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# AN ENGLISH READING COMPREHENSION MODULE INCORPORATING MULTIMODAL LEARNING FOR TEACHING NON-ENGLISH MAJORS IN CHINA

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## ABSTRACT

*Despite the recognized importance of reading, current pedagogical approaches for teaching non-English majors often fail to develop the multiliteracy skills required in a modern digital world. To address this gap, this study developed and evaluated an English reading comprehension module incorporating multimodal learning (MML English reading comprehension module). A mixed-methods design was employed, involving 238 non-English majors enrolled in a College English Course at a public university in Southwest China. Data were collected through a pretest, 7 units of in-class exercises, a posttest, and open-ended interviews. Quantitative results illustrated that the reading comprehension module led to a statistically significant improvement in students' performance across literal comprehension, reorganization comprehension, and inferential comprehension competence. Qualitative analysis of interview data revealed that the use of diversified modes of resources, such as video, charts, and music, offered supportive scaffolds, enhanced students' engagement, and facilitated their deeper textual comprehension. The findings offer empirically grounded strategies for integrating multimodal resources and technology into teaching curricula, providing valuable insights for teachers and curriculum developers seeking to foster critical multiliteracy skills in higher education.*

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**KEYWORDS:** English Reading Comprehension Module; Reading Comprehension; Multimodal Learning; Higher Education.

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## 1. INTRODUCTION

Reading is a crucial means of acquiring knowledge, contributing to students' academic success (Hsieh & Huang, 2020) and career success (Oakhill et al., 2015). In the digital age, the prevalence of multimodal information has fundamentally transformed how individuals access and communicate information. College students must be proficient in comprehending diverse reading materials presented through various modes and channels. Despite the shift, reading instruction, particularly for non-English majors in China, often remains in traditional ways. Many non-English majors, who are typically required to take a College English Course, still struggle with English reading comprehension, leaving them underprepared for the demands of a globalized world. The College English Curriculum Requirement (2020) addressed this need, explicitly calling for modernized pedagogical approaches and improved learning outcomes.

Beyond the need for pedagogical modernization, another fundamental challenge exists: the very nature of "reading" has undergone an update. Scholars contended that the concept of "text" must be expanded. Reading comprehension requires interpreting various semiotic systems, such as images and symbols (Eisenmann & Summer, 2020). Therefore, it should be understood as a process involving multiple meaning-making resources, including speech and gesture (Danielsson & Selander, 2021). This modern literacy is essential for anyone to function effectively as a member of modern society (Roe et al., 2018). