https://journal.ypidathu.or.id/index.php/ijlul/
P - ISSN: 3026-7102
E - ISSN: 3030-8372

Strengthening English Language Learning through Artificial Intelligence-Based Mobile Applications: A Comparative Study in Formal and Informal Contexts

Ira Nurmala[1], Ali Reza[2], Carli Apriansyah Hutagalung[3], Petrus Jacob Pattiasina[4], Jimmy Malintang[5]
[1]Sekolah Tinggi Ilmu Kesehatan Pelita Ibu, Indonesia
[2]University of Tehran, Iran
[3]Universitas Media Nusantara Citra, Indonesia
[4]Universitas Pattimura, Indonesia
[5]Universitas Islam Negeri Walisongo Semarang, Indonesia

ABSTRACT

Background. AI-based mobile applications are revolutionizing language learning by offering personalized, adaptable tools. Their impact differs across various learning environments, prompting the necessity for a comparative study to understand these variances better.

Purpose. This study aims to compare the effectiveness of AI-based mobile applications for English language learning in formal classroom settings versus informal self-study environments. The goal is to determine how these tools perform across different contexts and identify the optimal conditions for their use.

Method. A comparative study was conducted involving high school and university students in formal educational settings and adult learners in informal self-study settings. Over three months, participants utilized AI-based language learning applications. Data collection involved pre- and post-tests to measure learning outcomes, alongside surveys and interviews to gauge user experiences and preferences.

Results. Analysis revealed significant improvements in both learning environments, with formal settings showing a 12% increase in test scores and informal settings an 8% increase. Students in formal settings more frequently engaged with interactive features, whereas informal learners gravitated towards self-study tools. Engagement and interaction levels were notably higher in formal educational settings compared to informal ones.

Conclusion. AI-based mobile applications significantly enhance English language learning, particularly in structured, formal environments. The findings underscore the importance of tailoring these tools to fit different learning contexts. While both formal and informal settings benefit from these applications, formal education environments seem to leverage their interactive features more effectively, resulting in higher engagement and better learning outcomes. This study highlights the need for educators and developers to consider context-specific strategies to maximize the benefits of AI-based language learning tools.

KEYWORDS

AI-based Learning, Formal Learning, Informal Learning, Language Education, Mobile Applications

Citation: Nurmala, I., Reza, A., Hutagalung, A,C., Pattiasina, J, P., & Malintang, J. (2024). Strengthening English Language Learning through Artificial Intelligence-Based Mobile Applications: A Comparative Study in Formal and Informal Contexts. *International Journal of Language and Ubiquitous Learning*, *2*(4), 470–479.
https://doi.org10.70177/ijlul.v2i4.1764

Correspondence:

Ira Nurmala,
iranurmala07@gmail.com

Received: December 15, 2024

Accepted: December 17, 2024

Published: December 29, 2024

INTRODUCTION

Artificial Intelligence (AI) has revolutionized various fields, including education, by providing innovative

solutions to enhance learning experiences (Christou, 2023). In the context of language learning, AI-based mobile applications have gained popularity due to their accessibility, interactive features, and personalized learning paths. These applications use AI algorithms to adapt to individual learner needs, providing tailored feedback and support (Nadarzynski dkk., 2019).

Language learning is a complex process that involves acquiring various skills, including listening, speaking, reading, and writing. Traditional classroom settings often face limitations, such as large class sizes and limited individual attention, which can hinder effective language acquisition (Abdelhadi, 2020). AI-based mobile applications offer a complementary tool to traditional methods, allowing learners to practice and improve their language skills at their own pace (Adebileje, 2020).

Several studies have shown that AI-based mobile applications can significantly improve language learning outcomes (Jia, 2022). For example, these applications can provide instant feedback on pronunciation, grammar, and vocabulary usage, helping learners to correct mistakes and reinforce their understanding. Additionally, the use of gamification elements in these apps can increase learner engagement and motivation (Duarte, 2019).

The informal context of language learning, such as through mobile applications, provides learners with more flexibility and convenience (Alsager, 2020). Learners can access language learning materials anytime and anywhere, making it easier to integrate language practice into their daily routines. This flexibility is particularly beneficial for adult learners who may have work or family commitments that limit their availability for formal language classes (Alsaadi, 2022; Al-Shammari, 2020).

The use of AI in mobile applications also allows for continuous assessment and progress tracking. Learners can receive regular updates on their performance, identify areas for improvement, and set personalized learning goals. This data-driven approach enables a more targeted and efficient learning process, as learners can focus on specific skills that need development (An, 2021; Chen, 2021).

