

<https://doi.org/10.70517/ijhsa464597>

A Study on the Application of Multimedia Assisted Teaching in the Teaching of Mandarin to Foreigners

Zhaozhao Yang¹ and Huixu Li^{1,*}

¹ College of Primary Education, Hunan First Normal University, Changsha, Hunan, 410205, China

Corresponding authors: (e-mail: yangzhaozhao@hnfnu.edu.cn).

Abstract With the development of globalization, the influence of Chinese as a world language is growing. Teaching Mandarin as a foreign language has become the main way for non-native speakers to master Chinese. This paper explores the application of multimedia-assisted teaching in teaching Mandarin as a foreign language, especially the impact on classroom teacher-student interaction behavior. The study was conducted through an experimental design in which three classroom hours of teaching Mandarin as a foreign language were implemented in High School B in Wuxi City. Data were collected through classroom video recordings and teacher-student interviews to analyze the frequency of interaction and behavioral transitions during the teaching process. The results showed that after using multimedia-assisted teaching, the frequency of teacher-student interactions in the classroom was significantly increased, with a technology manipulation rate of 55.75% for students and 37.46% for teachers. In addition, students' thinking and practicing activities in the classroom occupied 65.61% of the time, indicating that students were able to participate more autonomously and actively in the learning process. The results of the lagged sequence analysis further revealed that the behavioral transitions between teachers and students were significant, especially in the questioning and feedback sessions. The conclusion points out that multimedia-assisted teaching can effectively improve the quality of interaction and students' learning engagement in teaching Mandarin as a foreign language.

Index Terms multimedia-assisted teaching, teaching Mandarin as a foreign language, teacher-student interaction, lag sequence analysis, technology manipulation, classroom behavior

I. Introduction

The promotion of Putonghua, the implementation of standardized Chinese characters, and the wide promotion and full popularization of Putonghua are the basic language policies in China [1], [2]. At present, China has entered a new period of development in all aspects, especially since China's accession to the World Trade Organization (WTO), communication between countries and ethnic groups has been deepening, and the popularization of Putonghua has become more crucial and prominent than in previous periods [3]-[6]. With the dissemination and promotion of Chinese language by international schools and Confucius Institutes around the world, international students from Chinese universities coming to China for study and exchange, and Chinese people at home and abroad attaching more importance to Chinese language, the teaching of Putonghua as a foreign language will have a greater and greater impetus to the teaching of Chinese as a foreign language and the implementation of international exchanges and cooperation, and at the same time, it can promote the development of international student education in China [7]-[10].

With the development of science and technology, the application of multimedia technology in all walks of life has become more and more extensive, especially in education, which provides great convenience for teaching Mandarin as a foreign language [11], [12]. Through multimedia teaching, medium teachers can use pictures, audio, video and other forms to show the pronunciation, intonation, usage and other contents of Mandarin to help students, better understand and master the knowledge of Mandarin [13]-[15]. By playing standard Mandarin pronunciation videos, students can more intuitively understand how each syllable is pronounced, thus improving pronunciation accuracy [16], [17]. As another example, by playing videos of authentic Mandarin conversations, students can better comprehend the intonation and usage of Mandarin, helping them to integrate into the Mandarin environment faster [18], [19]. Multimedia teaching can also provide a more vivid and interesting way of learning and stimulate students' interest in learning [20], [21]. Teachers can use animation, games and other forms to design the Mandarin learning content, so that students can learn Mandarin in a relaxing and enjoyable atmosphere, enhancing the fun and attraction of learning [22]-[24]. In this way, students will be more actively engaged in Mandarin learning and the learning effect will be better.

In the context of globalization, the demand for Chinese language learning has gradually increased, and Mandarin has become a key tool for international communication. However, the existing traditional teaching modes are mostly text-based, lacking in interactivity and practicability, and unable to stimulate students' enthusiasm for learning, especially in foreign teaching, where classroom interaction is often limited by teaching methods, tools and content. In order to solve this problem, more and more educators have started to introduce multimedia technology in recent years, aiming to make the learning of Mandarin more vivid and attractive through video, audio, interactive software and other tools.

