



Research Article

Implementation of Reinforcement Learning Algorithm in the Development of English Language Learning Skills

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Abstract

Given the increasing importance of English proficiency in today's globalized world, this study introduces an innovative approach to learning the language. Recognizing the complexities of language acquisition, the research proposes a novel method that combines recent advancements in reinforcement learning algorithms with educational knowledge to create a flexible and adaptive learning environment. This methodology charts a personalized learning path by thoroughly evaluating students' reading, listening, and observational skills. By meticulously developing an application based on the suggested technique, 50 participants engaged in a practical application that utilized reinforcement learning algorithms to evaluate student performance and identify individual strengths. The continuous effectiveness assessments demonstrate the model's resounding success, with an impressive 98% course completion rate and 97% accuracy. The platform aims to enhance cross-linguistic abilities, such as critical thinking and effective communication, alongside traditional language proficiency. This method empowers students globally by seamlessly integrating cutting-edge technology with pedagogical insights, offering a tailored and dynamic learning environment to help students thrive in the evolving educational landscape of the 21st century.

Keywords: Reinforcement learning algorithm, English, Artificial Intelligence, Language.

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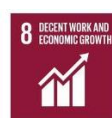
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1. Introduction

English competence is becoming increasingly important in the ever-connected world as a means of literacy, efficient communication, and personal development. Proficiency in the English language may lead to a variety of opportunities, such as engaging in international conversation and gaining access to worldwide knowledge. However, learning a language is a complex process that frequently calls for specialized methods to suit a range of aptitudes and learning styles. We provide a novel and all-encompassing technique for an intelligent English learning platform that defies traditional paradigms of language acquisition in response to this requirement. Understanding that literacy is more than just language proficiency; our method combines state-of-the-art algorithms for reinforcement learning with our knowledge of education to create a dynamic and adaptable learning environment. Not only is the importance of English proficiency recognized, but it is also deeply ingrained in our approach, which aims to tackle the larger domain of literacy and cognitive empowerment. A thorough preliminary evaluation is the first step in the learning process and is a fundamental component of our technique. Assessing listening, reading, and observational abilities allows us to get deep insights into the specific areas of strength and growth for each student. In addition to classifying users into discrete skill categories, this diagnostic stage lays the groundwork for the subsequent tailored learning path. The next stage occurs when students are smoothly guided to specialize. The utilization of reinforcement learning algorithms, which constantly modify content and complexity based on user performance, is the true power of our methodology. Learners progress through a variety of subjects and ability levels, and they have to master each before going on. This customized approach speeds up the learning process and fosters a sense of accomplishment, both critical for sustaining motivation. An important part of our process is the continuous success evaluation stage. Metrics like completion rates, accuracy, and completion percentages are regularly watched in order to provide quantitative insights into the growth of learners. This real-time evaluation provides the adaptive algorithms with information that they may use to modify the learning path and material delivery in order to create a dynamic and productive learning environment. There are benefits to our method. The website becomes more than just a tool for language acquisition; it also ignites cross-linguistic skills such as effective communication, critical thinking, and problem-solving. Apart from acknowledging the significance of English language competency, our proposed method seeks to transform the learning experience into a transformative one. By fusing cutting-edge technology with pedagogical expertise, we seek to empower students worldwide by giving them the linguistic and cognitive skills they need to thrive in our increasingly interconnected society. As we navigate the ever-changing landscape of education, we remain committed to helping students realize their full potential and raising a generation ready to thrive in the complexity of the twenty-first century.

2. Literature Review

The project aims to integrate artificial intelligence into an online English education system by means of deep learning, neural networks, and decision tree algorithms. By considering students' personalities and knowledge levels, the goal is to increase the efficacy of language acquisition. Through the analysis of several characteristics and evaluation outcomes, the technique provides educators with valuable information. The AI-powered system summarizes rules and does data

analysis to create an evaluation model. Test applications provide individualized and technologically advanced educational objectives by demonstrating improved English performance, increased learning efficiency, and higher relevancy of material (Sun et al., 2021).