Despite the advantages of AI-based mobile applications, their effectiveness in different learning contexts, such as formal classroom settings versus informal self-study environments, remains a subject of ongoing research. Understanding how these applications perform in various contexts can provide valuable insights for educators and policymakers to design more effective language learning programs that leverage the strengths of AI technology (Alam, 2019; Alrasheedi, 2021).

The differential impact of AI-based mobile applications on English language learning in formal classroom settings versus informal self-study contexts is not fully understood. While these applications show promise, the extent to which their benefits vary between these two learning environments requires further exploration. Insights into how learners engage with AI tools differently in formal and informal settings are essential to optimize their effectiveness (Bice, 2019; Bin-Hady, 2021).

The specific features of AI-based applications that contribute most significantly to learning outcomes in different contexts remain unclear. It is not well-defined which aspects of these applications, such as personalized feedback, gamification, or adaptive learning paths, are most beneficial in formal education compared to informal learning. Identifying these key features will help in tailoring applications to better meet the needs of learners in various environments (Anam, 2020; Arslan, 2020).

The long-term efficacy and retention of language skills acquired through AI-based mobile applications in informal contexts have not been extensively studied. While short-term improvements are often reported, understanding how these gains translate into sustained language

proficiency is crucial. Research is needed to evaluate the durability of learning outcomes achieved through informal, AI-driven language practice (Barrs, 2020).

There is limited data on the scalability and accessibility of AI-based mobile applications across diverse learner populations. The effectiveness of these tools for learners with different backgrounds, levels of language proficiency, and access to technology varies. Comprehensive studies are required to assess how well these applications cater to a broad spectrum of learners and identify potential barriers to their widespread adoption (Aldobekhi, 2024).

The integration of AI-based mobile applications with traditional teaching methods in formal educational settings is underexplored. How these applications can complement and enhance existing curricula and teaching practices is not fully understood. Research is needed to develop strategies for effectively incorporating AI tools into the classroom to support teachers and enhance student learning outcomes (Alefesha, 2019).

Understanding the differential impact of AI-based mobile applications in formal and informal learning contexts is crucial for optimizing their use. By exploring how learners interact with these tools in different environments, researchers can identify best practices for their implementation. This research aims to fill this gap by comparing the effectiveness of AI-based applications in structured classroom settings and flexible self-study scenarios (M. M. Ali, 2023).

Identifying the key features of AI-based applications that contribute most significantly to language learning outcomes will help in designing more effective tools. By determining which aspects of these applications are most beneficial in formal versus informal contexts, developers can create tailored solutions that better support learners' needs. This research focuses on evaluating the impact of personalized feedback, gamification, and adaptive learning paths on learning outcomes (Annamalai, 2023).

Evaluating the long-term efficacy and retention of language skills acquired through AI-based mobile applications will provide valuable insights into their effectiveness. By assessing the sustainability of language proficiency gains, researchers can determine the true value of these tools in informal learning contexts. This research aims to investigate the durability of learning outcomes achieved through AI-driven language practice, contributing to a deeper understanding of their long-term benefits (Anchunda, 2022).

RESEARCH METHODOLOGY

The research design involves a comparative study to evaluate the effectiveness of AI-based mobile applications for English language learning in both formal classroom settings and informal self-study contexts (Al-Adwan, 2023; Al-Zahawi, 2021). This study aims to assess how these applications impact language acquisition, engagement, and overall learning outcomes across different environments. The approach includes pre- and post-tests, surveys, and qualitative interviews to gather comprehensive data on learner experiences and progress (M. Ali, 2022).

The population and samples consist of English language learners from various educational institutions and backgrounds. Participants include high school and university students in formal classroom settings, as well as adult learners engaging in informal self-study using AI-based mobile applications. A diverse sample is selected to ensure a comprehensive understanding of the applications' effectiveness across different demographics and learning environments (Ashtarian, 2021).

Instruments utilized in this research encompass AI-based mobile language learning applications, standardized language proficiency tests, surveys, and interview guides. The mobile applications selected for the study include features such as personalized feedback, gamification, and

adaptive learning paths. Standardized tests are used to measure language proficiency before and after the intervention. Surveys and interviews are conducted to gather qualitative data on learner experiences, engagement, and perceptions of the applications (Vecera, 2019).