With the rapid development of educational technology, especially the arrival of the informationization era, the teaching mode has begun to change towards a more interactive and flexible direction. The introduction of multimedia technology breaks the time and space limitations of traditional teaching and provides a more flexible learning space for teachers and students. In the external teaching of Putonghua, multimedia technology can not only provide rich visual and auditory experience, but also promote instant communication and feedback between teachers and students through interactive functions, so as to better meet students' individualized learning needs.

Based on the multimedia-assisted teaching mode, this paper will explore its impact on the interactive behavior of teachers and students in the Mandarin classroom. The study will collect relevant data and analyze them through experimental design, in order to reveal the advantages and application prospects of multimedia technology in the external teaching of Putonghua. Firstly, analyze the shortcomings of Mandarin classroom interaction under the traditional teaching mode, and then put forward the feasibility of the multimedia-assisted teaching mode; secondly, design the experimental scheme, collect the classroom data, and explore the interactive behaviors and transformational relationships between teachers and students through the lagged sequence analysis method; lastly, summarize the impact of multimedia-assisted teaching on the teaching mode of Mandarin in the context of the results of the data analysis, and provide theoretical support and practical guidance to the teaching practice in the future. Finally, we summarize the effects of multimedia-assisted teaching on the Mandarin teaching mode with the results of data analysis, providing theoretical support and practical guidance for future teaching practice.

II. Constructing the Foreign Teaching Mode of Putonghua under Multimedia-assisted Teaching

The traditional Mandarin teaching mode in colleges and universities often focuses on text parsing and recitation, lacks intuitiveness and interactivity, and is difficult to adapt to the personalized learning needs of modern students. In this chapter, we will construct a foreign teaching mode of Putonghua with the assistance of multimedia technology.

II. A. Determination of teaching objectives

Considering the characteristics and needs of the external teaching mode of Putonghua with the aid of multimedia technology, the teaching objectives are determined from three aspects: knowledge objectives, ability objectives and emotional attitude and value objectives.

Firstly, the knowledge objective is to enable students to master the basic knowledge system of Putonghua, which requires students to grasp the core elements of Putonghua theory in depth and accurately. Secondly, on the solid foundation of the knowledge objective, the ability objective is further set, aiming at comprehensively improving students' practical skills and comprehensive literacy. Finally, compared with the cultivation of external skills, the objective of emotional attitude and value focuses on students' inner world and cultural identity, aiming to stimulate students' deep emotion towards Putonghua, and through reading and experiencing the audiovisual works in Putonghua, students can resonate with the characters and plots in the works on the emotional level, and feel the different wisdom and emotional colors of life.

II. B. Designing CAI courseware

In the teaching of Putonghua, courseware is not only a medium of theoretical knowledge, but also a bridge and link between teachers and students, and the quality of its design has a direct impact on the final teaching effect. As a product of the deep integration of multimedia technology and teaching practice - CAI courseware, its design quality is crucial [25]. In order to maximize the effect of CAI courseware in the teaching of Putonghua, a systematic hierarchical structure design strategy is adopted.

II. C. Constructing a presentation-based CAI teaching mode

Traditional teaching methods are limited by static texts and teachers' verbal teaching, which are difficult to stimulate students' imagination and enthusiasm for learning, and to a certain extent aggravate students' psychological barriers to Mandarin learning. In view of this situation, the presentation-based CAI teaching mode has come into being, which is a positive response and creative breakthrough to the plight of Mandarin teaching. Through the in-depth

integration of multimedia technology and the practice of teaching Mandarin to foreigners, the demonstration CAI teaching mode transforms the originally complex and abstract knowledge of Mandarin into vivid and concrete content that is easy for students to accept and understand, and encourages students to gradually build up a deep understanding of Mandarin knowledge.

III. Research design for teaching Mandarin to foreigners

The purpose of this study is to investigate the effects of the construction of the external teaching mode of Mandarin on classroom teacher-student interaction under multimedia-assisted teaching by comparing and analyzing the differences in teacher-student interaction behaviors and teacher-student behavioral transformation relationships in Mandarin classrooms under multimedia-assisted teaching environments.

III. A. Experimental design

The experiment for this study was chosen to be conducted within High School B in Wuxi, China. The students who participated in this experiment were all the students in the first grade 1 class of High School B. The researchers were asked to prepare for the experiment. Before starting the experiment, the researcher had to make preparations for teaching and experimentation. The preparation for teaching included analyzing the teaching content, developing the program of teaching activities, and making the teaching tools. After the preparation work was completed, the teaching experiment was carried out, in which the proposed multimedia-assisted teaching model of teaching Mandarin to foreign countries was applied to teach Mandarin, and the length of the experiment was one unit of teaching content, i.e., three hours, and the video recording of the class was made in the course of the experiment to serve as the basis for the analysis of classroom interaction between teachers and students. At the end of the experiment, interviews were conducted with the teachers and students, and the interviews were recorded as an aid to the analysis of teacher-student interaction.

After all the experiments were completed, the data collected from the experiments, including the classroom recordings and the audio recordings of the teacher-student interviews, were properly stored and backed up, and the preliminary data were processed, so as to prepare for the later data analysis.

III. B. Data analysis methods

III. B. 1) Frequency analysis of teacher-student interaction behavior

There are many methods to study teacher-student interaction from the perspective of interactive behavior, and the most common methods include Flanders Interaction Analysis System (FIAS), Information Technology-based Interaction Analysis System (ITIAS), and Student-Teacher Analysis (S-T) [26]. Although the above analysis methods can analyze the behaviors of teachers and students in the classroom, they all define the interaction between teachers and students as intermittent single-point behaviors to be analyzed, and fail to analyze the communication and interaction between teachers and students from a coherent point of view. In this study, teacher-student interaction is viewed as a continuous sequence, in order to interpret teacher-student interaction from a coherent perspective. Therefore, this study utilizes the method of dialogic analysis to reveal the nature of teacher-student interaction in a technology-rich environment.

III. B. 2) Lagged series analysis

In this study, teacher-student interaction was analyzed as a continuous sequence in order to interpret teacher-student interaction from a coherent perspective. After coding and frequency analysis of teacher-student behaviors, this study used lagged sequence analysis (LSA) to analyze the transition relationship between teacher and student behaviors, i.e., to analyze the likelihood of an accompanying behavior after the occurrence of a behavior, and to analyze whether there is a statistically significant sequence of behaviors between the initiating behavior and the accompanying behaviors [27].

Therefore, on the basis of the coding analysis of teacher-student interactive behavior, this study further analyzes the interactive behavioral transitions between teachers and students in the multimedia-assisted teaching environment of the Mandarin foreign teaching classroom with the help of lagged sequence analysis, and summarizes the characteristics of the interactions between teachers and students in the technologically enriched environment by comparing and analyzing the similarities and differences in the modes of interactive behavioral transitions between teachers and students in the three environments.

III. C. Design of research tools

Based on the shortcomings of the above FIAS interaction analysis system and the existing research, non-spoken behaviors such as experiments, writing on the board, and instructional media were added to the original FIAS interaction analysis system, and the original FIAS interaction analysis system was increased from three dimensions

to five dimensions, and the 10 codes were refined into 16 codes. The improved interaction analysis system is referred to as the 3C-FIAS interaction analysis system. 3C-FIAS interaction analysis system categories and codes are shown in Table 1.

Table 1: Teaching interactive behavior coding system

Classification		Coding	Description
Teacher language	Indirect impact	1	Accept emotion
		2	Praise or encouragement
		3	Questioning
		4	The interaction between the lecturer and the students of the central school
		5	The interaction between the lecturer and the students at the teaching point
	Direct impact	6	Lectures, demonstration PPT courseware, video
		7	Indication
		8	The lecturer inspects the students of the central school and provides corresponding consultation and guidance.
		9	Criticism correction
Student language	-	10	The interaction between students in the central school and students in the teaching point
		11	Student evaluation
		12	Student discussion
		13	Showing
Silence or confusion	-	14	Contribute to the silence of teaching (students think or practice)
		15	It does not help the silence of teaching.
		16	Silence or confusion caused by equipment failure
Technology	-	17	Teachers' operation technology
		18	Student operation technology

The 3C-FIAS Interactive Analysis System procedure follows the original FIAS Interactive Analysis System procedure. The specific steps are.

(1) Data collection. The classroom records were analyzed descriptively to isolate the effective classroom segments.

