Construction of Middle School English Multimodal Classroom from the Perspective of Cognitive Load Theory

Peipei Lu¹,* , Yun Huang² , Xiaoqiu Wu³

¹Lingnan Normal University, Zhanjiang, Guangdong province
²Lianjiang No.3 Middle School, Zhanjiang, Guangdong Province
³Dongmengcheng School, Zhanjiang City, Guangdong Province

Abstract: With the application of multimodality in the field of teaching, in today's global integration, diversification and technicalization, the student literacy training is not only the aim during teaching. The more important aim is to cultivate students' multiple reading ability. The study will introduce multimodality and cognitive load theory into middle school English teaching, so as to improve students' listening, speaking, reading, writing, international vision and other comprehensive quality. Students can gradually form "cross-cultural communication and communication consciousness and ability; learning to be objective and form rational view of the world; setting up the international vision, conservation feelings and appraisal culture self-confidence; forming the correct world outlook, the outlook on life and values; laying the foundation to adapt to the future social development for students lifelong learning", which has been proposed in "New Curriculum Standards". It is of great value to reconstruct the English teaching ecology in middle schools. At the same time, it can help teachers to effectively integrate teaching resources, create a multi-modal teaching environment, and stimulate students' learning motivation.

Keywords: Cognitive load theory, Multimodality, Middle school English.

1. Introduction

At present, China's basic education is experiencing a new stage of reform and breakthrough, especially in the teaching concept, teaching content, curriculum system, teaching methods, teaching means, evaluation system and other aspects of new breakthroughs, the cultivation of students' comprehensive use of English has made great progress in English. The purpose of teaching English in basic education is to enable students to exchange information in English rather than just obtain information. Mastering good learning methods and improving cultural literacy are also valued as the purpose of teaching.

In the "Compulsory Education Curriculum Standards" issued by the Ministry of Education (hereinafter referred to as the "New Curriculum Standards") in 2022, the main changes are the improvement of the training objectives, the optimization of the curriculum setting, and the refinement of the implementation requirements. The new curriculum standard mainly implements the requirements of the "Double Reduction" policy of the CPC Central Committee and the State Council, and adjusts and optimizes the curriculum setting on the basis of maintaining the total course hours of 9522 in the nine years of the compulsory education period. English teaching gives play to the role of core literacy, builds curriculum structure based on grading system, pays attention to the integration of "teaching evaluation" design and promotes the depth of information technology and English teaching.

Based on the cognitive load theory and multimodal theory, through the multimodal perspective of middle school English classroom teaching mode practice and exploration, this paper aims to improve students' English comprehensive ability, make students have good ability of listening, speaking, reading and writing, provide good learning strategies, methods and habits for students' future learning. It is of great value to reconstruct the English teaching ecology in middle schools. At the same time, it can help teachers integrate teaching resources effectively, create a multi-modal teaching environment, and stimulate students' learning motivation.

2. Cognitive Load Theory and Multimodal Teaching

2.1 Cognitive Load Theory

Load theory is an important cognitive psychology theory. Its research content mainly involves human cognitive load and its influencing factors, which refers to the cognitive load faced by human cognitive system when performing tasks. The theory of cognitive load proposed by Sweller (1988) is one of the classical theories in this field. This theory holds that cognitive load is divided into three categories: internal cognitive load, external cognitive load and interactive cognitive load. Internal cognitive load refers to the cognitive resources required for completing tasks, including processing information, memory, classification, etc.; external cognitive load refers to the irrelevant noise, interference and stress in the task; interactive cognitive load refers to the cognitive load caused by the interaction with others or the outside world in the task. The application of load theory can help educators to better design their teaching content and teaching methods to optimize students' cognitive load and improve their learning effect.

With the development of this field, Moreno (2010) and other scholars have conducted in-depth research on the load theory, and put forward many new concepts and methods, such as cognitive load and hierarchical load theory in multimedia...
learning. In China, the research of load theory has also gradually gained attention. Leppink et al. (2013) developed a tool to measure different types of cognitive load to assess the level of cognitive load of students in learning. Kalyuga (2011) has critically analyzed the theory of cognitive load from the theoretical level, and put forward his own views and suggestions. In addition, the application of the load theory has also gradually penetrated into the education field. Taking the study of Sweller et al. (2006) as an example, they analyzed the effectiveness of different teaching methods and proposed some teaching design suggestions to optimize students' cognitive load and improve their learning effects. In foreign countries, the research results of load theory are also relatively rich. Paas and Sweller (2012) upgraded the cognitive load theory and proposed the cognitive load theory based on human motor system and collaborative learning, which can better support learning complex cognitive tasks. Ayres and Sweller (2014) proposed the "distraction principle", which means that dispersing learning materials on multiple screens should be avoided to reduce students' cognitive load. Sweller (2017) reviewed the latest developments in the research areas such as cognitive load theory, evolutionary educational psychology and teaching design.

2.2 Multimodality

Modality refers to the way in which people connect with the external environment through their senses. According to the number of senses used by individual human interactions with the external environment, it can be divided into single, dual, and multimodal modes.

In the era of modern multimedia teaching, Jewitt (2009) proposed that classroom teaching is usually completed by a variety of modes, including space, gesture, gaze, body potential, movement, sound, tone, music, three-dimensional things, spoken, written language, graphics, tables, animation and so on. The teaching research of Chinese scholar Zhang Delu (2015) shows that teachers create multi-modal situations for teaching with the help of modern educational information technology. The design of teaching activities changes from single-dimensional text mode to more abundant multi-modal interaction process, and the rich expression forms of teaching language can significantly improve the teaching efficiency.

2.3 Research Status of Cognitive Load Theory and Multimodal Teaching at Home and Abroad

The concept of cognitive load was developed by Australian psychologist Sweller (1988), which refers to the level of mental energy needed to process the information. It is based on resource-finite theory and schema theory. The cognitive load theory holds that the learning process is the process in which the schema has been constructed and he information schema has been stored in long-term memory within the range of the limited working memory capacity of learners. When the cognitive resources consumed in this process exceed the total amount of cognitive resources possessed by the learner himself, the learner will be overloaded, resulting in unsatisfactory learning effect.

Mayer & Moreno (2010) believes that "multimedia learning is learning from words and pictures"; "multimedia teaching is the text and pictures selected to promote learning". Mayer & Moreno (2003) proposed nine methods to reduce the cognitive burden, namely, unloading, segmentation, training in advance, miscellaneous removal, prompt, orderly arrangement, elimination of redundancy, synchronization, and individuation. The proposal of these specific methods provides a powerful implementation tool for teaching practice, and provides practical operation methods for reducing students' cognitive load.

The teaching research of Chinese scholar Zhang Delu (2015) shows that teachers create multi-modal situations for teaching with the help of modern educational information technology. The design of teaching activities changes from the scope of writing mode to a more abundant multi-modal interaction process, and the rich expression form of teaching language can significantly improve the teaching efficiency. From the perspective of students' sensory learning mechanism, the multimodal teaching characteristics are mainly manifested in the use of more than two language learning symbols at the same time and the comprehensive use of two or more modes.

From a comprehensive view of the domestic multi-modal research results, it is found that the researchers have paid full attention to the research value of the multi-modal trend, and have made breakthroughs in both theoretical exploration and practical research. The research fields involve a variety of languages. But after all, the domestic introduction of multimodal theory and the research history is not long, and the theoretical construction and research methods need to be further deepened and reformed.

The main problems in the middle school English classroom are: students’ insufficient background knowledge and vocabulary reserves lead to the high endogenous cognitive load; unreasonable reading material presentation and teaching design leads to students’ high exogenous cognitive load; lack of teachers' guidance to students' reading strategy attention leads to students' low correlation cognitive load. How to rebuild the ecological environment of middle school English classroom under the premise of reducing students' cognitive load? How to reconstruct the multimodal middle school English classroom? These urgent problems waiting to be solved will become the focus of future basic education research, which will help promote the classroom teaching reform, improve teaching efficiency and optimize teaching effect.

3. Construction of Middle School English Multimodal Classroom from the Perspective of Cognitive Load Theory

Load theory is a theory of cognitive psychology widely used in the educational field, which aims to reduce the cognitive load of students and improve the learning effect by optimizing the learning environment and teaching design. The learners' cognitive load should be controlled within a reasonable range in order to learn and remember more effectively.

In middle school English teaching, the application of load theory mainly includes the following aspects:
(1) The clarity of teaching objectives: teachers need to be clear of the teaching objectives, so that students can concentrate on learning important knowledge points and avoid excessive cognitive load caused by useless information.

(2) Optimization of information presentation methods: Teachers need to choose appropriate teaching materials and information presentation methods, such as using appropriate multimedia teaching resources, reasonable charts, animation, etc., to reduce students' cognitive load.

(3) Optimization of teaching process: Teachers need to design appropriate teaching steps and activities according to students' cognitive level and ability, such as using heuristic teaching and inquiry-based learning, so as to improve students' interest and participation in learning and reduce cognitive load.

(4) Optimization of evaluation methods: Teachers need to use a variety of evaluation methods, such as self-assessment, peer evaluation, teacher evaluation, etc., to help students test their learning results and improve their learning effects.

Combined with the current situation of English learning in China, middle school English classroom can comprehensively use the following teaching modes in class to build a low-load and multi-modal classroom:

**Multi-level teaching:** students can be divided into different groups according to their English ability level. In this way, every student can learn within the scope suitable for their own ability and avoid too high cognitive load. Teachers can divide students into three levels: primary, middle and high, and broadcast listening materials of different difficulty levels respectively. The junior group listens to a simple English dialogue; the intermediate group listens to a short English essay; the senior group listens to an English news. After listening to the materials, each group of students answered the corresponding difficulty questions to test their listening level.

**Interactive teaching:** In the teaching process, students are encouraged to interact with teachers and students. This can improve students' interest and learning motivation, and it is conducive to students' language output and practice. Teachers can provide a topic, such as "my family", with students working in two groups to introduce each other about their family situation. Each group selected a representative to report the information within the group to the whole class. During the reporting process, other students can ask questions or make comments to deepen the communication.

**Multimedia assisted teaching:** the use of multimedia assisted teaching, such as the use of audio, video and other resources, can make students intuitively feel the true meaning and usage of English language, and improve the learning effect. Teachers can present a piece of English news for students, and play with the English original video, so that students can better understand the content of the article. After reading, students will answer relevant questions to test their understanding and mastery of English news.

**Step-by-step teaching:** in the teaching process, from simple to complex, from easy to difficult, teachers can let the students gradually master the basic knowledge and grammar rules of English, and then gradually improve the level. This can avoid students from being exposed to difficult knowledge too early, resulting in high cognitive load. Teachers can explain the basic concepts and classification of nouns first, and then let the students master the usage of nouns through practice. Then, the teacher explains the basic concepts and classification of pronouns, and lets the students understand the usage of pronouns through practice. Through Gradually deepening, students can gradually master the English grammar rules.

**Multi-angle evaluation:** in the teaching process, a variety of ways should be used to evaluate the students, such as listening, speaking, reading, writing and other aspects of the assessment, so teachers can have a more comprehensive understanding of the students' learning situation, and timely adjust the teaching content and methods. Teachers can regularly conduct listening, speaking, reading, writing and other aspects in a semester. For example, listening test in the first week, speaking test in the second week, reading test in the third week, and writing test in the fourth week. After each examination, the teacher gives feedback to the students' advantages and disadvantages timely, and provides the corresponding teaching guidance and support according to the students' disadvantages.

These teaching modes can effectively control students' cognitive load, improve the learning effect, and promote the overall improvement of students' English ability. Teachers can combine the above one or several teaching mode according to the different teaching contents, so as to reduce the student load and create a multi-modal classroom. At the same time, the methods to reduce the cognitive burden of learners include off-loading, segmenting, pretraining, weeding, signaling, aligning, eliminating redundancy, synchronizing, and individualizing. Teachers can select appropriately according to the modal presentation mode and the classroom teaching design.

4. Case Studies in Middle School English Teaching

**Case 1:**
Theme: My hometown

**Objectives:**
(1) Learning to master the basic information of the geographical location, population and culture of the hometown;

(2) Learning to master the common language expression methods of introducing your hometown;

(3) Improving students' language skills by listening, speaking, reading, writing and other ways.

**Teaching procedure:**
(1) Introduction: Through pictures, videos and other ways, let the students understand the geographical location and basic information of their hometown, and inspire the students' curiosity and interest in their hometown.
(2) Information presentation: Teachers use multimedia teaching resources to display information about the scenic spots, culture and history of their hometown, and guide students to focus on important information points.

(3) Teaching process: The teacher guides the students to learn and introduce the common language expressions of their hometown, and lets the students exchange the cultural characteristics and personal experience of their hometown through role-playing, group discussion and other activities.

(4) Evaluation method: Teachers evaluate students' language skills in various methods such as self-assessment, peer evaluation and teacher evaluation. For example, teachers let the students evaluate each other's oral expression skills, and make suggestions and suggestions for improvement.

(5) Conclusion: Through the application of load theory, teachers can optimize the teaching design, reduce students 'cognitive load, and improve students' learning effect and language skills.

Case 2:

Title: Travelling Around the World

Objectives:

(1) To develop students' reading, writing, listening, and speaking skills.

(2) To enhance students' understanding of different cultures and customs around the world.

(3) To reduce cognitive load by presenting information in a clear and organized manner.

Materials:

(1) A world map

(2) Pictures and videos of different countries and cultures

(3) Textbook with reading passages and comprehension questions

(4) Writing prompts and graphic organizers

(5) Audio recordings of native speakers

Procedure:

(1) Introduction:

Asking students to look at the world map and identify different countries and continents.

Showing pictures and videos of different countries and cultures, and ask students to describe what they see and what they know about those places.

(2) Information Presentation:

Presenting reading passages about different countries and cultures, and use graphic organizers to help students organize the information.

Using audio recordings of native speakers to help students practice their listening skills and get familiar with different accents.

Providing writing prompts and ask students to write short paragraphs about what they have learned.

(3) Interactive Learning:

Dividing students into small groups and assign each group a different country to research.

Each group should research and present information about their assigned country, including its geography, culture, customs, and traditions.

Each group should create a presentation using multimedia resources, such as pictures, videos, and audio recordings.

Assessment:

Using comprehension questions to assess students' understanding of the reading passages.

Evaluating students' writing assignments and provide feedback on grammar, vocabulary, and organization.

Assessing each group's presentation based on their use of multimedia resources, clarity of information, and overall presentation skills.

(4) Conclusion:

Reviewing key concepts and information about different countries and cultures.

Asking students to reflect on what they have learned and what they found most interesting.

Encouraging students to continue exploring and learning about different cultures and customs around the world. By following the principles of cognitive load theory and using a variety of teaching strategies and resources, this lesson aims to help students engage with the material in a meaningful way and reduce cognitive load.

5. Conclusion

This study is based on cognitive load theory, combined with multimodality, that is, integrating speech, images, sound and other symbolic resources, to analyze how different modes cooperate to participate in meaning construction. Through the construction of multimodal classroom and the demonstration of specific teaching cases, it aims to promote the reform of middle school English classroom teaching, improve the teaching efficiency and optimize the teaching effect. Multimodal low-load teaching method can effectively enhance students' interest, mobilize students' subjective initiative, and let students learn English efficiently. With the improved teaching design, students can reduce their cognitive...
load in the process of obtaining multimodal information. In practical teaching, teachers should pay attention to the eye contact and movement expression with students, enhance the communication with students, implement the principle of adjusting measures to local conditions, choose the most suitable teaching mode based on the opportunity, give play to the advantages of modern technology effectively, and further optimize the classroom environment.

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References


Author Profile

Peipei Lu (1982- ), female (Han Nationality), lecturer, master’s degree. Main research interests: comparative linguistics and translation

Yun Huang (1992- ), female (Han Nationality), bachelor’s degree. Main research interests: English teaching

Xiaoqiu Wu (1990- ), female (Han Nationality), bachelor’s degree. Main research interests: English teaching

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