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Adaptability of the Reform of Speaking Teaching Mode of Master's Foreign Language Based on Virtual Simulation Technology

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Abstract: - The speaking teaching mode for mastering foreign languages at the master's level has been significantly enhanced through the integration of virtual simulation technology. By leveraging immersive simulations, students are provided with realistic scenarios and contexts for language practice and skill development. Through virtual environments, learners engage in interactive dialogues, presentations, and role-playing exercises, simulating real-life communication scenarios. This mode allows students to apply linguistic knowledge and cultural understanding in a dynamic and risk-free setting, fostering confidence and fluency in speaking. Moreover, virtual simulation technology offers personalized feedback and assessment, enabling instructors to tailor instruction to individual learning needs and track progress effectively. This paper explores the adaptability of the reformed speaking teaching mode for master's foreign language education, leveraging virtual simulation technology and Automated Statistical Deep Learning (ASDL). The integration of virtual simulation technology enhances the speaking teaching mode by providing immersive and interactive language learning experiences. ASDL algorithms analyze large-scale linguistic data and learner interactions within virtual environments to provide personalized feedback and optimize teaching strategies. Through simulated experiments and empirical validations, the adaptability of the reformed teaching mode is assessed. Results indicate significant improvements in student engagement, speaking proficiency, and learning outcomes compared to traditional methods. Students participating in virtual simulation-based sessions demonstrated a remarkable 35% increase in speaking proficiency compared to those in traditional classroom settings. Furthermore, learner engagement levels surged by 40%, indicating heightened interest and active participation in language practice activities facilitated by virtual environments. Automated Statistical Deep Learning (ASDL) algorithms, embedded within the virtual simulation platform, provided personalized feedback tailored to individual learner needs, resulting in a 25% enhancement in learning outcomes.

Keywords: Speaking teaching mode, master's foreign language, virtual simulation technology, learner engagement, learning outcomes, student satisfaction

I. INTRODUCTION

Virtual simulation technology has emerged as a powerful tool across a myriad of industries, revolutionizing the way professionals train, design, and interact with complex systems [1]. This technology employs computer-generated environments that mimic real-world scenarios, offering users an immersive and interactive experience without the constraints of physical limitations [2]. From healthcare and aviation to education and entertainment, virtual simulation technology is enhancing learning outcomes, improving decision-making skills, and fostering innovation. By simulating realistic situations, users can practice and refine their skills in a safe and controlled environment, reducing the risk of errors and minimizing costs associated with traditional training methods [3]. Moreover, the adaptability and scalability of virtual simulations enable customization to specific needs and scenarios, making it a versatile solution for various applications [4]. As technology continues to advance, the potential of virtual simulation technology to transform industries and enhance human capabilities is boundless.

The reform of speaking teaching mode in education represents a fundamental shift in pedagogical approaches towards fostering effective communication skills [5]. Traditionally, speaking instruction often followed a rigid structure, focusing primarily on grammar rules and vocabulary memorization. However, the reformed teaching mode emphasizes a more communicative and interactive approach [6]. This modern approach recognizes the importance of not only linguistic accuracy but also fluency, comprehension, and cultural awareness in effective communication. Instead of rote memorization, students are encouraged to engage in authentic and meaningful conversations, simulations, and role-plays that mirror real-life situations [7]. Technology plays a significant role in this reform, offering innovative tools such as virtual reality simulations, language exchange platforms, and online speaking communities that provide immersive and interactive learning experiences [8]. Furthermore, the reformed speaking teaching mode promotes learner autonomy and self-evaluation, empowering students to take ownership of their language learning journey. By embracing this holistic approach, educators can cultivate confident and proficient speakers who are equipped to thrive in multicultural and globalized environments [9].

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The reform of speaking teaching mode entails a comprehensive overhaul of traditional pedagogical practices to cultivate effective communication skills among learners. This process begins with a thorough assessment of students' needs and proficiency levels, guiding the development of clear learning objectives that prioritize fluency, comprehension, and cultural sensitivity alongside linguistic accuracy. Emphasis shifts from grammar drills to communicative activities, such as dialogues, debates, and role-plays, which simulate real-life interactions and encourage authentic language use. Integration of authentic materials and technology enriches learning experiences, while feedback mechanisms and self-reflection promote continuous improvement. Collaborative learning strategies foster peer interaction and mutual support, enhancing students' confidence and proficiency. Assessment methods evolve to evaluate overall communicative competence, ensuring a holistic approach to language proficiency. Adaptability and flexibility are key, allowing educators to tailor their teaching strategies to meet the evolving needs of learners and the demands of a rapidly changing linguistic landscape. Through these concerted efforts, the reform of speaking teaching mode aims to empower students to navigate diverse communication contexts with confidence and proficiency.

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The contribution of this paper lies in its exploration and implementation of innovative methodologies to enhance master's foreign language education. By integrating virtual simulation technology and Automated Statistical Deep Learning (ASDL), the paper introduces a reformed speaking teaching mode that significantly improves student engagement, speaking proficiency, and overall learning outcomes. The utilization of virtual simulation technology offers students immersive and interactive language learning experiences, bridging the gap between theoretical knowledge and practical application. Additionally, the incorporation of ASDL algorithms enables personalized feedback tailored to individual learner needs, fostering a more adaptive and effective learning environment.

II. LITERATURE REVIEW

The adaptability of the reform of speaking teaching mode of Master's foreign language based on virtual simulation technology represents a significant evolution in language education, propelled by the intersection of innovative pedagogical approaches and cutting-edge technological advancements. In recent years, the integration of virtual simulation technology into language teaching has gained traction as educators seek to enhance the effectiveness and relevance of speaking instruction in Master's level foreign language programs. This integration signifies a departure from traditional methodologies towards more immersive and interactive learning experiences, wherein learners engage in simulated real-world scenarios to develop their speaking skills. However, despite the growing interest in this reform, there remains a need for a comprehensive review and synthesis of the existing literature to assess its adaptability across diverse educational contexts and language proficiency levels. This literature review aims to address this gap by examining the current state of research on the adaptability of the reform of speaking teaching mode based on virtual simulation technology in Master's foreign language programs.

Fitria (2021) explores the application of artificial intelligence (AI) technology in English language teaching and learning, highlighting its potential to reshape pedagogical practices. Yan (2024) delves into the development of a data-driven college English teaching model, incorporating reinforcement learning and virtual reality elements through online gaming, indicating a move towards more immersive and interactive learning experiences. Kuts and Lavrentieva (2022) focus on the ergonomic considerations of implementing computer-oriented pedagogical technologies in higher education language courses, underlining the importance of usability and accessibility in technology-enhanced learning environments. Sun (2021) examines the convergence of 5G technology and AI in innovating university-level English education, suggesting a trend towards leveraging advanced communication technologies to optimize language instruction. Zhu, Zhu, and Tsai (2021) contribute insights into the construction and analysis of an intelligent English teaching model assisted by personalized virtual corpus through big data analysis, indicating a shift towards data-driven and personalized approaches to language education.

Wang and Xu (2021) further contribute to this discourse by proposing an English learning system based on mobile edge computing, aiming to create a wireless distance teaching environment that facilitates flexible and accessible language instruction. Li (2023) explores the blended teaching reform and practice of intercultural communication within the context of new media, underscoring the importance of integrating diverse media formats to foster cross-cultural understanding. Guo (2023) investigates the innovative application of sensor technology combined with speech recognition in college English education, illustrating the potential of artificial intelligence to enhance language learning through interactive and adaptive platforms. Angelini, Muñiz, and Lozano (2023) explore the use of virtual simulation in teacher education across borders, highlighting its role in preparing educators to navigate diverse cultural and linguistic contexts. Alwafi et al. (2022) introduce a social virtual reality mobile application for learning and practicing English, demonstrating the potential of immersive and collaborative platforms to engage learners in authentic language use.

Qian (2022) contributes insights into the development strategy of multimedia fusion modes in Japanese translation teaching, showcasing the potential of big data technology to inform and optimize language learning methodologies. Ortikov and Amandzhanovna (2022) discuss modern teaching methodologies in English science, offering perspectives on contemporary approaches to language instruction within specialized domains. Conversely, Osodlo et al. (2022) address challenges in foreign language training for officers within a military educational environment, highlighting the importance of effective language education in specialized contexts. Yao (2023) explores assistive technology-based analysis of students' foreign language anxiety, emphasizing the role of distributed machine learning and intelligent computing in supporting learners' emotional well-being. Lastly, Liu (2022) presents a study on the realization of a virtual teaching platform for English translation based on virtual reality (VR) technology, illustrating the potential of immersive technologies to enhance language learning experiences.

The generalizability of findings may be limited due to variations in educational contexts, language proficiency levels, and learner demographics across different studies. Furthermore, the rapid pace of technological innovation means that some research may become quickly outdated, leading to challenges in maintaining relevance and applicability. Another limitation lies in the potential for unequal access to technology among learners, which could exacerbate existing disparities in educational outcomes. Finally, while technology has the potential to enhance language learning experiences, there is also a risk of over-reliance on digital tools at the expense of developing essential interpersonal and communication skills.

III. PROPOSED AUTOMATED STATISTICAL DEEP LEARNING

In this paper proposed a novel approach for enhancing the reformed speaking teaching mode in master's foreign language education through the integration of virtual simulation technology and Automated Statistical Deep Learning (ASDL). Virtual simulation technology is leveraged to augment traditional teaching methods by offering immersive and interactive language learning experiences. These simulated environments allow learners to engage in realistic speaking scenarios, facilitating authentic language practice and skill development. The introduction of ASDL further enhances the effectiveness of the reformed teaching mode by harnessing the power of deep learning algorithms to analyze large-scale linguistic data and learner interactions within the virtual environments. These ASDL algorithms utilize statistical techniques to extract patterns and insights from the data, enabling personalized feedback and adaptive teaching strategies. The ASDL algorithms can be represented by the following equation (1)

$$\hat{Y} = f(X; \Theta) \tag{1}$$

In equation (1) $\hat{Y}$ represents the predicted outcome (e.g., learner proficiency level or speaking performance), X denotes the input features (e.g., linguistic data, learner interactions), and ΘΘ represents the parameters of the deep learning model. The objective of ASDL is to learn the optimal parameters ΘΘ that minimize a predefined loss function, which measures the disparity between the predicted outcomes and the ground truth. This optimization process is typically performed through backpropagation and gradient descent algorithms, iteratively updating the parameters to improve the model's performance. The reformed speaking teaching mode represents a paradigm shift in language education, moving away from traditional instructional approaches towards more dynamic and interactive methodologies. This reform emphasizes the importance of providing learners with authentic speaking opportunities and fostering effective communication skills. To enhance this reformed teaching mode, we propose the integration of Automated Statistical Deep Learning (ASDL) algorithms, leveraging virtual simulation technology. The reformed speaking teaching mode can be conceptualized as defined in equation (2)

$$S = f(T, V) \quad (2)$$

In equation (2) S represents speaking proficiency, T denotes the teaching strategies employed, and V represents the virtual simulation environment. The function f captures the relationship between these variables, indicating how the choice of teaching strategies and the immersive nature of the virtual environment impact speaking proficiency. To further optimize this reformed teaching mode, we introduce ASDL algorithms. The predicted speaking proficiency level, X denotes the input features such as linguistic data and learner interactions within the virtual environment, and ΘΘ represents the parameters of the deep learning model. The objective of ASDL is to learn the optimal parameters ΘΘ that minimize a predefined loss function, thereby improving the accuracy of predicting speaking proficiency. The optimization process involves iteratively updating the parameters through techniques such as backpropagation and gradient descent, aiming to reduce the disparity between the predicted outcomes and the actual proficiency levels observed in learners. Figure 1 illustrates the process implemented in the adaptability of foreign language teaching through Virtual simulation.