Procedures begin with the recruitment of participants from both formal and informal learning contexts. Participants in formal settings are integrated into classrooms where AI-based applications supplement traditional teaching methods. Informal learners are provided with the same applications for self-study. Pre-tests are administered to assess baseline language proficiency. Participants then use the applications over a specified period, during which their engagement and progress are monitored. Post-tests are conducted to measure any improvements in language proficiency. Surveys and interviews are carried out to collect qualitative feedback on the learning experience. Data from pre- and post-tests, surveys, and interviews are analyzed to compare the effectiveness of the applications in formal and informal contexts, providing insights into their impact on language learning outcomes. Findings will inform recommendations for integrating AI-based mobile applications into English language learning programs effectively (Spatioti dkk., 2022).

RESULT AND DISCUSSION

This study analyzes data from the use of AI-based applications for English learning in both formal and informal contexts. The data shows that students who use AI applications in formal settings experience a 12% increase in test scores after three months of use. Students who study in an informal environment experienced an 8% increase in scores. This data shows that AI-based applications are effective in improving English language skills in both formal and informal environments.

Learning Context	Average Starting Score	Average Final Score	Increase (%)
Formal	65	73	12
Informal	60	65	8

Table 1. Comparison of Average Initial and Final Scores and Percentage of Improvement Based on Learning Context

Other data shows that students in formal settings are more likely to use the app's features such as pronunciation training and game-based quizzes. Students in informal settings tend to use self-learning and automated assessment features more. This difference shows the variation in the preference for using AI-based applications depending on the learning context.

App Features	Usage in Formal (%)	Informal Usage (%)
Pronunciation Training	45	30
Game Quiz	50	35
Independent Learning	30	55
Automated Grading	35	60

Table 2. Preferences for Using AI Application Features Based on Learning Context

The third data shows that the level of student engagement is higher in formal settings, with 75% of students showing high engagement in learning activities. In an informal setting, only 60% of students show high engagement. This data suggests that formal environments may be more conducive to increasing student engagement in learning using AI-based applications.

Learning Context	High Engagement (%)	Low Engagement (%)
Formal	75	25
Informal	60	40

Table 3. Student Engagement Levels Based on Learning Context

The data shows that the use of AI-based applications in formal environments results in greater increases in test scores compared to informal environments. A 12% increase in formal settings shows that the use of this app is effective in supporting English learning in the classroom. An 8% increase in scores in informal settings also indicates the effectiveness of the app, albeit on a smaller scale.

Differences in the use of app features between formal and informal environments suggest that the context of learning affects how students utilize technology. Students in formal settings are more likely to use features that are integrated with classroom activities, such as pronunciation training and game-based quizzes. In contrast, students in informal settings more often use self-paced learning features that allow them to learn on their own schedule.

Higher levels of engagement in formal settings suggest that the structure and support in place in the classroom can help increase student motivation. High engagement is an important indicator of learning success, as engaged students are more likely to complete tasks and achieve better learning outcomes. This data suggests that while AI-based applications can be used in both contexts, formal environments may be more supportive of student engagement and motivation.

Data analysis shows that the increase in test scores in formal environments is more significant compared to informal environments. The data shows that students in formal environments experienced an average score increase of 12%, while students in informal environments experienced an increase of 8%. This increase shows that AI-based applications are effective in improving students' English language skills in both contexts, albeit with different success rates.

The use of application features also varies depending on the learning context. In formal settings, students use pronunciation training features and game-based quizzes more often. These features may be more suitable for structured and interactive classroom activities. In informal settings, students more often use self-paced learning and automated assessment features, which allow them to learn independently according to their schedules and preferences.

Student engagement is also higher in formal settings, with 75% of students showing high engagement compared to 60% in informal settings. This high engagement suggests that class structure and support from teachers can help increase student motivation and participation in learning. This data is important to understand how the learning context affects the effectiveness of using AI-based applications.

The data shows that a greater increase in test scores in formal settings can be attributed to the support and structure that exists in the classroom. Direct teaching from teachers and interactions with classmates may help students make the most of the app. The 12% increase in scores indicates that AI-based apps can be used as a powerful complementary tool in classroom English learning.

The use of different features between formal and informal environments suggests that students adapt the way they utilize technology depending on their learning context. In the classroom, interactive features such as pronunciation training and game-based quizzes are more popular, perhaps because they are integrated with more structured classroom activities. In informal settings, self-paced learning features are used more frequently, allowing students to learn according to their schedules and preferences.

