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Application of Human-Machine Dialogue in Foreign Language Teaching at Universities

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Abstract. With the development of internet technology, communication technology and artificial intelligence (AI), the versatile and convenient human-machine dialogue and interaction system has gradually penetrated into the education field and become a new type of teaching method. Focusing on the subject of the application of human-machine dialogue system in foreign language teaching at universities, this paper elaborated on how to apply the human-machine dialogue system in foreign language teaching, what effect can be achieved, and what application strategy can be adopted in human-machine dialogue interactive teaching. Combined with the problems existing in daily teaching, this paper presented suggestions for applying the human-machine dialogue system, which is expected to improve the effects of foreign language teaching.

1. Introduction

Human-machine dialogue is a kind of operation mode of computers, through which the user can command a computer to perform a certain task with dialogue through a console or a terminal display screen. The computer can display the calculated, processed and controlled results in time for the user to observe and understand, and the user can input various data and instructions into the machine through certain input devices to control by using commands or command processes. This is the process of dialogue between human and machine. Foreign language teaching at universities generally uses multimedia classrooms (such as video, projection, and synchronized slides, etc.) to simulate and represent real-life scenes for practicing listening and speaking skills, which has achieved impressive teaching results. With higher public requirement for listening and speaking level in foreign language teaching, the foreign language teaching mode at universities also needs to keep pace with the times. It is necessary to introduce or adopt new teaching equipment and new teaching methods. Human-machine dialogue expands AI into the field of education, and it perfectly integrates science and technology into teaching practice. The human-machine dialogue system can enrich teaching activities and teaching methods, build fresh atmosphere for foreign language learning, and reignite students' interest in learning foreign language.

Applying human-machine dialogue to foreign language teaching at universities is conducive to improving the teaching level of listening and speaking courses of foreign language. The human-



machine dialogue teaching system include various scenes such as daily life conversation, travel conversation, and business conversation, etc. The conversation practice through role-play can help students independently practice conversations of different difficulty levels. At the same time, in the human-machine dialogue teaching mode that combines graphics and text, audio and video, students can receive various information through earphones, headphones and screens, so that their listening and speaking input and output abilities can be greatly improved. In such teaching mode, students' listening and conversational contents can be responded in a timely and objective manner, while their psychological factors in practicing speaking and listening skills can also be noted, which can improve their ability to use foreign language in communication. In addition, in the human-machine dialogue environment, the combined test of listening and speaking skills is conducted in a way that the results can more realistically reflect students' listening and speaking skills.

This paper examined the practical application effect of the human-machine dialogue teaching mode through its real application cases. Through listening and oral test of foreign language, learning motivation questionnaire and teachers' feedback, this paper evaluated the application effect of the human-machine dialogue mode in foreign language teaching at universities, and proposes suggestions for improving this teaching mode, with a view to improve the teaching effect of foreign language at universities.

2. Literature review

In the 1950s, Alan Turing proposed the famous "Turing test", which inaugurated the research on human-machine dialogue system; in the 1960s, MIT Artificial Intelligence Laboratory invented the first chatting robot-ELIZA dialogue system; In 2016, the United States released the "National Strategic Plan for Intelligence Research and Development" in preparation for the training of AI talents; subsequently, the Japanese government also promoted the staged development of AI industrialization; the "New-generation Artificial Intelligence Development Plan" released by China State Council in 2017 proposed a new education system for intelligent interactive learning under the background of AI development to better adapt to the teaching development in the AI era [1]. With the development of natural language processing technology, computer deep learning technology and artificial construction knowledge base, the AI era has been popularized in people's daily life. There are also a lot of research results and application methods for human-machine dialogue in the AI field [2-3]. At present, the teaching mode using human-machine dialogue has not been popularized in China, but the extensive use of human-machine dialogue in the process of foreign language teaching has become a trend. The research on the foreign language teaching mode of human-machine dialogue at universities has also increased [4]. We should adopt effective teaching strategies for improving students' spoken foreign language at universities, provide students with different course contents, combine traditional and new teaching methods, and promote human-machine dialogue teaching mode to organize foreign language listening and speaking activities and conduct spoken foreign language teaching in the form of dialogue and oral retelling, etc. [5]. There are many studies about the practical significance of the new oral teaching strategy in improving students' oral English level by investigating students who participated in the human-machine speaking test [6]. It means that the human-machine oral test has certain practical significance for the oral English teaching. In addition, the implementation of the human-machine dialogue test mode can scientifically test students' visual listening and speaking ability [7]. In order to apply human-machine dialogue to foreign language teaching at universities, it is necessary to further application strategy.