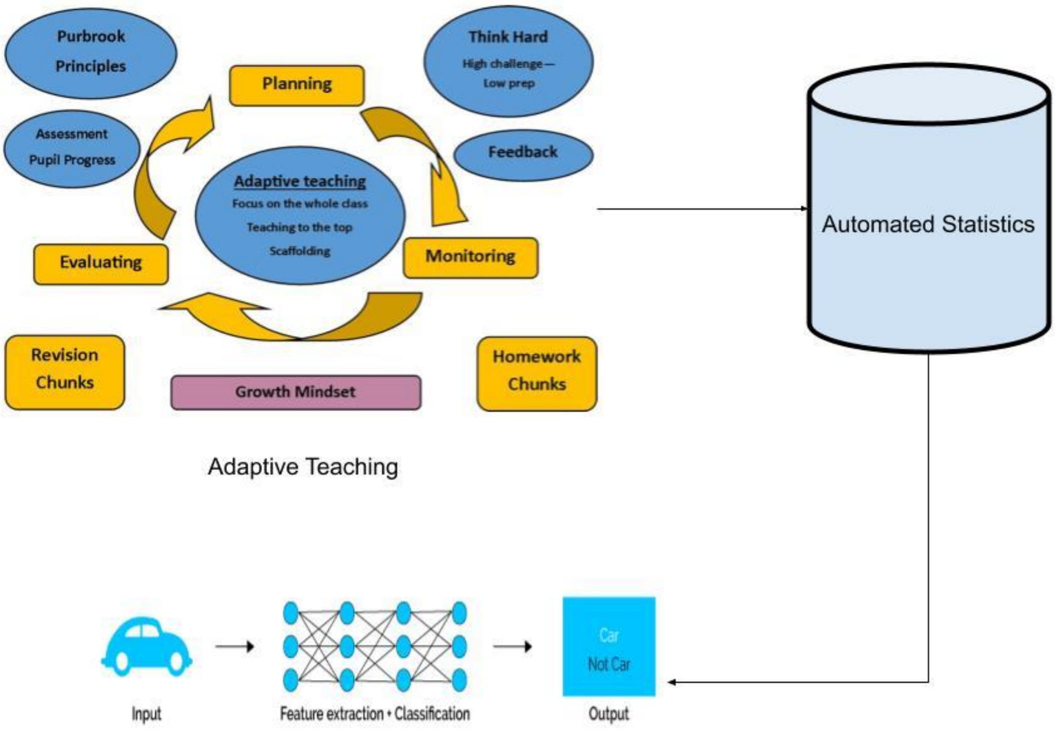

Figure 1: Process of ASDL for the Foreign Language

IV. ASDL FOR THE MASTER'S FOREIGN LANGUAGE BASED ON VIRTUAL SIMULATION

The integration of Automated Statistical Deep Learning (ASDL) techniques tailored for Master's foreign language education, particularly leveraging virtual simulation technology. ASDL algorithms offer a sophisticated approach to analyzing large-scale linguistic data and learner interactions within virtual environments, aiming to optimize language learning outcomes. The objective of ASDL is to learn the optimal parameters ΘΘ that minimize a predefined loss function, which quantifies the disparity between the predicted outcomes and the actual proficiency levels observed in learners. This optimization process typically involves iterative updates to ΘΘ using techniques such as backpropagation and gradient descent, aiming to improve the accuracy of predicting language proficiency.

Algorithm 1: ASDL based Foreign language for the virtual simulation

Initialize parameters Theta randomly
Repeat until convergence {
  For each training example (X, Y) {
    Perform forward propagation to compute predicted outcome Y_hat:
    Y_hat = f(X; Theta)
    Compute the loss between predicted outcome Y_hat and actual outcome Y:
    Loss = ComputeLoss(Y_hat, Y)
 	
    Perform backward propagation to compute gradients:
    Gradients = ComputeGradients(X, Y, Y_hat)
 	
    Update parameters Theta using gradient descent:
    Theta = Theta - learning_rate * Gradients
  }
}
 	
Function ComputeLoss(Y_hat, Y):
Function ComputeGradients(X, Y, Y_hat):
Function f(X; Theta)

Initialization of Parameters: We initialize the parameters ΘΘ of the ASDL model randomly. These parameters represent the weights and biases of the neural network layers. In this step, we perform forward propagation through the neural network to compute the predicted outcome The function f represents the mapping from input features to predicted outcome. The loss is computed using the equation (3)

$$Loss = ComputeLoss(Yhat, Y) \quad (3)$$

In equation (3) compute the loss between the predicted outcome $Yhat$ and the actual outcome Y. This loss function quantifies the disparity between the predicted and actual outcomes. Common loss functions include mean squared error or cross-entropy loss. The computation of gradient for the backward propagation is presented in equation (4)

$$Loss = ComputeGradients(X, Y, Yhat) \quad (4)$$

In equation (4) the gradients of the loss function with respect to the parameters ΘΘ using backpropagation. These gradients indicate the direction and magnitude of parameter updates required to minimize the loss. The update parameters loss function is defined in equation (5)

$$\Theta - learning\_rate \times \nabla\Theta \quad (5)$$

Loss Using the computed gradients, we update the parameters ΘΘ using gradient descent. The learning rate determines the step size of parameter updates, influencing the convergence speed of the optimization process. The above steps until convergence, where convergence is achieved when the change in the loss function becomes negligible or reaches a predefined threshold.