The integration of artificial intelligence (AI) in middle school English education is the focus of this study, which is motivated by the growing trend of computerized English writing assessments. The main objective is to use information technology in the curriculum in a way that will improve the efficacy and quality of English language instruction. The paper suggests an AI-based assisted education system for college English using field research, literature analysis, and curriculum theory. With the use of AI technology, the system seeks to improve English training in a compassionate and personalized way by streamlining the teaching process and providing a customized, intelligent learning environment. (Bin & Mandal, 2019)

The purpose of this project is to investigate how artificial intelligence (AI) may be used to improve inclusion in English language training (ELT). The goal is to include AI technology in ELT classes with an emphasis on student diversity, hence fostering inclusion. The methodology entails examining learner-centered methods, artificial intelligence (AI) technology, and theoretical underpinnings of language acquisition. Teachers can get important insights from the study on how to design inclusive learning environments that meet the requirements of a diverse student body. The findings show how AI may revolutionize ELT teaching by providing individualized instruction, enhancing accessibility, and providing a variety of learning possibilities. (Anis, 2023)

The purpose of this literature review is to examine how English language learners and teachers see the application of artificial intelligence (AI). Using a mixed-methods approach that includes focus groups, interviews, and surveys, the research finds that people have good impressions of AI's ability to improve language fluency and provide individualized teaching. Participants acknowledge the versatility of AI, but they also voice worries about the need for assistance and training, as well as technical preparedness. The results highlight the significance of teacher training, technical preparedness, and support for the successful integration of AI in English language teaching, maintaining the human aspect while enabling customized and flexible learning experiences. (Hartono et al., 2023)

To improve learning performance evaluation in computer-assisted English teaching, this study offers a machine learning technique that combines artificial intelligence and neural networks. The technique includes a wavelet entropy feature for adaptive modelling and the integration of auditory data. The study uses controlled experiments and quantitative statistics to demonstrate the model's effectiveness in assessing computer English learning outcomes, leveraging cutting-edge technology to advance assessment processes in computer-assisted language learning and learning performance evaluation. (Nianfan, 2021)

This study uses quantitative and qualitative research approaches to study how Chinese college students use internet platforms for English reading. The findings emphasize difficulties such as a lack of prior knowledge, exercise coverage, difficulty-based categorization, and information retention. According to poll results, people favour websites for ease of use and smartphone applications for mobility. To solve these challenges, the study suggests developing an AI-powered self-learning platform that prioritizes individualized learning, various English exercises, extended

reading materials, and level-based categorization while also aligning with student preferences and employing AI to improve platform functioning (Guo & Jiang, 2022).

3. Proposed Methodology

An application-based AI model has been developed for users. (Dong, 2022) An online web application is proposed and released to be used free of cost. The users may download it on their mobile phone, or they may log in through their desktop/laptop (Ji, 2022).

Participants

For this study, participants were obtained from English coach centres, and they were informed earlier about the process. 50 participants were taken, and for each of them a separate performance analysis record was created (Barjesteh & Ghaseminia, 2023).

Materials Used

We collected audio, reading passage and videos for training and testing the participants. A website for created and provided user access to everyone to monitor and record the participants' performance.