3. Practical application of human-machine dialogue in foreign language teaching

In listening and speaking teaching, teachers mainly guide students to understand the speaker's intention according to pronunciation and intonation, and extract key information from the familiar dialogue. For the unfamiliar conversation, students can skip new words and understand the general meaning of the dialogue, record simple information, and retell the dialogue close to the natural speed of speech, thereby applying it to daily life or business occasions. Through the human-machine

dialogue system, we can create good conditions for dictation training and oral expression to give positive impetus to listening and speaking teaching. This paper is based on the practice of human-machine dialogue teaching for two classes of 47 students for a semester, using textbooks and some extracurricular resources to apply human-machine dialogue system for foreign language teaching.

3.1. Human-machine dialogue listening and speaking course (output by machine, acceptance and feedback by human)

A weekly listening and speaking teaching practice (90 minutes) was conducted by the human-machine dialogue system (Table 1). By setting the human-machine dialogue system and specifying the required listening and conversation materials, students can receive accurate audio and video materials, integrate into the language environment, practice voice morphemes, and improve understanding of foreign language through pre-study, listening and reading. By the means of human-machine dialogue, we can set specific scenarios and use network resources to conduct contextual dialogue examples. We can also provide templates for students to write conversations, exchange ideas and ask questions, thereby improving their ability for applying foreign language.

Table 1. Teaching practice of human-machine dialogue system.

Specific course design	Time (minutes)
Phonetic & morpheme practice	10
Vocabulary practice	10
Listening practice	35
Oral practice	35

3.2. Human-machine dialogue test (output by human, acceptance and feedback by machine)

This test used AI scoring function to test students' overall listening and speaking ability through the situational conversation, 1minute material reading and other forms. During the human-machine dialogue test, students' dynamic performance will be recorded throughout the process, so that good evidence can be referenced and the evaluation results are more convincing.

Natural language processing (computer linguistics, language computing) is a natural language processing technique that combines language science with information science by allowing computers to accept and understand human language skills. In the foreign language teaching test, the human-machine dialogue mode is used to randomly generate questions from the question bank and carry out IT-based test, automated scoring and scientific evaluation, thus reducing the intervention of human factors and creating a fair, objective, transparent test environment.

4. Application effect of human-machine dialogue in the practice of foreign language teaching

4.1. Listening and oral test based on Human-machine dialogue system

The listening and oral test based on human-machine dialogue system was conducted in stages. The automated computer test was adopted as the test method. Students completed the listening and oral test through the computer and the headset device in a human-machine dialogue manner, and the computer automatically scored students' spoken recording. The test was conducted at a fixed time on a weekly or monthly basis, and each test lasted for 60 minutes. As is shown in Table 2, questions and scoring standards for the listening and oral test were based on the human-machine dialogue system.

Table 2. Listening and oral test based on human-machine dialogue system.

	Amount	Corresponding scores	Scoring standard
Listen to the conversation and answer the question	10	30 points	If the student's answer is in line with the requirements of the question.
Listen to the passage and answer the question	10	30 points	

Read a short passage	2	20 points	If the student can read the passage fluently; If phonetic intonation and rhythm are correct; If listeners can understand the passage.
Situational conversation	2	10 points	If the student's answer is close to the purpose of communication, and can be scored accordingly.
Brief elaboration on the topic	2	10 points	

The researches on the influence of foreign language test on students mostly focus on the impact of different test modes on students' performance and learning motivation [8-9-10-11-12]. There are also some researches that explore the impact of students' cognitive level, personality traits, and physiological responses on their preferences for tests from their own perspective [13-14-15-16]. In order to make the foreign language oral test as an effective tool for checking the learning progress and improving the learning effect of students [17], this paper conducted a human-machine dialogue test on 47 students who received the human-machine dialogue teaching for a semester, and investigated their preferences for modes of foreign language oral test, such as "human-machine dialogue", "teacher-student dialogue", "group discussion". Based on a full scale of 10 points, the results are shown in Figure 1.