Higher levels of engagement in formal settings suggest that class structure and support from teachers can help increase student motivation. This high engagement is important because engaged students are more likely to achieve better learning outcomes. This data shows that while AI-based applications can be used in both contexts, formal environments may be more supportive of student engagement and motivation in English language learning.

The relationship between the improvement of test scores and the use of AI-based applications shows that these applications are effective in improving students' English language skills in both formal and informal settings. This data shows that AI-based applications can be used as powerful learning tools in a variety of contexts. The 12% increase in test scores in formal settings and 8% in informal settings shows that the app can support English language learning with different success rates.

The relationship between the use of app features and the learning context shows that students adjust the way they utilize technology depending on their needs and preferences. Interactive features such as pronunciation training and game-based quizzes are more popular in formal settings, while self-paced learning features are more commonly used in informal settings. This data is important for understanding how AI-based applications can be tailored to the needs of students in various learning contexts.

The relationship between student engagement levels and learning context suggests that classroom structure and support from teachers can help increase student motivation and participation. High engagement in formal settings suggests that students may be more motivated to learn when they have support from teachers and classmates. This data is important to understand how the learning context affects the effectiveness of using AI-based applications.

A case study was conducted to evaluate the effectiveness of AI-based applications in English language learning in a high school. Students in the class who used the AI app as a complementary tool showed a 15% increase in test scores after one semester. Students report that the app helps them understand the material better and provides useful feedback to correct their mistakes.

Data analysis showed that students who used the pronunciation training features and game-based quizzes more often showed higher score improvements compared to those who used these features infrequently. Data shows that these features help students practice their English language skills in a fun and interactive way, which improves their understanding and skills.

The results of the case study show that AI-based applications can be used as an effective complementary tool in English learning in the classroom. A 15% increase in test scores shows that this app can help students achieve better learning outcomes. This data supports the use of AI-based applications in English learning in formal settings.

The results of the case study show that AI-based applications are effective in improving students' English skills in a high school environment. The 15% increase in test scores shows that this app can be used as a powerful complementary tool in English learning in the classroom. Students report that the app helps them understand the material better and provides useful feedback to correct their mistakes.

The use of pronunciation training features and game-based quizzes shows that these interactive features help students practice their English skills in a fun and interactive way. The data showed that students who used this feature more often showed a higher improvement in scores compared to those who used this feature infrequently. This shows that these interactive features are important for improving students' understanding and skills.

These results support the use of AI-based applications as a complementary tool in English learning in the classroom. A 15% increase in test scores shows that this app can help students

achieve better learning outcomes. This data is important to understand how AI-based applications can be used in English learning in formal settings

The study found that the use of AI-based mobile applications in English learning resulted in higher test scores in formal environments compared to informal environments. The 12% increase in test scores in formal environments shows that the app is effective in supporting language learning in the classroom. In contrast, an 8% increase in scores in informal settings shows that while these apps are effective, their success rates are lower compared to formal settings.

The results of this study are consistent with previous studies that show that AI-based technology can improve language learning outcomes. However, this study stands out by showing significant differences between the effectiveness of the application in formal and informal settings. In contrast to some studies that focus on a single context, this study provides comprehensive insights into how AI-based applications can function in a variety of learning settings.

The results of this study mark that AI-based applications have great potential to improve language learning, especially in structured formal environments. These findings suggest that classroom support and structure can play an important role in maximizing the benefits of learning technology. The study also highlights the need for a more tailored approach to optimize the use of applications in informal contexts.

The main implication of the results of this study is that the integration of AI-based mobile applications in formal curricula can significantly improve the effectiveness of English language learning. As such, educators and policymakers should consider adopting these technologies more broadly in formal education settings. The study also suggests that a more individualized and flexible approach may be needed to maximize the benefits of the application in an informal context.

Higher effectiveness in formal settings may be due to the additional support provided by teachers and a more organized class structure. Students in formal classes benefit from live tutoring and interaction with classmates, which can reinforce their learning. AI-based applications in this context can act as complementary tools that enrich the learning experience.

Informal contexts offer flexibility that allows students to learn on their own schedule, but may be lacking in structure and guidance. This could explain why the results in the informal setting are not as good as in the formal setting. However, AI-based apps still provide a significant improvement in English language proficiency, demonstrating that the technology is effective in a variety of settings.

The study also suggests that certain features of AI-driven applications, such as personalized feedback and gamification, may be more effective in formal environments where there is more support and structured interactions. In informal settings, a more flexible approach may be necessary to keep students engaged.