Method

Participants are asked to log into their websites to undertake the test. Initially, all the materials used for training and testing were uploaded to each module for every user. Levels of learning is also separated into modules. Along with this, an AI model is proposed to evaluate performance and provide guidance and suggestions for upcoming learning. AI model is trained to evaluate based on the performance result in each task. (Delgado et al., 2020) The scores they have taken classify participants into different categories. It identifies the most suitable type of learning for each participant. Three inputs were used to classify the participants' learning types based on their learning skills. The first one is listening skills; for this, audio inputs were given to the participants and asked to take the test. The second one is reading skills; this reading passage is provided in the GUI, and questions were provided at the end to test their performance. The third one is observing skill; for this video, inputs were provided, and like the first one, questions were asked at the last minute to take the test. From these three aspects of the learning method, a participant is understood and classified according to their type of learning. The proposed AI model will look into the progress of all three activities and compare to the results it concludes on their skill-choosing. (Imasha et al., 2022; Zhou, 2022)

Audio Input

The audio inputs for testing, training and learning purposes are taken from the breaking news website. The categories of audio selection are business English, environment, lifestyle, technology, world news, etc. Other than these topics, more topics are also available on the website itself. Every topic is being utilized in each area. The audio was played through the website designed for this learning. The audio lasts for nearly 1 minute in the starting stage of the level. On increment of each level, the timing of the audio will increase gradually.

Reading Input

The passage for reading is taken from the breaking news website. It is nearly two or three paragraphs long. As we used to do in our childhood, below each paragraph, some questions will be provided, and relevant answers will be presented as options. By choosing the right answer, the skill will be evaluated.

Observing Input

Videos or poster relevant to learning purpose were brought from the internet and loaded. From the poster or communication video the users are asked to observe and to provide correct answers among the options provided.

Like this, these skills were monitored and will come to a conclusion on choosing the right skill type learning for the individual users. The inputs provided will be modified on each test. There will be three evaluations to choose the right type of learning. The majority of results will be chosen for further learning. After choosing the learning process, questions will be coming on the topics of communication, grammar, vocabulary, etc. This process continues until their performance reaches a satisfactory level. This satisfaction level will be judged by the AI. When completing each level, the progress bar will consider each level's progress and estimate the satisfaction level. Figure 1 depicts the entire AI judging process for the user. (Molavi & Kuhi, 2018; Shu & Xu, 2022; Win & Maung, 2019).

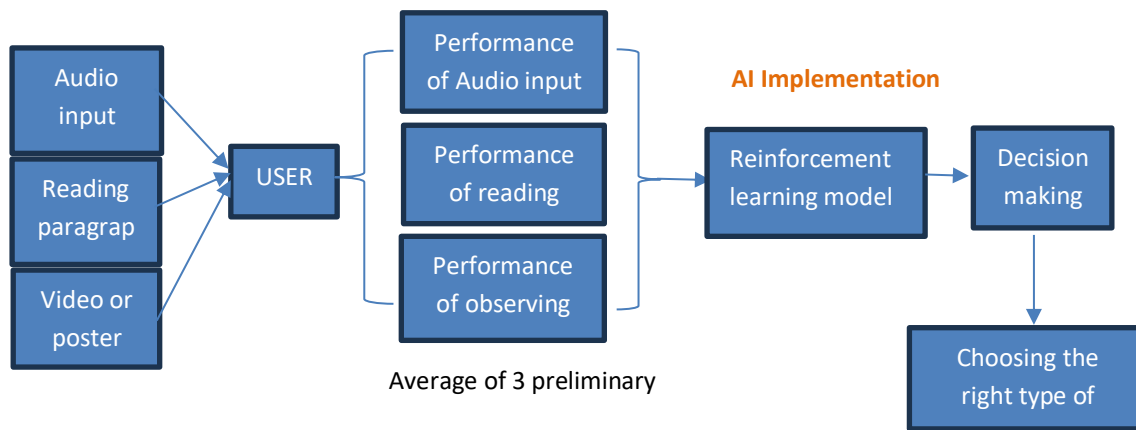


Figure 1: Depiction of the judging model of AI

After the decision-making process, the user will be paved into their learning process. Each type of skill level will be prepared pre-defined. Like the games, each user will enter the next level upon completing the current level. If the user cannot complete the current level, they can attempt the level again of multiple times until the completion. The no of time they used to complete the level will also be monitored by the AI to predict the satisfaction of the completion of the learning. The satisfactory level is made to satisfy when the user used to complete the levels on a single attempt. The completion of the level is decided by getting all the answers to be correct. And all the topics to be covered by the users to complete the learning process. For each user this process will takes place on each type of skill chosen. Figure 2 explains the recursive function of the proposed model. (Tzeng et al., 2023; Uc-Cetina et al., 2023; Wang, 2022; Xu et al., 2022).