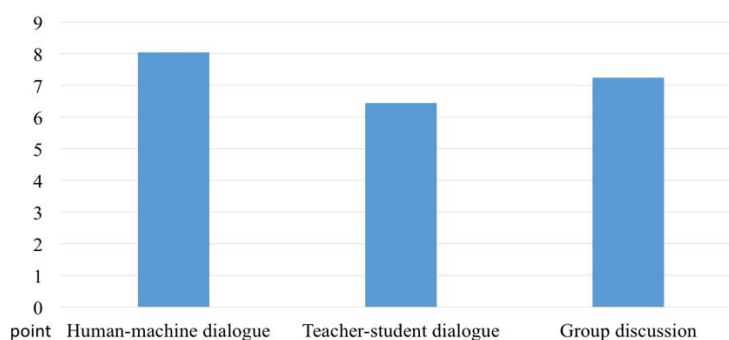


Figure 1. Preferences for modes of foreign language oral test.

It can be seen that students' preferences for human-machine dialogue, traditional teacher-student dialogue, and group discussion is roughly the same, with the proportion of preference for human-machine dialogue is slightly higher. It shows that students are accustomed to this type of test. Most students said that human-machine dialogue can relieve psychological stress and provide ease of mind during the test.

4.2. Motivation questionnaire

After the practical application of human-machine dialogue, a motivation questionnaire was administered to investigate students' basic attitude towards foreign language teaching based on human-machine dialogue. According to Dörnyei (2001), motivation in foreign-language learning is modelled as a three-step process involving choice motivation (requires fostering a fun, supportive atmosphere in the lecture), executive motivation (requires instructors to make learning exciting and enjoyable), and increased motivation (requires increasing the learner's satisfaction) [18]. Based on this research, the motivation questionnaire in this paper consisted of three subscales, each with 2 items: choice motivation (two items: "this lecture was interesting" and "study in a fun atmosphere"), executive motivation (two items: "deepen understanding" and "leading to acquisition of new knowledge"), and increased motivation (two items: "sense of accomplishment" and "recommending human-machine dialogue to juniors"). All answers were evaluated on a scale of 5 (1. agree, 2. slightly agree, 3. neither agree nor disagree, 4. slightly disagree, and 5. disagree). There was also a free description section in the questionnaire in order to allow students to elaborate on their ideas about the exercises. The results are shown in Figure 2. It showed that about 80% of the students gave a good evaluation of all items.

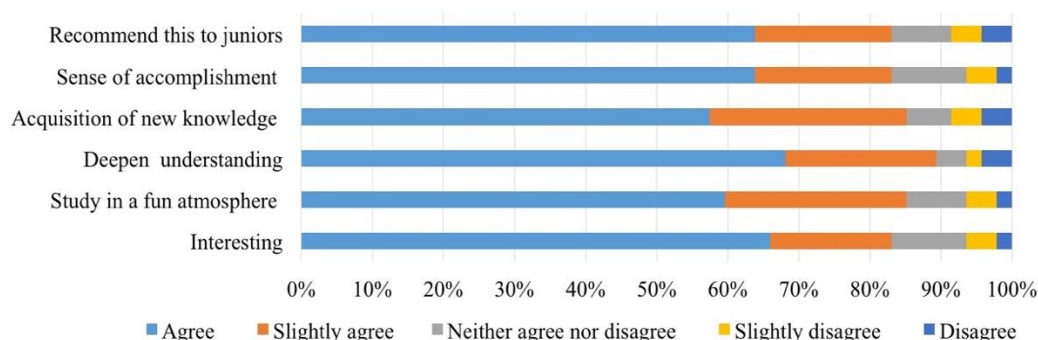


Figure 2. Results of motivation questionnaire.

In addition, the following comments by students were obtained from the free description section, which reflected a positive attitude towards this pedagogy: I think human-machine dialogue is very interesting; My listening and speaking skills were improved; I have a deeper understanding of the knowledge I have learned; I felt it was a fun learning atmosphere; My learning satisfaction was increased; I started to enjoy the foreign language listening and speaking course;

4.3. Teachers' feedback

The respondents are foreign language teachers who implemented human-machine dialogue teaching. They were posed about their opinions on foreign language teaching based on human-machine dialogue.