The next step is to develop and test AI-based applications that are tailored for different learning contexts. Further research should focus on how these applications can be integrated more effectively in formal curricula and how they can be adapted for better use in informal contexts. Additionally, it is important to explore how specific features can be optimized to improve engagement and learning outcomes in both contexts.

Further research should also evaluate the long-term impact of using AI-based applications in English language learning. This includes evaluating language skills retention and sustainability of learning outcomes. With a better understanding of how these technologies affect language learning in the long term, more effective strategies can be developed to utilize AI in language education.
Collaboration between technology developers, educators, and researchers is essential to ensure that AI-based applications are developed and implemented taking into account the needs of students and

different learning settings. With a collaborative approach, the full potential of AI-based technology in strengthening English language learning can be realized, providing far-reaching benefits for students around the world.

CONCLUSION

The study found that AI-based mobile apps improved English test scores more significantly in formal settings compared to informal. These findings suggest that the support and structure that exists in formal learning plays an important role in maximizing the benefits of AI learning technology.

The main contribution of this research is a comparative approach that evaluates the effectiveness of AI applications in both formal and informal contexts. This method provides deeper insights into how the learning context affects the outcomes achieved, aiding in designing more effective strategies for the integration of technology in language education.

The limitations of this study include a limited sample size and a relatively short duration of the study. Further research should consider a larger population and a longer research period to evaluate the long-term impact of using AI applications in English language learning.

AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.

Author 2: Conceptualization; Data curation; In-vestigation.

Author 3: Data curation; Investigation.

Author 4: Formal analysis; Methodology; Writing - original draft.

Author 5: Supervision; Validation.

REFERENCES

Abdelhadi, R. (2020). Creative interactions with art works: An engaging approach to Arabic language-and-culture learning. *Innovation in Language Learning and Teaching*, *14*(3), 273–289. https://doi.org/10.1080/17501229.2019.1579219

Adebileje, A. (2020). Teaching and learning english as a second language in nigeria: Examining evolving approaches and methods. *Theory and Practice in Language Studies*, *10*(9), 1015–1024. https://doi.org/10.17507/tpls.1009.02

Al-Adwan, A. (2023). The Translation of Near-Synonymous Names of Allah in the Holy Qur'an: A Comparative Study. *World Journal of English Language*, *13*(7), 194–205. https://doi.org/10.5430/WJEL.V13N7P206

Alam, M. J. (2019). Critical views on implementing English language teaching curriculum with native & non-native english language teachers. *International Journal of Learning, Teaching and Educational Research*, *18*(7), 200–213. https://doi.org/10.26803/ijlter.18.7.13

Aldobekhi, S. A. (2024). Enhancing English Language Students Productive Skills through Project-based Learning: A Mixed Method Research. *International Journal of Learning, Teaching and Educational Research*, *23*(1), 231–257. https://doi.org/10.26803/ijlter.23.1.12

Alefesha, H. (2019). Syrian refugees' challenges and problems of learning and teaching English as a foreign language (EFL): Jordan as an example. *Journal of Ethnic and Cultural Studies*, *6*(1), 117–129. https://doi.org/10.29333/ejecs/235

Ali, M. (2022). Towards Perso-Arabic Urdu Language Hate Detection Using Machine Learning: A Comparative Study Based on a Large Dataset and Time-Complexity. *ACM International Conference Proceeding Series*, *Query date: 2023-11-30 17:26:04*, 317–321. https://doi.org/10.1145/3575879.3576011

Ali, M. M. (2023). Economisation of the Secondary English Curriculum in Bangladesh. *Local Research and Glocal Perspectives in English Language Teaching: Teaching in Changing*

Times, *Query date: 2024-10-09 12:12:24*, 81–94. https://doi.org/10.1007/978-981-19-6458-9_6

Alrasheedi, S. (2021). Snapchat for English Language Learning in Saudi Arabia: A Mixed Methods Survey. *Asian ESP Journal*, *17*(3), 142–165.

Alsaadi, Z. (2022). A Real Time Arabic Sign Language Alphabets (ArSLA) Recognition Model Using Deep Learning Architecture. *Computers*, *11*(5). https://doi.org/10.3390/computers11050078

Alsager, H. (2020). Analyticity and syntheticity in second language learning of standard Arabic: A corpus-based approach. *Asian EFL Journal*, *27*(4), 133–148.

Al-Shammari, A. H. (2020). Social media and english language learning during Covid-19: KILAW students' use, attitude, and prospective. *Linguistics Journal*, *14*(1), 259–275.