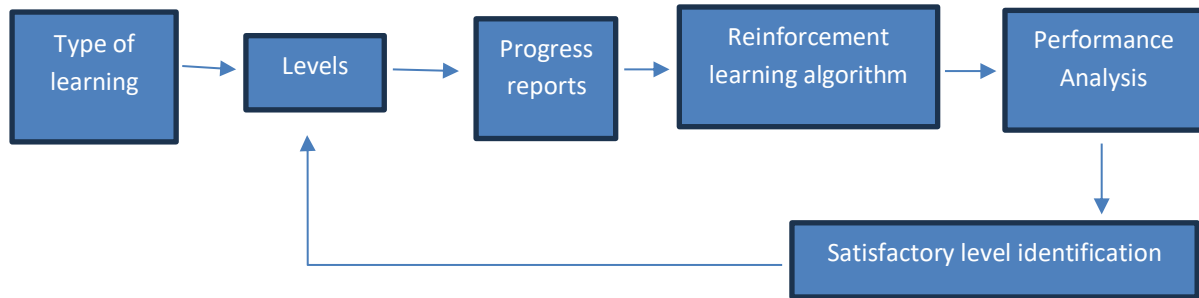


Figure 2: Continuous monitoring of each level progress to decide the satisfactory level

UI of the user Interaction

All the users will interact with the UI for the learning process. A website cum app is designed for the users to interact. The users can download the app from the Play Store, and it can also be used in the website format from Google (Gomathi et al., 2023; Gomathi et al., 2022). The interface is explained below.

Home Page

Before entering the home page, users are to be authenticated for profile maintenance purposes. User are asked to sign up using their e-mail id.