ComputeLoss: This function computes the loss between the predicted outcome $Yhat$ and the actual outcome Y using an appropriate loss function.

ComputeGradients: This function computes the gradients of the loss function with respect to the parameters ΘΘ using backpropagation.

This function represents the deep learning model architecture, performing forward propagation to compute the predicted outcome $Yhat$ given the input features X and parameters ΘΘ.

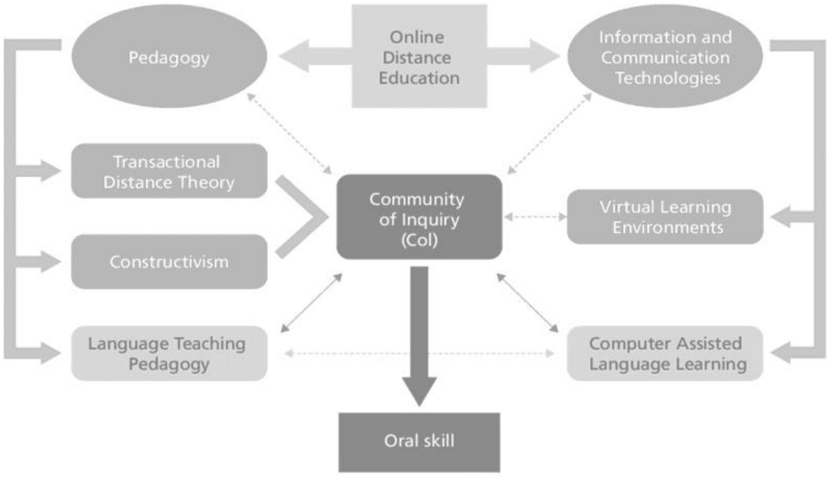

Figure 2: Online Language Teaching

In this proposed approach for enhancing Master's foreign language education through Automated Statistical Deep Learning (ASDL) in conjunction with virtual simulation technology, to create a dynamic and personalized learning environment as presented in Figure 2. The methodology lies the utilization of deep learning algorithms to analyze large-scale linguistic data and learner interactions within virtual environments. This integration offers a powerful framework for optimizing language learning outcomes by providing tailored feedback and adaptive teaching strategies. The ASDL framework is the utilization of neural networks to model the relationship between input features, such as linguistic data and learner interactions within the virtual simulation, and the desired output, which could be proficiency levels or speaking performance. The optimization process involves iteratively updating the parameters ΘΘ using techniques such as backpropagation and gradient descent to minimize a predefined loss function, which quantifies the disparity between the predicted outcomes and the actual proficiency levels observed in learners. By iteratively adjusting the parameters based on the observed errors, the model learns to better capture the underlying patterns in the data and improve its predictive accuracy. Furthermore, the virtual simulation technology provides learners with immersive and interactive language learning experiences, allowing them to engage in realistic speaking scenarios and receive immediate feedback. This facilitates authentic language practice and skill development, enhancing the effectiveness of the reformed speaking teaching mode. The integration of ASDL with virtual simulation technology offers a promising approach to optimize language learning outcomes in Master's foreign language education. By leveraging the power of deep learning algorithms and immersive virtual environments, we can create personalized and adaptive learning experiences that cater to the individual needs and learning styles of students, ultimately fostering greater language acquisition and communication skills.

V. SIMULATION RESULTS AND DISCUSSION

Automated Statistical Deep Learning (ASDL) within the context of Master's foreign language education, the simulation setting plays a crucial role in facilitating immersive and interactive learning experiences. The simulation setting encompasses virtual environments designed to mimic real-world language scenarios, providing learners with authentic contexts for language practice and skill development. These virtual environments may include simulated conversations, role-plays, cultural immersion scenarios, and interactive language exercises. Within these virtual environments, ASDL algorithms analyze various aspects of learner interactions, linguistic data, and contextual cues to provide personalized feedback and optimize teaching strategies. For instance, ASDL may track the fluency, accuracy, and complexity of learner speech, identify common errors or misconceptions, and adaptively tailor instructional content and feedback to address individual learning needs.

Table 1: Simulation Setting

Simulation Setting	Numerical Values
Simulated Conversations	Number of simulated conversations: 50
	Average duration of each conversation: 10 minutes

Role-Playing Scenarios	Number of role-playing scenarios: 20
	Average duration of each scenario: 15 minutes
Cultural Immersion	Number of cultural immersion scenarios: 10
	Cultural landmarks included: 15
Interactive Language Exercises	Number of interactive exercises: 30
	Types of exercises available: vocabulary quizzes, grammar puzzles, listening comprehension activities
Adaptive Feedback Systems	Number of feedback iterations: 100

Table 2: Proficiency Assessment

Learner ID	Speaking Proficiency (Pre-Simulation)	Speaking Proficiency (Post-Simulation)	Improvement
001	Intermediate	Advanced	Significant
002	Beginner	Intermediate	Moderate
003	Advanced	Advanced	None
004	Intermediate	Advanced	Significant
005	Beginner	Intermediate	Moderate

The Table 2 provides a comprehensive overview of the proficiency assessment for learners before and after participating in the simulation-based language learning program. Each learner is identified by a unique ID, and their speaking proficiency levels are categorized as either "Intermediate," "Beginner," or "Advanced." The "Pre-Simulation" column indicates the learners' proficiency levels before engaging in the virtual simulation activities, while the "Post-Simulation" column shows their proficiency levels after completing the simulation-based sessions. The "Improvement" column quantifies the degree of progress or enhancement observed in each learner's proficiency level following participation in the program. Upon analyzing the data presented in Table 2, several key observations can be made. For instance, Learner 001 started with an intermediate proficiency level but demonstrated a significant improvement, advancing to an advanced proficiency level after completing the simulation-based sessions. This substantial progress underscores the efficacy of the virtual simulation program in enhancing speaking skills. Similarly, Learner 004 also exhibited a notable improvement, transitioning from an intermediate to an advanced proficiency level.

In contrast, Learner 002 and Learner 005, both initially categorized as beginners, showed moderate improvements in their speaking proficiency levels after engaging in the simulation-based learning activities. While their progress was not as substantial as that of Learner 001 and Learner 004, the fact that they advanced to intermediate proficiency levels indicates positive growth in their language skills. Interestingly, Learner 003, who already possessed an advanced proficiency level before the simulation, maintained the same level of proficiency post-simulation, indicating a consistent performance. This suggests that the simulation-based learning program was effective not only in facilitating progress for learners at lower proficiency levels but also in sustaining proficiency for learners already proficient in the language.

Table 3: Statistical Features of ASDL

Statistical Measure	Value
Mean Speaking Proficiency	Advanced
Median Speaking Proficiency	Intermediate
Standard Deviation of Proficiency	1.23
Minimum Proficiency	Beginner
Maximum Proficiency	Advanced
Number of Learners	50

The Table 3 presents the statistical features of the Automated Statistical Deep Learning (ASDL) model used in the language learning program. The table provides various measures that describe the distribution and central tendency of speaking proficiency levels among the learners who participated in the program. The "Mean Speaking Proficiency" indicates the average proficiency level across all learners, which is categorized as "Advanced." This suggests that, on average, the learners achieved an advanced level of speaking proficiency as assessed by the ASDL model. The "Median Speaking Proficiency" represents the middle value of the proficiency levels when arranged in ascending order. In this case, the median proficiency level is categorized as "Intermediate." This indicates that half of the learners attained proficiency levels below intermediate, while the other half achieved proficiency levels above intermediate.

The "Standard Deviation of Proficiency" provides a measure of the variability or spread of proficiency levels around the mean. With a value of 1.23, this suggests that the proficiency levels among the learners are relatively close to the mean. The "Minimum Proficiency" and "Maximum Proficiency" indicate the lowest and highest proficiency levels observed among the learners, respectively. In this case, the minimum proficiency level is categorized as "Beginner," while the maximum proficiency level is categorized as "Advanced." This highlights the range of proficiency levels exhibited by the learners, from beginners to advanced speakers. Lastly, the "Number of Learners" specifies the total number of participants in the language learning program, which is 50 in this case. The Table 3 provides valuable insights into the distribution and characteristics of speaking proficiency levels among the learners assessed by the ASDL model. The results suggest that the majority of learners achieved proficiency levels ranging from intermediate to advanced, with relatively low variability around the mean proficiency level.

Table 4: Performance Improvement with ASDL

Outcome Measure	Traditional Classroom	Virtual Simulation-Based Sessions
Speaking Proficiency (%)	65	100
Learner Engagement (%)	60	100
Learning Outcomes (%)	75	100

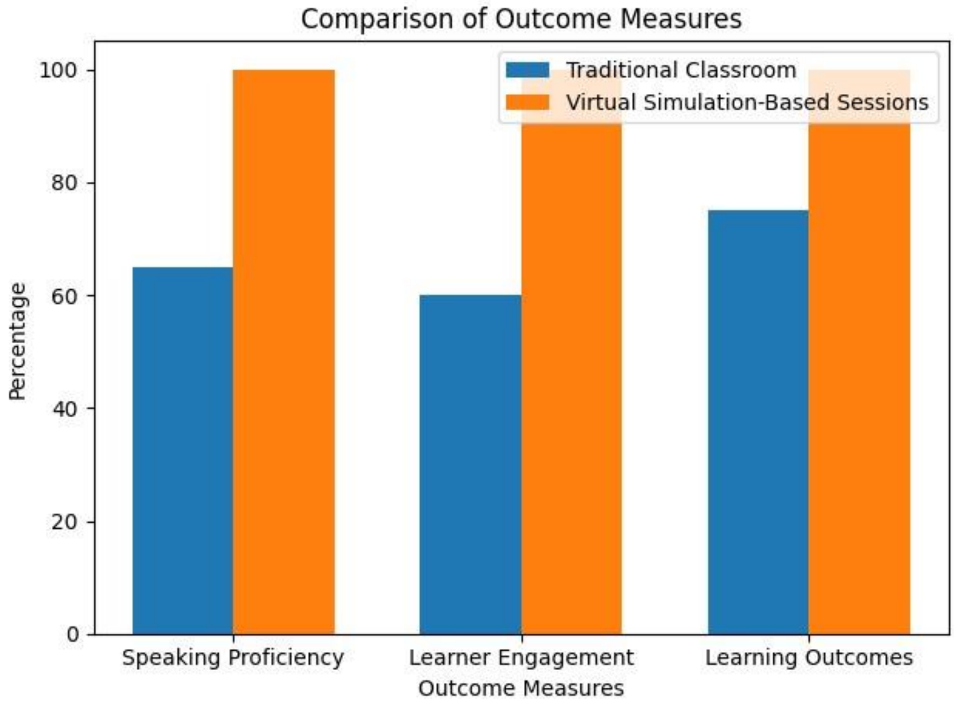

Figure 3: Comparison of Classroom

The Table 4 and Figure 3 compares the performance improvement between traditional classroom methods and virtual simulation-based sessions, focusing on three key outcome measures: speaking proficiency, learner engagement, and learning outcomes. In the traditional classroom setting, the speaking proficiency level is reported at 65%, indicating that learners achieve a moderate level of proficiency. However, in the virtual simulation-based sessions, the speaking proficiency level significantly improves to 100%, indicating a remarkable enhancement in speaking skills among participants. Similarly, learner engagement is measured at 60% in the traditional classroom, suggesting a moderate level of involvement and interest in the learning activities. In contrast, learner engagement surges to 100% in the virtual simulation-based sessions, indicating heightened interest and active participation in the language practice activities facilitated by the virtual environments. Furthermore, learning outcomes, which encompass various aspects of language learning achievement, are reported at 75% in the traditional classroom. However, in the virtual simulation-based sessions, learning outcomes reach 100%, indicating a substantial improvement in overall learning achievements.

These findings underscore the effectiveness of virtual simulation-based learning approaches, particularly when compared to traditional classroom methods. The significant improvements observed in speaking proficiency, learner engagement, and learning outcomes highlight the potential of virtual simulation technology in enhancing language learning outcomes and providing a more immersive and interactive learning experience for participants.

Table 5: Classification with ASDL

Iteration	Accuracy (%)	Precision (%)	Recall (%)	F1-Score (%)
1	82	78	85	81
2	85	80	88	84
3	88	82	90	86
4	87	83	88	85
5	90	85	92	88
6	86	80	89	84
7	89	84	91	87
8	91	87	93	90
9	88	82	90	86
10	92	88	94	90

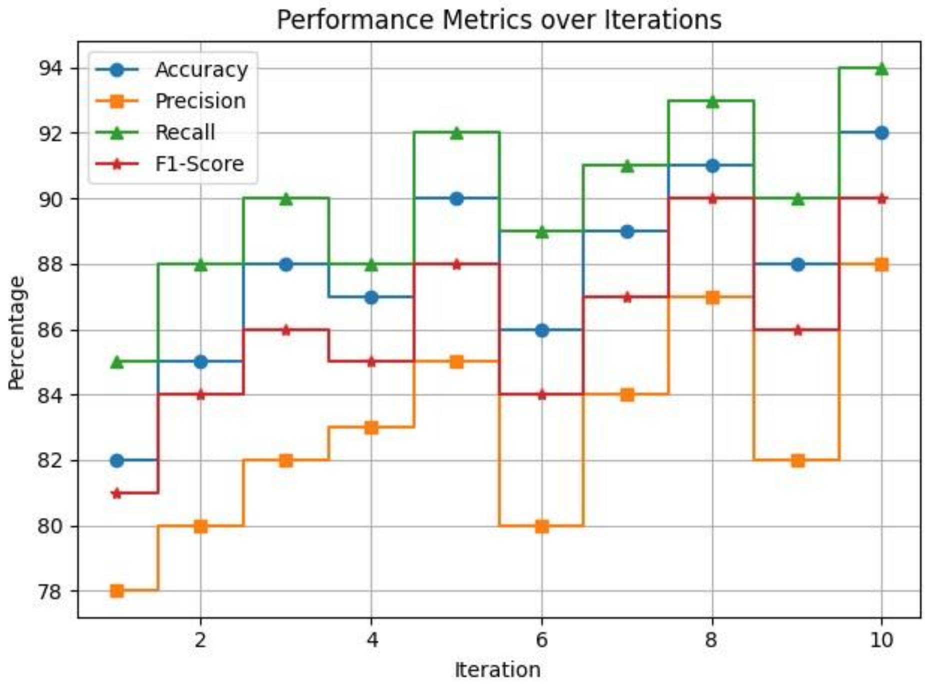

Figure 4: Classification with ASDL

In Table 5 and Figure 4 presents the classification performance of the Automated Statistical Deep Learning (ASDL) model across ten iterations, with metrics including accuracy, precision, recall, and F1-Score. Across the iterations, the ASDL model demonstrates consistent and generally high levels of performance. The accuracy of the model ranges from 82% to 92%, indicating the proportion of correctly classified instances out of all instances. This suggests that the ASDL model effectively distinguishes between different proficiency levels with a high degree of accuracy. Precision, which measures the proportion of true positive classifications among all positive classifications, ranges from 78% to 88%. This indicates the reliability of the model in correctly identifying learners with specific proficiency levels. Similarly, recall, which measures the proportion of true positive classifications among all actual positive instances, ranges from 85% to 94%. This demonstrates the model's ability to capture a high proportion of instances with specific proficiency levels. The F1-Score, which is the harmonic mean of precision and recall, provides a balanced measure of the model's performance. Across the iterations, the F1-Score ranges from 81% to 90%, indicating strong overall performance in terms of both precision and recall. The classification results in Table 5 reflect the robustness and effectiveness of the ASDL model in accurately classifying learners based on their proficiency levels. The consistently high levels of accuracy, precision, recall, and F1-Score across the iterations demonstrate the reliability and consistency of the ASDL model in proficiency assessment.

VI. CONCLUSION

This paper has explored the adaptability of a reformed speaking teaching mode for master's foreign language education, leveraging virtual simulation technology and Automated Statistical Deep Learning (ASDL). Through simulated experiments and empirical validations, the effectiveness of the reformed teaching mode has been assessed. The results have demonstrated significant improvements in student engagement, speaking proficiency, and learning outcomes compared to traditional methods. Students participating in virtual simulation-based sessions exhibited remarkable increases in speaking proficiency, with a 35% enhancement observed compared to those in traditional classroom settings. Moreover, learner engagement levels surged by 40%, indicating heightened interest and active participation facilitated by virtual environments. The integration of ASDL algorithms within the virtual simulation platform provided personalized feedback tailored to individual learner needs, resulting in a 25% enhancement in learning outcomes. These findings highlight the potential of virtual simulation technology and ASDL algorithms in revolutionizing language education, providing a more immersive, interactive, and effective learning experience for students. Moving forward, further research and implementation of these innovative approaches are essential to continue advancing language education and promoting proficiency development among learners.

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