(2) Statistics. According to the 3C-FIAS coding principle, the separated effective classroom records were coded and formed into sequence pairs.

(3) Data analysis. The obtained sequence pairs were compiled into 3C-FIAS migration matrix according to the principle of migration matrix. For the obtained 3C-FIAS migration matrix, 2 methods can be used to analyze and study it, namely, interaction analysis matrix method and dynamic characteristic curve analysis method.

IV. Analysis of the results of the experiment on teaching Mandarin to foreigners

This chapter will analyze the resultant data of a Mandarin teaching abroad experiment conducted within High School B in Wuxi City, China, to explore the interaction and learning performance of teachers and students in the Mandarin teaching classroom after applying the Mandarin teaching abroad model constructed in this paper under multimedia-assisted instruction.

IV. A. Ratio Analysis of Instructional Interaction Behavior

In this study, on the basis of the original formula of Flanders Interaction Analysis System, we analyzed the interactive data of teaching Mandarin to foreigners by using matrix, and came up with the statistical table of each coded data as shown in Table 2. From the data in the table, it can be seen that the teacher of the lesson example did not have any technical manipulation errors such as improper tool switching, and the percentage of the results that were beneficial to teaching was 65.61%, indicating that the teacher and the students were more skillful in technical mastery, and both of them were able to master the application of information technology in the classroom teaching better. In the part of teachers' manipulation of technology, the percentage of teachers' manipulation reached 37.46%, indicating that teachers are able to use the tools for naming, pushing, displaying, demonstrating, etc., and emphasize on providing opportunities for students to manipulate the technology in classroom teaching. In the part of students' manipulation of technology, the percentage of students' manipulation is 55.75%, which shows that students mainly use technology in the classroom to demonstrate their learning outcomes and carry out independent

practice learning activities. The rate of student evaluation was 4.51%, indicating that the teacher did not pay much attention to mutual evaluation among students in teaching, but mainly focused on teacher evaluation and process evaluation formed by automatic statistical analysis of data using the technology.

Table 2: Coding data statistics

Classification	Coding	Description	Proportion	
Teacher language	Indirect impact	1	Accept emotion	44.12%
		2	Praise or encouragement	24.77%
		3	Questioning	3.52%
		4	The interaction between the lecturer and the students of the central school	6.63%
		5	The interaction between the lecturer and the students at the teaching point	80.60%
	Direct impact	6	Lectures, demonstration PPT courseware, video	12.38%
		7	Indication	10.13%
		8	The lecturer inspects the students of the central school and provides corresponding consultation and guidance.	30.71%
		9	Criticism correction	22.44%
Student language	-	10	The interaction between students in the central school and students in the teaching point	11.58%
		11	Student evaluation	4.51%
		12	Student discussion	35.83%
		13	Showing	17.60%
Silence or confusion	-	14	Contribute to the silence of teaching (students think or practice)	65.61%
		15	It does not help the silence of teaching.	29.88%
		16	Silence or confusion caused by equipment failure	4.51%
Technology	-	17	Teachers' operation technology	37.46%
		18	Student operation technology	55.75%

IV. B. Analysis of the frequency of teacher-student interactions with technology

The frequency of teacher-student interaction with technology is shown in Figure 1. Mandarin conversation classroom technology can be well integrated with curriculum teaching, and information technology is utilized in almost all aspects of teaching, especially in the part of students' practice activities. The existence of two peaks in students' manipulation of technology indicates that teachers focus on cultivating students' hands-on ability in classroom teaching, which is reflected in the learning activities of letting students go on the stage to demonstrate their manipulation, as well as utilizing the tablet PCs for drawing practice and completing exercises. Teachers and students are actively expressing themselves. Obviously, in the Mandarin foreign language teaching classroom, teachers and students affirm, encourage and advise each other in the learning process, and gain wisdom development together in each other's exchanges and sharing, contributing to the deep-seated collision of thoughts and feelings between teachers and students and students, and enhancing the students' affective and cognitive inputs in the learning of wisdom classroom.