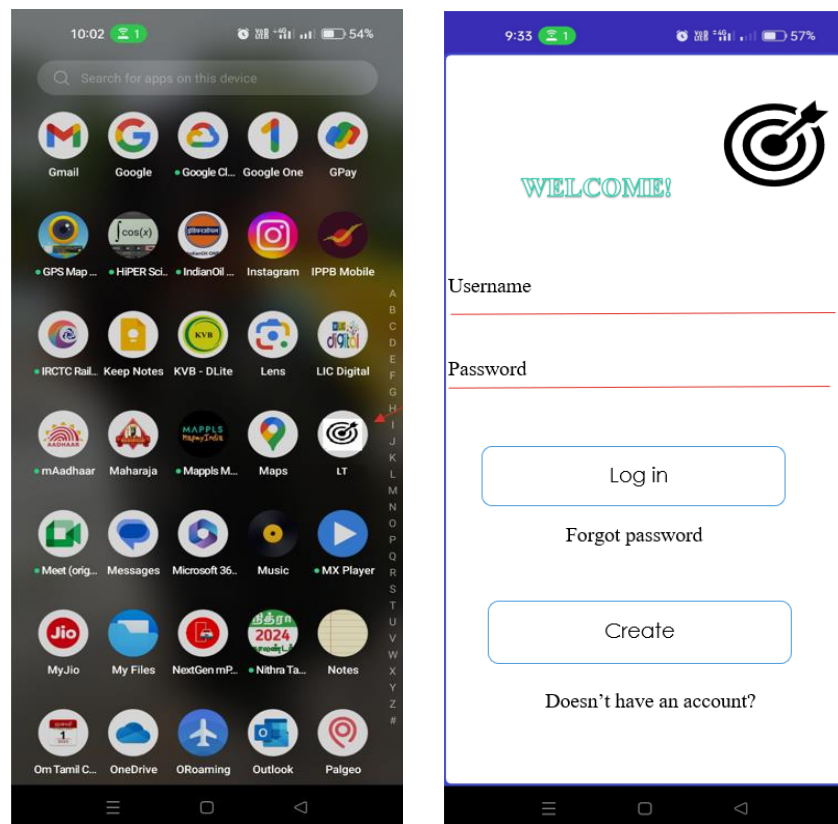


Figure 3: Application icon and the authentication page

After signing up, the user is asked to enter their age and education status. After completing this process, the user is redirected to the home page, as shown in Figure 3. The home page contains

the general description and the preliminary tasks, as shown in Figure 4. The user is now available to look into their other tabs, such as the progress tab and profile, through the dashboard.

Progress Page

The progress page contains the overall progress report, question completion status, and level completion status. It also produces a performance analysis of questions based on their difficulty level. From this AI-monitored progress report, users can learn about their performance, and knowing their fault areas will help them increase their performance in the next levels, as shown in Figure 5.

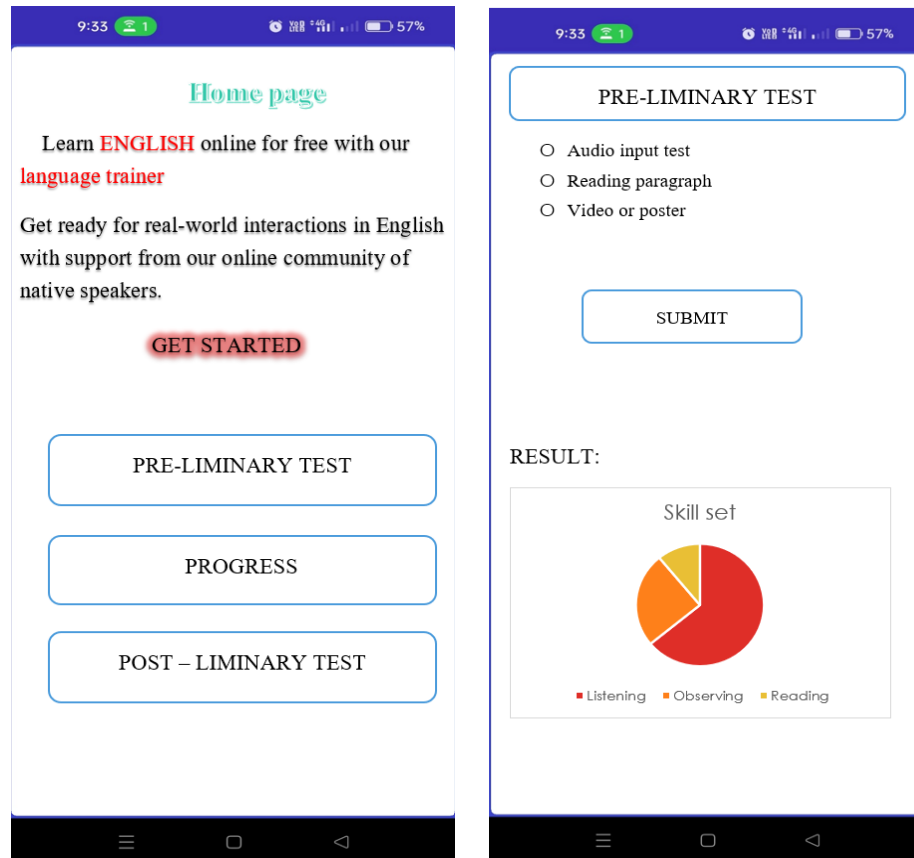


Figure 4: Home page

Profile and Levels Tab

The profile page contains the user credentials and a logout option, as shown in Figure 5. This tab will be available in the dashboard. It shows the number of levels left and the completed levels. It is designed to be attractive, and as such, the game looks like it is designed to continuously increase the learning process.

