Research on the Mechanism and Effects of Multimodal Symbol Resources Collaboration in Primary School English Learning

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Abstract. The rapid development of digital technology has promoted the extensive application of multimodal symbol resources in the field of education, providing students with an immersive learning experience. The effectiveness of multimodal symbol resources in English teaching has received widespread attention, but empirical research at the primary school stage remains insufficient. This paper analyzes the impact of multimodal symbol resources on the effectiveness of primary school English learning through a mixed study (experiments and interviews). The analysis concludes that multimodal resources can effectively enhance learning interest and efficiency, and their integrated use can significantly improve students' English performance, boost learning interest and language application abilities, and increase classroom participation. However, alongside these positive effects, this study also explores the problems that multimodal symbol resources bring to primary school English teaching. Based on this, the paper puts forward the following suggestions: establish a mixed teaching model, grasp the teaching rhythm, and cultivate teachers' digital literacy.

1 Introduction

The development of digital technology has given rise to multimodal language expression, which has rapidly permeated every corner of social life. Multimodal discourse includes but is not limited to text, images, sound, video, animation, color, and graphs, encompassing various sensory modalities such as visual, auditory, and tactile [1]. It has profoundly changed how people learn and interact socially. In recent years, multimodal teaching resources have continuously emerged, with multimedia courseware and online courses, such as rain classrooms and massive open online courses, providing students with a more intuitive and immersive learning experience, effectively enhancing their interest and efficiency in learning. In teaching, multimodal approaches based on multimedia have become an indispensable trend. This approach emphasizes the use of language, images, colors, symbols, music, and animation to create a positive learning environment for students, improving their ability to apply knowledge [2]. Especially in primary school English teaching, the application of

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multimodal discourse is reshaping traditional teaching models, offering students a more intuitive and immersive learning experience.

Previous research has provided theoretical support for multimodal teaching methods. However, existing studies mainly focus on language learning in higher education, and empirical research on the mechanisms and effects of multimodal English teaching for younger primary school students is relatively scarce. There are differences in the learning abilities and attention of primary school English learners as compared to adults. This study aims to explore the specific impacts of multimodal symbolic resources in primary school English teaching in the digital age, to fill this gap. By applying theories such as multimodal discourse analysis and sociolinguistics, along with empirical investigations of primary school English teaching, it reveals the complex relationship between multimodal symbolic resources and the effectiveness of English teaching. Additionally, it provides new suggestions and ideas for English teaching in the digital age by examining the influence of multimodal resources on primary school students' English proficiency and their attitudes towards multimodal teaching.

2 Research methodology

2.1 The theoretical foundation of the research

The employment of various modalities (i.e., channels of communication) by an individual to express meaning is referred to as multimodality. Language, visual, auditory, gestural, and spatial modes are examples of such modes [3]. The theoretical foundation of multimodal discourse analysis can be traced back to Systemic Functional Linguistics (SFL) and Visual Grammar. The theory of Visual Grammar proposed by Kress and van Leeuwen provides an important theoretical framework for multimodal discourse analysis, positing that visual elements such as images, color, and layout have functional roles in meaning-making just like language. Multimodal discourse is integrative and interactive, and it is believed that the synergy between different modalities can enhance the effect of information transmission [4]. In language learning, multimodal symbolic resources help learners understand language knowledge from different perspectives, enhance language memorization effect, improve language application ability and stimulate learning motivation by providing diverse information input. The application of multimodal symbolic resources in English teaching is mainly reflected in the diversification of teaching resources and the innovation of teaching methods. While traditional English teaching mainly relies on text and speech, multimodal teaching provides students with a more intuitive and immersive learning experience through the combination of images, videos, audio, and other modalities. Multimodality increasingly permeates many aspects of teachers' daily practices, especially because digital tools are so commonplace. Using storyboard activities, picture description tasks, flashcards, audio- and video-based files, multimedia projects, and other multimodal resources, many teachers might not be aware of how much they use and depend on various modes as part of their pedagogical arsenal [3].

2.2 Research specific methods

This experiment will use a mixed research method, utilizing the number comparison experimental method and interviews to complete the entire process of the experiment. This experiment has been approved by the parents of the students who participated in the experiment.

2.2.1 Comparative experimental method

As the basic idea of recognizing the commonality and difference between different objects, comparative experimental research discovers and reveals the intrinsic nature and laws of things by comparing the similarities and differences of things. This enables a deeper understanding of the purpose of things and provides important ideas for the improvement, development, and design of experiments [5]. Contrasting experimental methods of causal inference have validity: the experimental subjects are 40 elementary school students with a male to female ratio of 19:21 in the third class of the fifth grade of Beishe Primary School in Suzhou City as the experimental subjects, who are randomly divided into the experimental group and the control group, with 20 people in each group. Before the beginning of the experiment, a short English proficiency test was utilized to confirm that the initial English proficiency of the students in the two groups was similar. By setting up an experimental group (using multimodal teaching resources, including multimedia courseware, video materials and the interactive learning platform "Rain Classroom") and a control group (traditional unimodal teaching, mainly relying on textbooks and teachers' explanations), and controlling variables (such as textbook content and class duration), the study lasted for 2 weeks from February 17 to March 2, 2025. 2 lasted for 2 weeks. At the end of the experiment, the same English proficiency test was administered to all students, and data were collected to calculate the average score of each student. The test scores before and after the experiment were compared and analyzed to compare the changes in the scores of the experimental group and the control group, which can be used to quantitatively analyze the effect of multimodal resources on the learning of English for elementary school students.

2.2.2 Interview method

While other methods of gathering data have their place in qualitative research, the main advantage of the semi-structured interview is that it allows interviews to be targeted while allowing the researcher to freely explore relevant ideas that may arise during the interview [6]. After the test, five students in the experimental group were selected on March 2, 2025, to conduct online interviews via Tencent Conference about their experiences and perceptions of multimodal teaching resources. Next, the interviews were organized and summarized to extract key insights. Compared with the macroscopic description of quantitative data, the interview method can explore the subjective feelings of the subjects about multimodal resources through open dialogues with them, effectively avoiding the simple inference of "data-conclusion".

Finally, based on the test scores and interviews, the impact of multimodal resources on primary school students' English learning is analyzed. The comparative experiment focuses on "whether multimodality is effective", while the interview method answers "why it is effective/ineffective" and "how to improve it". This synergistic analysis of quantitative data and qualitative results can effectively enhance the credibility of the research findings.

3 Experimental results

3.1 Difference in achievement between experimental and control groups

By comparing the English test scores of the experimental group (applying multimodal teaching resources) and the control group (traditional teaching methods), it is found that the application of multimodal teaching resources effectively improves the students' English learning efficiency.

As shown in Table 1, the average score of the experimental group before the use of multimodal symbolic resources is 65 (maximum 80, minimum 50), and the average score of the control group is 64 (maximum 79, minimum 48), which indicates that the initial English level of the two groups of students is similar.

After using the multimodal semiotic resources, the average score of the experimental group increased to 75 (maximum 90, minimum 58), while the average score of the control group only increased to 67 (maximum 82, minimum 52), which indicates that the English proficiency of the students in the experimental group increased more than that of the control group after using the multimodal semiotic resources.

Table 1. Growth of English Achievement of Experimental and Control Groups before and after Using Multimodal Symbolic Resources.

Group	Test time	Mean score (out of 100)	Maximum score	Minimum score
Experimental group	Pre-test	65	80	50
Experimental group	Post-test	75	90	58
Increase		10	10	8
Control group	Pre-test	64	79	48
Control group	Post-test	67	82	52
Increase		3	3	4

The data show that the average achievement of the experimental group improved by 10 points to 75 points (while the control group only improved by 3 points to 67 points). The achievement improvement of the experimental group is about 3.3 times more than that of the control group, and the expansion of the high score range is more obvious. Calculating the correlation coefficient r=0.75 (medium-strength positive correlation) between the two groups further indicates that multimodal teaching resources are positively correlated with students' English learning.

Comprehensive experimental data, multimodal teaching resources can effectively improve students' English learning effectiveness, and it is recommended that such resources be systematically applied in teaching to optimize the teaching effect.

3.2 Analysis of interview results

Multimodal teaching resources have certain advantages in stimulating learning interest, enlivening the classroom atmosphere, and improving language comprehension, and they are effective for most students, but individual differences still need to be taken into account.

The experiences and views of the five students in the experimental group interviewed about multimodal teaching resources are as follows:

"Multimedia courseware and video materials make the class more interesting, the text content can be accompanied by animation for us to watch, and I can understand the meaning of English sentences more easily." (Student A)

"I like it, I think it's faster to memorize words through games and interactive exercises. (Student B)

"I can learn things while watching animation, which helps me learn the pronunciation and intonation of words better, but teachers sometimes have difficulty using e-textbooks, and sometimes the teacher accidentally clicks on the answer to a question in class before I think of it." (Student C)

"I think the multimodal resources make learning less boring, especially the videos and interactive exercises, which make me feel more interested than the teacher's lectures." (Student D)

"I'm not used to it. The interactive games make me less able to concentrate on learning." (Student E)

The survey shows that about 83.3% of the students in the experimental group think that multimedia courseware, animated videos and interactive exercises effectively enhance classroom interest, among which Student A understands English semantics through animation, Student B strengthens vocabulary memorization with the help of interactive games, Student D thinks that the video resources are more appealing than the traditional lectures, and Student C thinks that animation and other video materials help him to better understand the meanings of English sentences as well as the words' pronunciation and intonation, which shows that multimodal semiotic resources have a certain facilitating effect on listening and comprehension in language learning. Most of the students had a positive attitude towards multimodal teaching resources, believing that they enhanced their interest in learning, helped them understand English, enhanced their memorization, and stimulated their motivation to learn. Some students also had reservations about the help of multimodal symbolic resources. They pointed out that they were not too comfortable with interactive games or that teachers sometimes skipped the students' thinking time and showed the answers directly when they used e-textbooks in class, which revealed problems with the adaptability of multimodal symbolic resources and teachers' digital literacy, and reflected that multimodal symbolic resources had limited effects on some students' learning and that individual differences needed to be taken into account.

4 Research implications

4.1 The role and problems of multimodal teaching and learning

According to the correlation coefficient r=0.75 between the two groups of students' English scores, it shows that multimodal teaching resources are positively related to students' English learning. Multimodal resources can effectively enhance students' learning interest and language application ability, especially in listening comprehension and oral expression, and students can better understand the phonetic intonation and cultural background of English through the combination of video and audio [2]. In addition, the multimodal teaching model emphasizes interactivity and participation. About 83.3% of the students in the experimental group believe that multimedia courseware, animated videos, and interactive exercises effectively enhance classroom interest. Through interactive multimedia courseware and an online learning platform, students can practice language in a virtual environment and enhance their language use ability. Multimodal interaction has potential in language learning, and multimodal expressions can enhance students' engagement and learning effects [7].

The application of multimodal discourse in elementary school English teaching has brought about a significant improvement in teaching effect, but it also raises some problems. First, multimodal resources are characterized by richness and diversity. Youngsters like animated figures, and by showing pictures of talks and pushing them to practice them, the use of color and animation in drawings is intended to spark students' enthusiasm in taking part in the learning process [8]. However, over-reliance on multimodal resources may lead to a decrease in students' depth of thinking and information processing skills. Some students in the experimental group had reservations about the help of multimodal symbolic resources because they were not too comfortable with the interactive games or the teacher sometimes skipped the students' thinking time during the use of e-learning in the classroom and presented the answers directly. Although the multimodal teaching mode can enhance students' intuitive experience, how to balance the relationship between multimodality and the traditional teaching mode is still an urgent problem in English teaching [2]. The application

of multimodal discourse also puts new demands on teachers. Over-reliance on multimedia technology ignores the guiding role of teachers, as well as the uneven quality of multimedia teaching resources. Therefore, how to reasonably use multimedia technology for teaching and improve the teaching effect has become an important issue facing the current education sector [9]. This requires that teachers not only need to master traditional language teaching skills, but also need to have the ability to design and use multimodal resources. The multimodal teaching mode requires teachers to have interdisciplinary knowledge and skills, and to be able to flexibly use multiple modalities for instructional design and classroom management [10].

4.2 Recommendations

First of all, multimodal symbolic resources effectively improve the quality of elementary school teaching, but teachers need to balance the relationship between multimodal teaching and traditional teaching modes, reasonably allocate the time slots between multimedia interactive sessions and traditional teaching, and retain the teaching tempo of the traditional lecture mode while using multimodal symbolic resources to enhance classroom interactivity to ensure that the teaching objects adapt to the multimodal English teaching.

Secondly, teachers should grasp the pace of English teaching according to the differences in students' individual adaptability (e.g., the distraction problem of Student E in the interactive game), determine whether they understand the lesson by observing students' expressions or asking questions, and reserve time for students to think independently during the teaching process to avoid the cognitive overload of primary school students due to the prolonged use of multimodal resources.

In addition, schools can organize training for teachers to enhance their ability to apply multimedia courseware and digital education platforms and to design multimodal teaching. In terms of classroom management problems that may result from multiple interactions in multimodal teaching, senior veteran teachers can provide classroom management experience to young teachers, and young teachers can help veteran teachers learn to use multimodal teaching resources to promote mutual promotion.

5 Conclusion

This study confirms that multimodal symbolic resources have a positive impact on elementary school English teaching. The experimental results show that the integrated use of multimodal resources can effectively improve students' English performance, enhance their interest in learning and language application skills, and improve classroom participation. At the same time, there are potential problems: some students have difficulty adapting due to the fast pace of interaction or distraction, which requires teachers to improve their ability to utilize multimodal symbolic resources in their teaching, and at the same time, take into account individual differences and balance the relationship between multimodal and traditional teaching modes. The small sample size, short duration, and single concentration on the same class in this study may weaken the stability of the results. Second, multimedia teaching is overly dependent on hardware equipment and network environment, and its application is limited in economically disadvantaged areas and schools. The scope of the study is also small, covering only fifth-grade students in an elementary school in Suzhou City, not involving different geographical areas, and the generalizability of the conclusions needs to be examined. Future research could expand the sample capacity, school segments and long-term tracking of teaching effects to more comprehensively assess the potential of multimodal symbolic resources to enhance teaching and learning.

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