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Comparison on Applications and Impact of AI in English Grammar Learning

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Abstract

English grammar plays an important role in the learning of English language skills. However, it has always been challenging for students to understand grammar right from school. Complicated rules make the learning process even harder. Teachers have tried to come up with many ways to make the learning process interesting and simple yet there exists a gap. Artificial Intelligence bridges the gap and achieves the goal of attaining grammar learning in interesting ways. The integration of artificial intelligence (AI) in grammar learning applications represents a transformative approach to language education. Many applications focus on teaching grammar by gamifying the learning process. AI-powered applications provide personalized learning experiences, immediate corrective feedback, and adaptive difficulty adjustments, leading to improved grammatical competence and sustained user engagement. This research attempts to make a comparative study of English grammar learning platforms and applications by analyzing their impact on the autonomous learning of students. Applying AI has been considered learner-centric as it stimulates learning and fascinates the learners with expected learning outcomes.

Keywords: AI Tools, English Grammar learning, Gamification, Autonomous Learning

1. Introduction

The use of Artificial intelligence has revolutionized the education sector. According to the report of the Congressional Research Service, “AI can generally be thought of as computerized systems that work and react in ways commonly thought to require intelligence, such as the ability to learn, solve problems, and achieve goals under uncertain and varying

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conditions, with varying levels of autonomy." [1] In recent times many educationalists have started to acknowledge the importance of integrating AI in classrooms to enhance the learning of students. In English language learning one of the topics in which students still struggle is learning basic grammar concepts and integrating them in communication effectively. This is because of the complexities of grammar rules and lack of practice. But now with the help of AI, a teacher can have as many teaching assistants as possible in various forms of applications and software. However, deciding on the right tool for the students is a challenge. For example, even though gamification is an effective tool in grammar learning, it is not apt for every situation and all students. For an advanced learner, gamification is not necessary. This gives rise to a need for further comparative study in the field of Grammar learning through AI as studies so far have studied applications in isolation.

Learning grammar is an essential part of language learning. The role of AI is to make learning easy, effective and interactive. Many free tools are available online which help learners in improving their grammar. Prominent among them are Grammarly and QuillBot. Grammarly and QuillBot are grammar correction tools which help students correct their basic grammar and paraphrase the sentence. Speak and Improve and Deep English are speech-based AI chatbots that help improve learners' grammar through interactive conversation. This study attempts to make a comparative study of Grammarly, QuillBot, Speak and Improve, and Deep English to analyse the role of AI in grammar learning. It also attempts to study the advantages of simultaneously using grammar correction applications and conversational chatbots to improve the English language of college students.

2. Problem Statement

Learning grammar can be difficult for various reasons. Many students learn grammar mechanically in the form of rules rather than understanding the concept. In addition to this, students have very little conversational practice. Because of this, they find it difficult to use grammar elements in both written and oral communication. This study is an attempt to analyze the role of AI in enhancing grammar competency among college students by using a collaboration of grammar correction applications like Grammarly and QuillBot and Conversational Chatbots like Speak and Improve and Deep English.

3. Literature Review

In current times, much research is conducted in the field of AI and Language learning. In the book "Intelligent English Grammar: AI Strategies to Master the Rules", Infante Vera

argues that, “Artificial Intelligence (AI) has the potential to radically transform the way grammar is taught and learned in English. AI technologies, such as Natural Language Processing (NLP), Machine Learning, and Intelligent Tutoring Systems, offer new and powerful tools to address common challenges in grammar learning and significantly improve the student experience.”[2] Hea-Suk Kim’s Findings align with these findings as she concludes in her article that, “while grammar proficiency improved after using AIs grammar correction during the English composition process, no discernible differences in grammar improvement were observed across the different AI used.” [3] In research conducted by Nawsha Ghaleb Shareef, “EFL students perceive AI-powered platforms as beneficial tools for improving their English grammar proficiency as they can serve as valuable tools for practising grammar, providing personalised feedback, and adapting to individual learning needs, pace, and styles.” [4]

In research study entitled “The Role of Grammarly in Assessing English as a Foreign Language (EFL) Writing”, the use of grammar software was evaluated. The findings of the study confirm that when students' work is assessed by an AI grammar checker, there is a substantial decrease in their mistakes. (indirect corrective feedback). The application is more effective in eliminating mistakes in terms of language use (grammar), and writing mechanics (spelling and punctuation). [5] Umu Fadhilah also concludes that “Grammarly application can provide comprehensive feedback to students about grammatical errors, thus saving students and lecturers time in improving writing, while also training students with the ability to learn independently.[6]

According to W. Alharbi, AI-powered synchronous text editors are more recent than asynchronous ones. Examples of those include Grammarly, ProWritingAid, and Writing Mentor applications which have been gaining popularity in educational, professional, and personal settings. These tools intelligently provide users with automated written corrective feedback (AWCF)” [7] Furthermore, in another study conducted by Tran Tin Nghi, Tran Huu Phuc, and Nguyen Tat Thang, it was concluded that “Chatbots have proved themselves as a handy tool to help students engage in the lessons, especially in practice activities with mobile-based application through social networks. Students are eager to share their understandings and their performance with their peers.[8]

In a similar study, Burr Settles analyzed the impact of AI in Duolingo and concluded that “The strong relationship between scores based on ML/NLP estimates of item difficulty and the IRT estimates from operational data provides evidence that our approach—using items’

linguistic characteristics to predict difficulty, a priori to any test administration—is a viable form of test development."[9] Ann Neethu Mathew, in her study "NLP-Based Personal Learning Assistant for School Education," [10] explores the role of chatbots in teaching pedagogy. Hussain A. Younis, in "A Systematic Literature Review on the Applications of Robots and Natural Language Processing in Education," [11] provides an in-depth examination of recent research on AI in education. Another study, "Exploring the Opportunities and Challenges of NLP Models in Higher Education: Is Chat GPT a Blessing or a Curse?" [12] addresses both the benefits and potential issues of NLP models, including the loss of human interaction, bias, and ethical concerns.

4. AI techniques used in Grammar Learning Tools

AI plays a vital role in improving language by providing platforms for learning grammar, the base of a language. Grammarly AI and Quillbot AI use Natural Language Processing (NLP) to understand and interpret human language, enabling tools to detect errors, suggest corrections, and even offer style improvements. They employ machine learning algorithms to analyze vast amounts of text data, learning from millions of writing samples to refine their error detection and suggestion capabilities. This allows for more nuanced and accurate grammar and style suggestions. AI tools often incorporate feedback from users, learning from corrections and suggestions made by human editors to improve their algorithms further.

Grammarly's AI models use two techniques to analyse a sentence, Syntactic parsing and Tokenization. Grammarly's AI breaks down sentences into their grammatical components (like nouns, verbs, adjectives, etc.). This process, known as syntactic parsing, helps the tool understand the structure of the sentence, making it possible to detect grammatical errors such as misplaced modifiers, subject-verb disagreement, and incorrect punctuation. The process of breaking down a sentence into smaller units called tokens (words, punctuation marks, etc.) is called Tokenization. Grammarly uses tokenization to analyze each part of a sentence individually while understanding its role in the larger context.

Grammarly employs supervised Machine learning where the AI is trained on vast amounts of labelled data. This means the system has seen thousands (if not millions) of examples of correct and incorrect grammar, allowing it to learn patterns and make predictions about new, unseen text. For more accurate grammar checking, Grammarly uses feature engineering to create features (or attributes) from the text. These features might include parts of speech, word patterns, and sentence structure, which the machine learning models use to

detect errors and suggest corrections. The models used by Grammarly are trained on a variety of data sources, including books, websites, and user-generated content, to understand different writing styles and contexts. This broad training helps the tool make accurate suggestions across different types of content, from formal essays to casual emails.

Grammarly leverages deep learning, particularly neural networks, to improve its language understanding. Neural networks can model complex relationships between words and their meanings, allowing Grammarly to make more sophisticated corrections, such as rephrasing awkward sentences or suggesting style improvements. Grammarly doesn't just point out mistakes; it also generates suggestions to improve the text. Using NLG, Grammarly's AI can create alternative phrases or sentences that are clearer or more concise, helping users express their ideas more effectively. Grammarly's AI models continually improve by learning from user interactions. When users accept or reject suggestions, this feedback is used to refine the models, making them smarter over time. Grammarly uses reinforcement learning to adapt to individual users' writing styles. Over time, it learns from the corrections and suggestions that users accept or reject, tailoring its advice to better fit their preferences and writing habits.

QuillBot's core feature is its ability to paraphrase sentences. This involves understanding the input text and generating a new version that conveys the same meaning using different words and structures. QuillBot also uses NLP techniques like sentence tokenization and syntactic parsing to understand the grammar and context of the original sentence before attempting to rephrase it. QuillBot uses transformer-based models, similar to those in OpenAI's GPT series or Google's BERT. Transformers excel at understanding the context within a piece of text, which is crucial for generating coherent and contextually relevant paraphrases. The self-attention mechanism in transformers allows the model to focus on different parts of a sentence when generating a paraphrase. The models used by QuillBot are fine-tuned on specific paraphrasing tasks. This involves adjusting the pre-trained models using a smaller, more focused dataset, which helps the AI generate better paraphrases that are in line with the user's expectations. QuillBot often generates paraphrases by replacing words with synonyms. NLG techniques help ensure that these replacements are contextually appropriate and that the paraphrased sentence maintains the original meaning.

Grammarly and QuillBot, while serving slightly different purposes, share several similarities in their AI technologies, particularly in their use of NLP, machine learning, deep learning, and natural language generation. Both tools are designed to understand context, offer real-time suggestions, and adapt to user preferences, making them powerful writing assistants.

While their specific applications may differ—Grammarly focuses more on grammar and style, and QuillBot on paraphrasing and summarization—the underlying AI techniques they use are remarkably similar.

5. Learning Grammar through Grammarly and Speak & Improve

Grammarly is an advanced writing assistant tool that uses artificial intelligence to help users improve their writing. It offers real-time grammar, punctuation, and style suggestions to enhance the clarity, engagement, and overall quality of the written content. In her article, Tira Nur Fitria explains Grammarly as "It is a digital writing platform that uses artificial intelligence and processes language naturally and grammatically. Grammarly works by suggesting corrections for spelling mistakes that are automatically highlighted, suggesting synonyms for words on double-tap, and substitutions for or suggestions for removing overused words." [13] Each interface provides constructive feedback for the user so that they can learn from their mistakes. These tools are similar to the assessments made by teachers in a traditional classroom and help students to become autonomous learners. By suggesting a replacement for vague words with more precise vocabulary, it adjusts sentence structures for clarity. Along with providing explanations to understand why the changes are necessary, Grammarly also offers advice on adjusting the tone to be more formal and academic. Continuous improvement is encouraged as users see their progress and become more proficient in grammar. It also integrates with various platforms, including browsers, word processors, and mobile devices. Users can receive grammar support across different writing contexts, whether composing emails or academic studys.

Speak and improve is a research project by Cambridge University. Here the chatbot asks a series of eight questions based on the reply of which the AI analyses the competency of the speaker. Further, it gives feedback on the improvement of language and grammar. Speak and Improve (S&I) is still in its early stages of development. In her article, Diane Nicholls reports that "S&I is designed for all proficiency levels, from basic beginner through independent intermediate to proficient learners." [14] By adapting to the user's level and learning pace, it offers tailored exercises that focus on the areas needing improvement. This personalized approach ensures that learners focus on their specific grammatical weaknesses. Speak and Improve makes grammar practice more engaging and enjoyable by gamifying the learning process. This leads to better retention and a more positive learning experience.

6. Learning Grammar through Quillbot and Deep English

QuillBot is a paraphrasing tool that rephrases sentences while maintaining their original meaning. This helps users explore different ways of structuring sentences, enhancing their understanding of grammar and syntax. Exposure to a broader range of vocabulary and sentence structures aids users in developing a more nuanced understanding of grammar. According to Alzubi's research, "There is a consensus among both students and teachers that QuillBot can significantly enhance the paraphrasing skills of preparatory year EFL students in an English language writing class." [15] QuillBot also provides tips, explanations, and examples to help users understand its corrections and suggestions, serving as a learning aid to grasp grammar concepts more thoroughly

Deep English is a conversational chatbot which was co-founded by Dan Douglass and Aaron Campbell, both belonging to the teaching fraternity. This speech-based AI application is classified according to topics and grammatical units. The chatbot starts a conversation with the user based on the grammatical unit selected making the grammar learning process interactive and hence providing a more human-like experience for the user. The application uses engaging, real-life stories to teach grammar in context. This method allows learners to see how grammatical structures are used naturally, enhancing understanding and retention. By focusing on fluency, the application encourages learners to use English more confidently and naturally. This approach helps in internalizing grammar rules without the need for tedious memorization. The platform provides opportunities for learners to interact with peers globally, enhancing a collaborative learning environment.

7. Methodology

Automated Grammar-checking tools were used to evaluate the student's proficiency. With the help of the language lab, students were asked to type an essay of over 500 words. Later the essays of the first group of students were evaluated using Grammarly and for the second group of students, Quillbot was used. The evaluation was done in front of the students, this helped students understand their mistakes as it involved immediate feedback. After writing the essay, the students were asked to have a conversation with AI chatbots on the topic of the essay. Group 1 used Speak and Improve, whereas Group 2 used Deep English.

8. Findings and Discussion

A study was conducted on the improvement in English proficiency among college students after using grammar learning applications supported by AI. A group of 20 first-year

engineering students were involved in the study from Tamil Nadu, 10 boys, and 10 girls, all aged between 18 and 19 years, with similar academic backgrounds. These students were divided into groups of 5 boys and 5 girls each. To track the level of improvement a pre-test was given, where the students were asked to write an essay on a selected topic. The proficiency of the students was assessed and they were categorised as beginner, elementary, intermediate and upper-intermediate. The Criteria for evaluating the data set is given in the Table 1 below:

Table 1. Evaluation Criteria

Beginner	0-39%
Elementary	40-59%
Intermediate	60-79%
Upper-Intermediate	80-100%

One group of students practised English grammar using Grammarly and Speak & Improve application and another group was asked to practice using QuillBot and Deep English application. After 15 days the students were again asked to write an essay on a similar topic. The details of the pre-test and post-test results for both groups are given in the Tables 2 and 3 and the results are depicted graphically in Figure 1 and 2.

Table 2. Test Results of Students using Grammarly and Speak & Improve

	Total No. of Students	**No. of Beginner Level Students**	**No. of Elementary Level Students**	**No. of Intermediate Level Students**	**No. of Upper-Intermediate Students**
Pre-Test Data	**10**	**4**	**6**	**0**	**0**
Post-Test Data	**10**	**0**	**1**	**6**	**3**

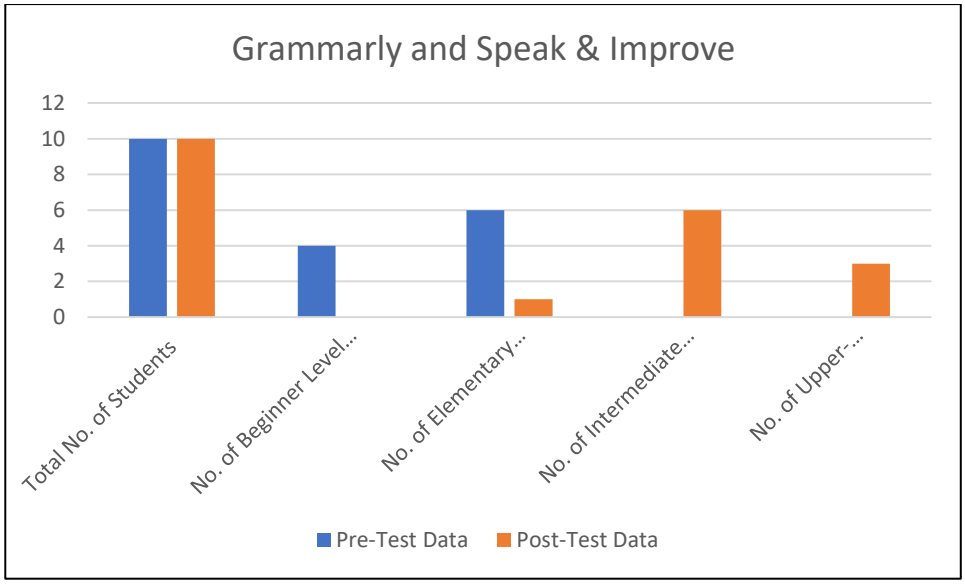

Figure 1. Test Results of Students using Grammarly and Speak & Improve

Table 3. Test Results of Students using QuillBot and Deep English

	Total No. of Students	No. of Beginner Level Students	No. of Elementary Level Students	No. of Intermediate Level Students	No. of Upper-Intermediate Students
Pre-Test Data	**10**	**4**	**6**	**0**	**0**
Post-Test Data	**10**	**0**	**2**	**7**	**1**

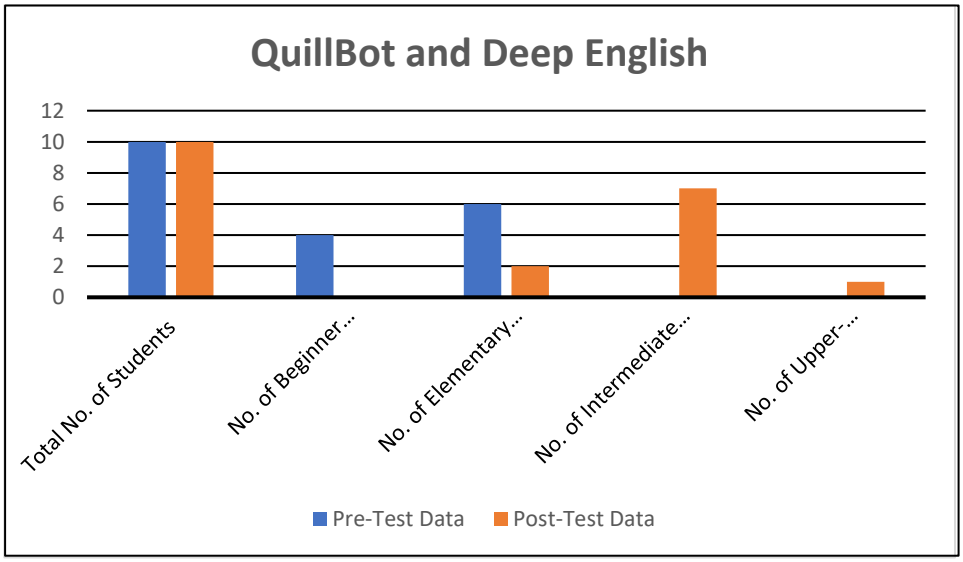

Figure 2. Test results of Students using QuillBot and Deep English

A single-factor ANOVA test was conducted to determine the similarity between both groups. ANOVA (Analysis of Variance) is a statistical method used to compare the means of two or more groups to determine if there are statistically significant differences between them. When applied to determine students' performance, ANOVA helps in understanding whether different factors such as teaching methods, study time, or class sections lead to different levels of student performance. The ANOVA test results for the pre-test scores of Group 1 and Group 2 are as follows:

- **F-value**: 0.096
- **P-value**: 0.760

8.1 Interpretation

- The **F-value** is very low, indicating that the variance between the group means is small relative to the variance within the groups.
- The **P-value** is 0.760, which is much higher than a typical significance level of 0.05. This means that there is no statistically significant difference between the pre-test scores of the two groups.

8.2 Descriptive Statistics

Table 4. Descriptive Statistics

Group	Test	Mean	SD	Proficiency Growth	*T*
G1 (N= 10)	Pre-test	38.5	15.31	30.1	-19.66
	Post-test	68.6	12.2		
G2(N=10)	Pre-test	40.6	15.01	29.6	-18.62
	Post-test	70.2	10.48		

Both groups show a significant improvement in the proficiency of the students as shown in Table 4 . The t-statistics indicate a statistically significant difference between the Pre-Test and Day 15 scores, suggesting that the use of AI had a significant positive effect on students' performance. The extremely low p-value confirms that the observed improvement in scores is highly unlikely to be due to chance. There is a noticeable improvement in the average scores from the Pre-Test to Day 15, indicating that the student's proficiency increased over time. The

decrease in standard deviation suggests that students' scores became more consistent by Day 15.

8.3 Comparison of the Proficiency Growth of Group 1 and Group 2

The first dataset exhibits slightly higher proficiency growth (30.1 points) compared to the second dataset (29.6 points). This indicates that the students in the first dataset showed a marginally greater improvement in proficiency from the pre-test to Day 15. Compared to the combined use of QuillBot and Deep English, the students using Grammarly and Speak & Improve show a higher percentage of improvement with a difference of 2.46%. Students in Group 1 demonstrated an average percentage improvement of approximately 36.08% Whereas students in Group 2 exhibited an average percentage improvement of about 33.62% This is because Grammarly offers more accurate grammar corrections and suggestions compared to QuillBot and the user interface is simple and effective. All 20 students demonstrated improvement in their grammar skills after using AI for learning. This shows that AI has a positive impact on the field of autonomous learning of students.

9. Conclusion

Grammar is an essential part of language development as it is the backbone that structures and refines communication. Studying grammar alone as rules and using traditional learning methods makes the process tedious. But when integrated into daily communication and simplified practice, it becomes easy for the learners as the rules get subconsciously embedded in their minds and become part of their communication skills. However, many students who graduate from government and government-aided schools learn English at a later stage of their lives, mostly after entering college. At this stage of their life, they hesitate to seek help as they are afraid of humiliation and hence their confidence level drops. AI-powered tools play a crucial role in enhancing grammar learning for various proficiency levels. Even though grammar learning is very efficient with the help of tools like Grammarly and QuillBot, when it is paired with conversational chatbots like Deep English and Speak & Improve, it increases the efficiency as chatbots focus on overall communication development through practice. Since software like Grammarly, QuillBot, and Speak & Improve are free and user-friendly, students belonging to any strata can utilise it. Despite recent criticisms of the internet by Generation Z, it remains a valuable tool for their learning and development

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