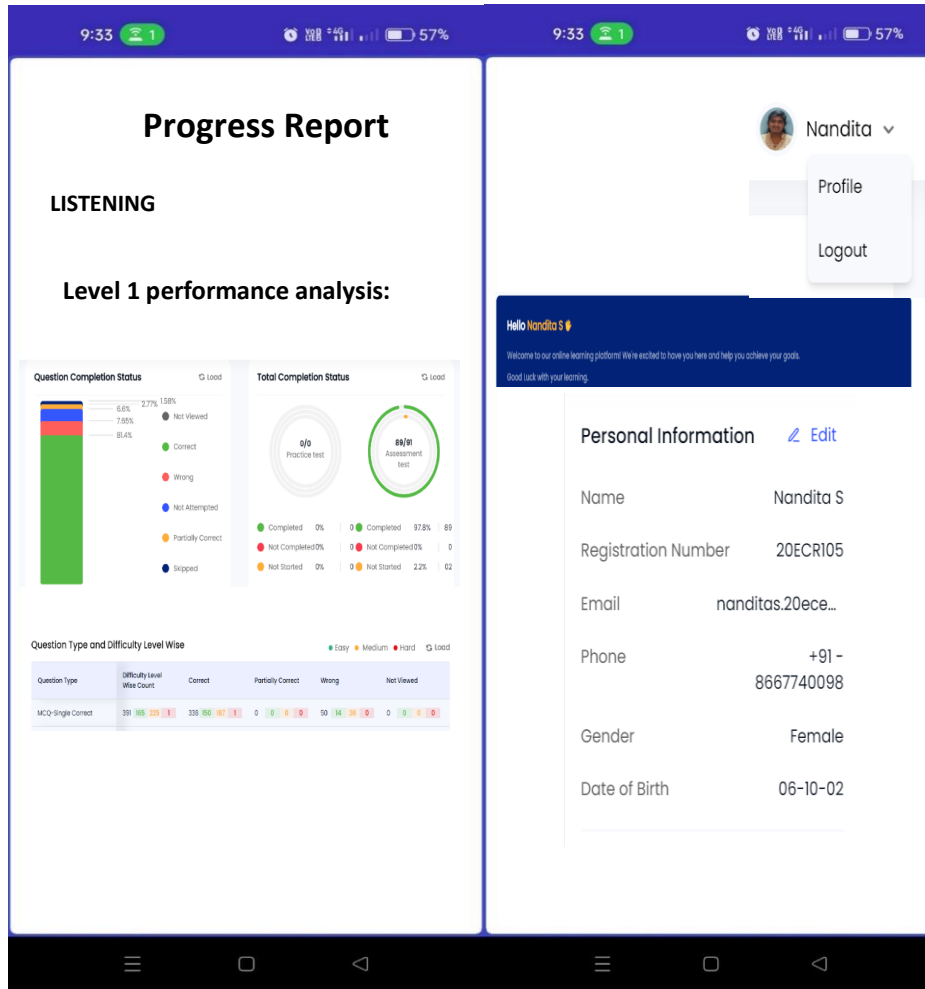


Figure 5: Progress and profile page

4. Results and Discussion

On each level, the reinforcement learning algorithm was evaluated for performance. First, it classifies the users into the three skills, and the classification result is more accurate. Table 1 below shows the preliminary test performance metrics of AI.

Completion Percentage: The recommended approach yields an 85% overall completion rate, with typical completion rates for listening, reading, and observation skills of 87%, 65%, and 75%, respectively. The variance numbers show the degree of variability surrounding these averages.

Accuracy: The algorithm's efficacy is 93% overall, 90% in reading, 92% in observing, and 95% in listening. The margin of error numbers expresses the expected volatility around this respective preciseness.

TABLE 1: Preliminary test performance evaluation

METRICS	LISTENING SKILL		READING SKILL		OBSERVING SKILL		OVERALL MEAN ± ERROR	OVERALL SD
	Mean ± Error	SD	Mean ± Error	SD	Mean ± Error	SD		
Completion percentage	87%±2.5%	2.5%	65%±1.8%	2.1%	75%±1.3%	2.1%	85%±2.5%	2.2%
Accuracy	95%±2.9%	2.4%	90%±2%	3.3%	92%±2.7%	3.2%	93%±1.9%	2.6%
Completion rate	85%±2.4%	1.2%	75%±1.5%	2%	83%±2.1%	3.3%	83%±1.7%	2.2%

Completion Rate: The methodology shows that 83% of the tasks are completed in general abilities, 75% in reading, 85% in listening, and 83% in observation. The discrepancies within these completion rates can be explained by the margin of error values.

Similar to the preliminary test, each process was evaluated. Table 2 below shows the performance evaluation of AI in progress.

TABLE 2: Progress-evaluation metrics table

METRICS	LISTENING SKILL		READING SKILL		OBSERVING SKILL		OVERALL MEAN ± ERROR	OVERALL SD
	Mean ± Error	SD	Mean ± Error	SD	Mean ± Error	SD		
Completion percentage	95%±2.3%	2.1%	87%±2.2%	2.1%	92%±1.3%	1.7%	89%±1.9%	2.3%
Accuracy	97%±1.9%	1.7%	94%±2%	3.3%	92%±2.4%	2.2%	95%±2.1%	2.7%
Completion rate	96%±2.1%	1.9%	77%±1.5%	2%	83%±1.8%	2.6%	87%±1.5%	2.2%

Completion Percentage: The system obtains greater completion percentages in the progress evaluation phase, with 95% in listening, 87% in reading, 92% in observing, and a total success rate of 89%. The error values show the predicted fluctuation around these median numbers.

Accuracy: The proposed method achieves 95% accuracy overall, 97% accuracy in hearing, 94% accuracy in reading, and 92% accuracy in observing abilities. It also shows improved accuracy in measuring development. The error numbers indicate the degree of hazard underlying these actual values.

Completion Rate: According to the system, the following skills have the highest completion rates: 87% for the reading skill, 77% for the hearing skill, 83% for the observing skill, and 96% for the listening skill. The mistake statistics provided insight into the volatility in these completion rates.

From Table 2, we can identify that the AI performance on progress and recursive learning shows an accuracy of 97% in the listening skill. From this, we can understand that most people have the highest skill and ability in listening and completing tasks. The table below, Table 3, depicts the success rate of AI in the teaching process.

TABLE 3: Success rate in user learning process

METRICS	LISTENING SKILL		READING SKILL		OBSERVING SKILL		OVERALL MEAN ± ERROR	OVERALL SD
	Mean Error	SD	Mean Error	SD	Mean Error	SD		
Completion percentage	97%±2.6%	2.6%	85%±2.1%	1.6%	95%±2.1%	1.5%	93%±2.3%	2.3%
Accuracy	96%±2.3%	2.3%	94%±1.8%	2.4%	94%±1.9%	1.6%	95%±1.5%	1.9%

Completion Percentage: Regarding the success rate of user learning, the algorithm performs well, achieving 97% in listening, 85% in reading, 95% in watching, and a 93% total completion rate. The predicted variability around these mean completion percentages is quantified by the error values.

Accuracy: The success rate of user learning is marked by an accuracy of 96% in listening skill, 94% in reading skill, 94% in observing skill, and an overall accuracy of 95%. The error values indicate the uncertainty around these mean accuracy values.