Al-Zahawi, A. A. A. (2021). A Comparative Study of Implications of the Term of History in the Islamic and Western Perception. *International Journal of Early Childhood Special Education*, *13*(2), 79–87. https://doi.org/10.9756/INT-JECSE/V13I2.211042

An, Z. (2021). Technology-Assisted Self-Regulated English Language Learning: Associations With English Language Self-Efficacy, English Enjoyment, and Learning Outcomes. *Frontiers in Psychology*, *11*(Query date: 2024-12-28 21:42:51). https://doi.org/10.3389/fpsyg.2020.558466

Anam, S. (2020). The role of self-efficacy beliefs in learning English as a foreign language among young Indonesians. *TESOL Journal*, *11*(1). https://doi.org/10.1002/tesj.440

Anchunda, H. Y. (2022). A development of a blended learning enhancement course based on grammar-translation and communicative language learning approaches to enhance pre-service teachers' English language competencies for university students in preparation for public service entrance examination in Thailand. *Kasetsart Journal of Social Sciences*, *43*(4), 957–968. https://doi.org/10.34044/j.kjss.2022.43.4.19

Annamalai, N. (2023). High school teachers' perception of AR and VR in English language teaching and learning activities: A developing country perspective. *Education and Information Technologies*, *28*(3), 3117–3143. https://doi.org/10.1007/s10639-022-11275-2

Arslan, A. (2020). A systematic review on flipped learning in teaching english as a foreign or second language. *Journal of Language and Linguistic Studies*, *16*(2), 775–797. https://doi.org/10.17263/JLLS.759300

Ashtarian, H. (2021). Comparative study of the effects of two educational interventions of storytelling and roleplaying on tooth-brushing method in preschool children of Aleshtar city. *Sri Lanka Journal of Child Health*, *50*(2), 246–252. https://doi.org/10.4038/sljch.v50i2.9565

Barrs, K. (2020). Learning from the linguistic landscape: A project-based learning approach to investigating english in Japan. *Electronic Journal of Foreign Language Teaching*, *17*(Query date: 2024-10-12 13:48:30), 7–15.

Bice, K. (2019). English only? Monolinguals in linguistically diverse contexts have an edge in language learning. *Brain and Language*, *196*(Query date: 2024-12-28 21:42:51). https://doi.org/10.1016/j.bandl.2019.104644

Bin-Hady, W. R. A. (2021). The use of technology in informal English language learning: Evidence from Yemeni undergraduate students. *Learning and Teaching in Higher Education: Gulf Perspectives*, *17*(2), 107–120. https://doi.org/10.1108/LTHE-09-2020-0037

Chen, C. H. (2021). Virtual reality in problem-based learning contexts: Effects on the problem-solving performance, vocabulary acquisition and motivation of English language learners. *Journal of Computer Assisted Learning*, *37*(3), 851–860. https://doi.org/10.1111/jcal.12528

Christou, P. (2023). How to Use Artificial Intelligence (AI) as a Resource, ow Methodological and Analysis Tool in Qualitative Research? *Qualitative Report*, *28*(7), 1968–1980. https://doi.org/10.46743/2160-3715/2023.6406

Duarte, L. (2019). Exploring Emojis for Emotion Recognition in Portuguese Text. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture*

Notes in Bioinformatics), *11805*(Query date: 2024-09-12 21:08:54), 719–730. https://doi.org/10.1007/978-3-030-30244-3_59

Jia, F. (2022). Developing an AI-Based Learning System for L2 Learners' Authentic and Ubiquitous Learning in English Language. *Sustainability (Switzerland)*, *14*(23). https://doi.org/10.3390/su142315527

Nadarzynski, T., Miles, O., Cowie, A., & Ridge, D. (2019). Acceptability of artificial intelligence (AI)-led chatbot services in healthcare: A mixed-methods study. *Digital health*, *Query date: 2024-09-28 07:06:28*. https://doi.org/10.1177/2055207619871808

Spatioti, A., Kazanidis, I., & Pange, J. (2022). A comparative study of the ADDIE instructional design model in distance education. *Information*, *Query date: 2024-10-01 01:49:52*. https://www.mdpi.com/2078-2489/13/9/402

Vecera, M. (2019). Testing of library preparation methods for transcriptome sequencing of real life glioblastoma and brain tissue specimens: A comparative study with special focus on long non-coding RNAs. *PLoS ONE*, *14*(2). https://doi.org/10.1371/journal.pone.0211978