*. IEEE.
- Popenici, S., & Kerr, S. (2017). *Exploring the impact of artificial intelligence on teaching and learning in higher education*. *Research and Practice in Technology Enhanced Learning*, 12(1). <https://doi.org/10.1186/s41039-017-0062-8>.
- Russel, S., & Norvig, P. (2010). *Artificial intelligence - a modern approach*. New Jersey: Pearson Education.
- Wolters, M. K., Kelly, F., & Kilgour, J. (2016). Designing a spoken dialogue interface to an intelligent cognitive assistant for people with dementia. *Health Informatics Journal*, 22(4), 854-866.

Appendix

Feedback Questionnaire for Learners (Edited)

Disagree Slightly	Agree Slightly	Neutral	Agree Moderately	Agree Strongly
1	2	3	4	5

Q. No.	Statement	1	2	3	4	5
Q.1	I find Amazon Alexa in the Classroom enjoyable.					
Q.2	Reading short stories with Alexa has been enjoyable for me.					
Q.3	The presented content was engaging and held my attention well.					
Q.4	I believe Alexa has contributed to improving my general knowledge.					
Q.5	I have enjoyed using Alexa skills.					
Q.6	I think Alexa has been helpful for problem-solving and cooperative learning.					
Q.7	I find this learning approach enjoyable.					
Q.8	I have a positive attitude towards participating in group discussions.					
Q.9	I can afford an Amazon Echo Alexa device.					
Q.10	I would appreciate having assistance from Alexa in my daily life.					
Q.11	The Ask Alexa Activity allowed me to express my opinions and thoughts.					
Q.12	I am open to receiving assistance from Alexa during quizzes.					
Q.13	I enjoy learning through various interactive activities.					
Q.14	Using Alexa to translate sentences is something I like.					
Q.15	The teacher has ensured the active participation of all students in classroom activities.					
Q.16	I have explored and learned new learning techniques.					