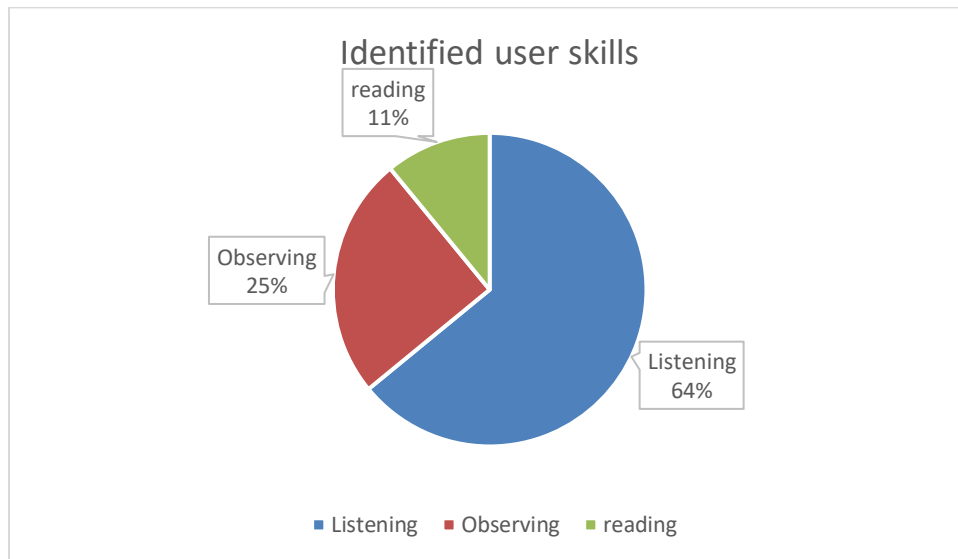


Figure 6: The chart depicts the completion of the learning by the users

The algorithm's high completion rates and step-by-step accuracy demonstrate a robust and effective learning technique. The progress evaluation phase shows a rise in completion and

accuracy rates, suggesting the existence of adaptive learning mechanisms. The high completion rates and accuracy of the user learning phase success rate show how effective the algorithm is at personalized learning. (Rusmiyanto et al., 2023; Ulfa, 2023; Wang, 2023).

From the experiment, we have find that listening skill produces an effective output in learning compared to other skills. (Madani & Kheirzadeh, 2022; Movva et al., 2022) It is noticed that most of the users who took the test have a skill set in listening rather than reading, as shown in Figure 6. Some people perform both listening and observing, but no one can perform well at reading. (Fitria, 2021; González-Calatayud et al., 2021; Li, 2021; Li et al., 2023) Completing task accuracy is obtained at a maximum level for listening skills. (Mitra & Banerjee, 2022; Prasad & Jaheer, 2023; Raine, 2018) Overall, the proposed method shows an accuracy of 97% in the teaching process, and the proposed reinforcement learning algorithm shows high output on continuous monitoring of the user's output and making it regressively for their future learning, modifying the contents based on their capability and providing feedback, hints to complete the task. A satisfactory level was identified for the entire 50 participants, which is about 95% of their learning part from this algorithm.

5. Conclusion

This proposed approach to English language acquisition has been a remarkable success, as seen by the outcomes of using the reinforcement learning algorithm. Initial assessments reveal a refined classification of students into discrete skill categories, allowing for a focused and individualized teaching strategy. Progress evaluations highlight the algorithm's flexibility and efficacy by improving completion percentages and accuracy. The algorithm's strong performance is attested to by the success rate in user learning, which regularly displays high completion percentages and accuracy across all competency kinds. By incorporating reinforcement learning, learning parameters are dynamically adjusted, optimizing information distribution and paths according to individual performance through the self-learning platform. The accuracy metrics and completion percentages' standard deviation values demonstrate how precisely and consistently the system can adjust to a wide range of learning methods. Ultimately, the results show how effectively the algorithm for reinforcement learning maximizes the process of learning English, providing a strong technological foundation for future advancements in customized training. The role of AI in learning English will still be an evolving technology for the future to learn and benefit in a huge manner by looking into a digital platform. Making the future more precise and completing each activity with ease, and gaining much knowledge.

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