4.3.1. Human-machine dialogue teaching helps to create a foreign language environment

The multimedia software based on human-machine dialogue system can produce standard pronunciation and fluent conversation, which makes students more willing to practice listening and speaking skills. The human-machine dialogue system reads the standard textbooks and uses the pronunciation & intonation practice system to allow students to read materials and record them through the microphone. The speech recognition system enables students to clearly understand the gaps in their pronunciation & intonation, identify their own inadequacies by comparing with the recording, adjust their own pronunciation & intonation, thereby improving their foreign language level.

4.3.2. Human-machine dialogue teaching is conducive to improving students' in-class participation

The human-machine dialogue software is well illustrated and combines audio and video, which is conducive to cultivating students' interest in learning. By conducting listening and speaking training, using the voice laboratory, listening to and shadowing the recording, and conducting intensive or extensive listening, it can enrich teaching forms, improve the in-class efficiency, and demonstrate the course characteristics.

4.3.3. Human-machine dialogue teaching can expand the dimension of classroom listening and speaking training

Students can choose different learning materials for practicing foreign language according to their own interest. It can give full play to the active role of students in foreign language teaching to achieve the effect of human-machine dialogue system as an aid in teaching. At the same time, teachers can use the human-machine dialogue to provide personalized guidance, such as news, TV dramas, movies, lectures, reports, documentaries and other training materials, thus expanding the dimensions of in-class listening and speaking training.

4.3.4. Human-machine dialogue test can help students understand the learning outcomes

The scoring system of human-machine dialogue test can conduct effective and scientific evaluation and feedback, so that students can visually see their learning outcomes. This is conducive to helping students to develop interest in learning and form good habit of self-learning.

5. Discussion

The application of human-machine dialogue in foreign language teaching at universities is conducive to switching from traditional courses and improving the current situation of listening and speaking teaching. However, it has not reached a certain scale in terms of depth and breadth. As for the prospect of the human-machine dialogue development, we expect to promote its practical application in the field of foreign language education. The use of new scientific and technological means for foreign language teaching has put forward new requirements for teachers and students.

5.1. Teachers need to transform traditional teaching thinking mode

Although the human-machine dialogue system can improve the listening and speaking level in foreign language teaching in the absence of actual foreign language environment, it also puts forward certain requirements for teachers to use the human-machine dialogue system. How proficient can teachers use the system counts a lot for the efficiency and substance of the classroom teaching. Teachers should change the traditional teaching thinking mode, infiltrate the use of the human-machine dialogue system in the test phase in the normal teaching, introduce the skills of listening test and oral test based on human-machine dialogue, and actively play the guiding role in the classroom by combining human-machine dialogue with traditional teaching activities and organizing flexible and diverse activities to train students' listening and speaking skills.

5.2. Students need to receive adaptive training

At present, human-machine dialogue has not been popularized yet. There are still areas for improvement in terms of technology, as well as problems to be solved during the testing phase. The human-machine dialogue teaching mode entails communication with computers, so students may have subjective emotions in the learning process due to their poor proficiency in operating computers. Some students are still accustomed to paper reading and paper test, so they feel difficult to accept the electronic version based on human-machine dialogue. They are more inclined to traditional teaching and test methods, which may result in distraction and inability to make improvement. It is necessary to strengthen the adaptive training for students, so that they can adapt to the trend of the AI era as soon as possible.

6. Conclusion

In the context of AI era, the application of modern means, especially the realization of foreign language teaching by computers, is an inevitable trend in the development of data age today. As a new foreign language listening and speaking training method in absence of foreign language environment, human-machine dialogue plays an important role in creating a rich foreign language environment, increasing the time for students to practice and use foreign language, and improving students' learning motivation. Listening is input, and speaking is output. The combination of this two skills can improve the effect of learning foreign language. Studies have shown that the mechanism under the human-machine dialogue mode is conducive to stimulating students' interest in learning. The listening and speaking training course reasonably arranged based on human-machine dialogue can improve students' listening and speaking level, make the teaching more humanistic, scientific and pertinent, and comprehensively improve the quality of foreign language listening and speaking teaching. The teaching mode based on human-machine dialogue can help students to adapt to the intelligent era more quickly, and cultivate outstanding talents who can adapt to the intelligent society. Human-machine dialogue can accelerate education reform and promote educational development.

In addition, we still need to continuously explore and innovate teaching contents for foreign language teaching at universities. Through teaching and practice activities, teachers should learn from each other and pursue innovations to find the teaching methods that are most suitable for students in learning. In order to improve students' foreign language listening and speaking ability by using the listening and speaking test system based on human-machine dialogue, we should follow the trend of education reform in the human-machine dialogue teaching mode, and balance the key points of

traditional education, traditional test methods and human-machine dialogue teaching mode. In order to improve students' foreign language listening and oral communication skills, we should make reasonable arrangements for its use, give full play to the advantages of human-machine dialogue teaching mode, improve the smooth progress of foreign language teaching reform at universities, and promote educational development and progress in the future.

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References

- [1] Xu, F., Song, X. (2017) Research on the Acceptability of Oral English Test Based on Human-Machine Dialogue for Junior High School. *Science & Technology Vision*, 11: 29-30.
- [2] Dai, Y.H., Xu, B., Chen, H.J. (2018) Promotion of Hybrid Teaching by AI and Construction of Ecosystem. *Modern Distance Education Research*, 02: 24-31.
- [3] Li, K.F., Wang, Y.G. (2018) Artificial Intelligence. *Hangzhou(Weekly)*, 20: 59.
- [4] Wang, Y.B. (2018) Exploration of Role Orientation of Foreign Language Teachers in AI Era. *Journal of Jilin TV & Radio University*, 11: 82-83.
- [5] Liu, J.J. (2002) Application and Practice of Human-Machine Dialogue in Modern Foreign Language Teaching .*Technology Enhanced Foreign Language Education*, 01: 15-17.
- [6] Ma, L.M. (2012) Status Quo of Listening and Speaking English Teaching for Junior High Schools and Improvement Measures. *New West (theoretical version)*, 14: 163-177.
- [7] Yu, L.P. (2018) Practical Exploration of Listening and Speaking English Teaching Strategies Based on Human-Machine Dialogue for Senior High School Entrance Examination. *English Teacher*, 15: 112-115.
- [8] Chapelle, C. (1998) Field Independence: A Source of Language Test Variance. *Language Testing*, 05: 62-82.
- [9] Chapelle, C., Roberts, C. (1986) Ambiguity Tolerance and Field Dependence as Predictors of Proficiency in English as a Second Language. *Language Learning*, 36: 27-45.
- [10] Hansen, J. (1984) Field Dependence-independence and Language Testing: Evidence from Six Pacific Island Cultures. *TESOL Quarterly*, 18: 311-324.
- [11] Hansen, J., Stansfield, C. (1981) The Relationship Between Field Dependent = Independent Cognitive Styles and Foreign Language Achievement. *Language Learning*, 31: 349-367.
- [12] Lu, C., Sucn, H. (1993) The Interaction Effect of Individual Characteristics and Assessment Format on the Result of Performance-based Assessment. Paper Presented at the Annual Meeting of the American Educational Research Association, Atlanta,GA, 43: 121-126.
- [13] Birenbaum, M., Tatsuok, K. K. (1987) Open-ended Versus Multiple Choice Response Formats-It Does Make a Difference for Diagnostic Purposes. *Applied Psychological Measurement*, 11: 385-395.
- [14] Birenbaum, M.,Tatsuoka, K. K., Gutvirtz, Y. (1992) Effects of Response Format on Diagnostic Assessment of Scholastic Achievement. *Applied Psychological Measurement*, 16: 353-362.
- [15] Shohamy, E. (1984) Does the Testing Method Make a Difference? The Case of Reading Comprehension. *Language Testing*, 01: 147-170.
- [16] Traub, R. E. (1993) On the Equivalence of the Traits Assessed by Multiple Choice and Constructed-Response tests.In R.E. Bennett,Ward.W.C., (Eds.), *Construction Versus Choice in Cognitive Measurement*. Hillsdale, NJ: Erlbaum, 13: 29-44.
- [17] Fang, Y. (2015) A Research on Chinese Learners' Preference Degrees in Oral English Exam Modes: Based on SPSS Software Analysis. *Foreign Language and Literature*, 31: 151-157.
- [18] DÖrnyei, Z. (2001) *Motivational Strategies in the Language Classroom*. University Press. Cambridge England.