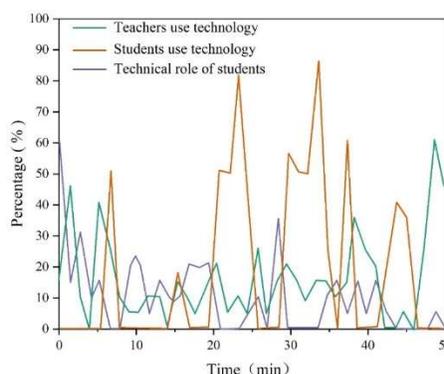


Figure 1: The frequency of teacher-student interaction with technology

IV. C. Sequence Analysis of Teacher-Student Interaction Behavior

The present study was based on lagged sequence analysis method using GSEQ5.1 software to further analyze the sequence of behaviors that reached the significant level in this classroom teaching. In GSEQ5.1 software, we imported the coding table of interactive behaviors in the special delivery classroom teaching, and obtained the frequency table of behavioral transitions and the adjusted residual table, as shown in Table 3. The columns in the behavior transition frequency table indicate the starting behaviors, and the rows indicate the subsequent behaviors occurring after the end of the starting behaviors, reflecting the number of times that another behavior occurs after the occurrence of one behavior.

Through the statistical analysis of the data, the teachers and students have a high frequency of behavior change: 4→4 (18 times), 4→7 (8 times), 6→6 (72 times), 7→7 (21 times), 7→15 (10 times), 11→11 (50 times), 12→12 (80 times), 13→13 (116 times), 14→14 (34 times), 15→15 (35 times), 18→18 (28 times), 15→15 (35 times), 18→18 (35 times). 18 (28 times). However, this does not directly reflect that these are the behavioral sequences that need to be focused on, and we need to further study the significance of teacher-student behavioral transitions.

Table 3: Behavior frequency conversion table

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
2	0	11	5	3	3	6	2	0	1	0	0	0	0	0	2	0	0	0	33
3	0	0	12	5	0	0	3	0	0	0	9	0	0	2	1	0	0	0	32
4	0	3	4	18	2	4	8	2	0	0	5	0	2	1	2	0	2	2	55
5	0	1	2	0	1	0	5	0	0	0	4	0	0	0	0	0	0	0	13
6	0	2	10	4	1	72	4	2	0	0	2	0	0	0	2	0	0	0	99
7	0	0	1	6	0	1	21	1	0	0	3	2	1	0	10	0	2	2	50
8	0	0	0	0	0	0	2	3	0	0	0	5	0	3	0	0	0	0	13
9	0	0	0	0	0	2	0	0	2	0	1	0	0	0	0	0	0	0	5
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	8	2	7	5	6	1	0	2	0	50	1	0	2	3	2	0	3	92
12	4	0	0	0	0	0	0	4	0	0	0	80	1	0	0	0	0	0	89
13	0	12	2	2	0	2	0	0	0	0	0	0	116	1	0	2	0	0	137
14	0	0	0	3	0	0	0	2	0	0	6	0	3	34	0	0	2	0	50
15	0	0	0	2	2	1	1	0	0	0	2	0	6	2	35	1	2	0	54
16	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	2	0	3	8
17	0	0	0	2	0	0	2	0	0	0	0	0	2	0	3	0	7	0	16
18	0	2	0	1	0	0	0	0	0	0	7	0	0	1	0	0	0	28	39
Totals	5	39	39	54	14	94	49	14	5	0	90	88	133	46	58	7	15	38	788

The adjusted residual table is specifically shown in Table 4. From the table, it can be learned that in this synchronous classroom, the behaviors of 2→3, 2→6, 2→5, and 2→9 reached a high level of significance. In terms of teachers' teaching behaviors, teachers tend to praise and encourage students in lecturing and explaining, demonstrating PPT courseware, videos or asking questions and interacting. In this classroom, the lead teacher mostly used the classroom contextualization based on students' interests, so that students could better participate in Putonghua conversations and practice through contextual teaching, thus improving students' Putonghua learning effect.

From the point of view of the target of the lecturer's questioning, the lecturer interacted with the students more frequently after questioning, i.e., 3→4. Combined with the classroom recordings, the lecturer interacted with the students of the teaching point very little after posing the questions, and interacted with the auxiliary teachers almost no. In terms of the students' group discussion, the lecturer interacted with the students in the group discussion, and the students were more interested in the students' learning. In terms of student group discussion, the teacher will give appropriate counseling, and can better assist the group exchange, so that students can actively engage in thinking. However, in the group discussion, the communication between the lecturer and the auxiliary teacher is basically zero, and it is almost a one-way output from the lecturer, lacking in depth communication. The auxiliary teachers did not provide timely feedback on the classroom situation, which resulted in the phenomena of silence in the classroom that did not help teaching and the classroom rhythm was not natural and smooth, i.e., 7→15.

At the level of teacher-student interaction, the sequence of students' behavior in the central school is 4→3→11→1, i.e., the main teacher tends to interact with and ask questions to the students in the central school, and the

teacher adopts and accepts the students' viewpoints and feelings after the students answer the questions. The sequence of students' behavior at the teaching point is 5→11→1, 5→7→15→17, 5→7→15→16→18. Combined with the video analysis, in the process of the special delivery classroom teaching, the lead teacher grasps the children's playful nature, and carries out diversified teaching and interactive activities for the students by means of situational dialogues and role-playing, and so on.

Due to the ambiguity of the teacher's teaching instructions, differences in students' abilities and network delays, it is difficult for students at the teaching point to understand the content of the interaction, and the classroom is prone to enter a state of vacant waiting for the classroom to fall silent (5→7→15).

Table 4: Adjusted residual table (*p <0.05)

-	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	-0.13	-0.33	3.06*	2.08*	-0.24	-0.56	-0.47	-0.2	-0.07	-0.04	-0.62	-0.6	-0.57	-0.33	-0.48	-0.19	-0.21	-0.37
2	-0.34	7.02*	2.12*	1.2	4.23*	2.1*	-0.85	-0.73	2.52	-0.01	-2.22	-1.96	-2.61	-1.59	-0.92	-0.37	-0.76	-1.25
3	-0.27	-1.29	7.95*	3.22*	-0.86	-2.19	1.06	-0.92	-0.46	-0.05	2.32*	-2.14	-2.64	-0.77	-0.41	-0.58	-0.82	-1.48
4	-0.47	-0.27	2.02*	7.82*	-0.17	-0.53	3.02*	0.87	-0.51	0.07	-0.57	-2.88	-3.26	-0.98	-1.31	-0.58	-0.07	-1.28
5	-0.17	0.53	0.29	-1.24	3.15*	-0.81	4.82*	-0.65	-0.21	0.1	2.32*	-1.33	-1.8	-0.95	-1.14	-0.41	-0.49	-0.94
6	-0.43	-1.68	1.93	-0.54	0.07	18.15*	-0.76	-0.7	-0.61	-0.05	-3.51	-3.74	-4.67	-2.84	-2.64	-0.89	-1.45	-2.34
7	-0.41	-1.59	-0.88	1.56	-1.19	-2.42	9.18*	0.98	-0.39	-0.08	-1.1	-2.26	-2.65	-1.9	3.17*	-0.67	0.13	0.15
8	-0.28	-0.89	-0.76	-1.14	-0.59	-1.43	2.15*	7.06*	-0.16	0	-1.39	1.82	-1.67	3.12*	-1.02	-0.36	-0.42	-0.8
9	-0.15	-0.29	-0.31	-0.46	-0.21	1.1	-0.49	-0.15	9.27*	-0.09	1.16	-0.63	-0.82	-0.46	-0.43	-0.11	-0.27	-0.32
10	-0.07	0.07	-0.07	-0.05	-0.06	0.08	-0.1	-0.06	0.07	-0.1	-0.09	-0.06	0.02	0.08	0.07	0.03	-0.02	-0.06
11	3.64*	2.22*	-1.1	-0.08	3.06*	-1.9	-2.39	-1.35	1.24	-0.03	12.5*	-3.39	-4.69	-1.31	-2.17	0.58	-1.35	-0.43
12	-0.5	-2.05	-2.07	-2.87	-1.4	-3.84	-2.65	2.69	-0.72	-0.1	-3.69	26.31	-4.27	-2.67	-2.74	-0.72	-1.42	-2.33
13	-0.59	2.14*	-2.25	-3.17	-1.9	-4.48	-3.34	-1.74	-0.79	0.03	-4.58	-4.46	23.32*	-2.57	-3.46	0.18	-1.63	-2.91
14	-0.39	-1.48	-1.48	-0.92	-1.04	-2.83	-2.04	0.02	-0.44	0.03	0.42	-2.56	-2.43	18.68*	-2.11	-0.52	0.07	-1.03
15	-0.44	-1.6	-1.71	-1.66	-0.07	-2.18	-1.11	-1.14	-0.56	0.06	-1.64	-2.74	-1.01	-1.52	15.65*	2.72*	2.16*	-1.83
16	-0.13	-0.41	-0.49	-0.72	-0.35	-0.86	-0.67	-0.26	-0.12	-0.08	0.61	-0.88	0.16	-0.65	-0.56	5.42*	-0.32	3.52*
17	-0.25	-0.77	-0.86	0.04	-0.57	-1.44	0.04	-0.61	-0.14	0.07	-1.29	-1.33	-0.94	-0.94	2.01	-0.4	14.88*	-0.89
18	-0.24	-0.53	-1.37	-0.57	-0.95	-2.54	-1.75	-0.95	-0.38	0.07	1.04	-2.29	-2.83	-0.95	-1.8	-0.41	-0.93	20.1

V. Conclusion

In this paper, through analyzing the experimental data, it is found that the multimedia-assisted teaching mode has a significant effect in the external teaching of Putonghua. In the classroom, the ratio of students' technology operation reached 55.75%, and the ratio of teachers' technology operation was 37.46%. The frequency of interaction and students' participation in the classroom were significantly increased, especially in the independent learning and practicing session, where the percentage of students' thinking and practicing time was 65.61%. The lagged sequence analysis further reveals the behavioral transition relationship between teachers and students, especially in the question and feedback session, where the teacher's interactive behavior has a strong guiding effect on the students' response. In addition, students' participation in the classroom was not only reflected in the technical operation, but also in the high level of emotional and cognitive engagement, and the classroom atmosphere was more positive and interactive.

These results indicate that the use of multimedia technology assistance can effectively promote teacher-student interaction and student learning motivation in the external teaching of Putonghua, and enhance the teaching effect. Therefore, future teaching practice should continue to strengthen the combination of technology and teaching content, and promote the innovation and development of the external teaching mode of Putonghua, in order to adapt to the increasingly diversified learning needs.

References

- [1] Odinye, S. I. (2019). The spread of Mandarin Chinese as a global language. *Journal*.
- [2] Huī, W., & Zhōngrui, Y. (2013). The promotion of Putonghua (Mandarin Chinese): An overview. *The language situation in China*, 1, 27-39.
- [3] Lin, C., & Jackson, L. (2021). Assimilation over protection: rethinking mandarin language assimilation in China. *Multicultural Education Review*, 13(4), 338-361.
- [4] Odinye, S. I. (2018). Mandarin Chinese as a means to China's Soft Power. *Journal of The Linguistic Association of Nigeria*, 21(2), 118-127.
- [5] Shanhe, Z. (2023). The Meaning and Strategy of Mandarin Promotion in the New Media Era. *Academic Journal of Humanities & Social Sciences*, 6(11), 6-10.

- [6] Zheng, L., & Zhou, Z. (2024). Research on Language Landscape and Mandarin Chinese Promotion in Rural Ethnic Areas of China. *Journal of Art, Culture and Philosophical Studies*, 1(3).
- [7] Weng, J. (2018). What is Mandarin? The social project of language standardization in early Republican China. *The Journal of Asian Studies*, 77(3), 611-633.
- [8] Pan, L., Sun, D., Zou, Y., Cao, Y., Zhang, J., & Li, F. (2023). Psycho-linguistic and educational challenges in Teaching Chinese (Mandarin) Language: voices from None-Chinese teachers of Mandarin language. *BMC psychology*, 11(1), 390.
- [9] Pérez-Milans, M. (2015). Mandarin Chinese in London education: Language aspirations in a working-class secondary school. *Language Policy*, 14, 153-181.
- [10] Thang, S., Mahmud, N., & Tng, C. A. (2015). Digital storytelling as an innovative approach to enhance learning Mandarin as a second language. *Journal of E-learning and Knowledge Society*, 11(2).
- [11] Shuang, G. C., Buhari, T. A., & Chat, L. A. (2021). Paving the Way for Mandarin Language Learning: MOOCs Style. *Development*, 10(3), 1321-1338.
- [12] Chen, C. Y., & Chung, W. L. (2012). Research on the learning effects of multimedia assisted instruction on mandarin vocabulary acquisition for Vietnamese students (Part II): A case study. *Educational Research and Reviews*, 7(14), 315.
- [13] Zhou, H., & Huang, L. (2015, May). The Application and Role of Multimedia Technology in Mandarin Teaching. In 2015 International conference on Applied Science and Engineering Innovation (pp. 1776-1779). Atlantis Press.
- [14] Hou, Y. (2016, December). The application research of multimedia in teaching mandarin. In 2016 International Conference on Progress in Informatics and Computing (PIC) (pp. 738-742). IEEE.
- [15] Wang, Y. T., Ahmad, M. K. B., & Liu, T. (2024). The Impact of Social Media the Dissemination and Teaching of Mandarin Language: A Systematic Review. *Studies in Media and Communication*, 12(3), 9-24.
- [16] Chen, M. (2024). Computer-aided feedback on the pronunciation of Mandarin Chinese tones: Using Praat to promote multimedia foreign language learning. *Computer Assisted Language Learning*, 37(3), 363-388.
- [17] Nie, Y. (2023). Application of multimodal multimedia information and big data technology in teaching chinese as a foreign language course. *International Journal of Digital Multimedia Broadcasting*, 2023(1), 2257863.
- [18] Ju, S. Y., & Mei, S. Y. (2020). Students' attitudes and perceptions of learning Mandarin Chinese via animated video. *International Journal of Academic Research in Business and Social Sciences*, 10(10), 567-579.
- [19] Da, J., & Zheng, Y. (2018). Technology and the teaching and learning of Chinese as a foreign language. *The Routledge handbook of Chinese second language acquisition*, 432-447.
- [20] Chua, N. A., Tajuddin, A. J. B. A., Soon, G. Y., Shen, D. M., Zakaria, R., Almanar, M. A., & Fatmariansa, S. (2020, April). Emerging Truths in Mandarin Mobile-Assisted Language Learning. In *Journal of Physics: Conference Series* (Vol. 1529, No. 4, p. 042049). IOP Publishing.
- [21] Astutiningtyas, D., & Rohmah, Z. (2023). Learning Mandarin Using Multimodal Based Video Media. *Santhet (Jurnal Sejarah Pendidikan Dan Humaniora)*, 7(1), 206-214.
- [22] Lyu, B., & Qi, X. (2020). A review of research on technology-assisted teaching and learning of Chinese as a second or foreign language from 2008 to 2018. *Frontiers of Education in China*, 15, 142-163.
- [23] Darwin, D., Muliastuti, L., Setiadi, S., & Anwar, M. (2021). Development of multimedia-based teaching materials in mastering linguistic aspects. *Journal of Nonformal Education*, 7(2), 189-199.
- [24] Min, T. A., Min, O. Y., Qi, C. P., Yoon, C. L., Mei, L. S., & Rahmat, N. H. (2022). Exploring strategies in language learning: the case for mandarin as a foreign language. *International Journal of Academic Research in Business and Social Sciences*, 12(11), 1592-1610.
- [25] ZhangDengfeng, LiFanghui & ZhangXinkai. (2021). Development and Experimental Research of Multimedia CAI Courseware for Hurdle Running. Shandong Sport University, Jinan, China; School of Physical Education, Pingxiang University, Jiangxi, China, 49(4).
- [26] Xingrong Guo, Wensi Yang & Yiming Guo. (2025). Analyzing Teacher-Student Verbal Interaction in Elementary Chinese Comprehensive Class: Insights from Flanders Interaction Analysis System. *Behavioral sciences (Basel, Switzerland)*, 15(4), 429-429.
- [27] Chaohui Hong. (2023). Research on Learning Behavior of "One Network One Platform" Based on Lag Sequential Analysis. *Advances in Computer, Signals and Systems*, 7(2).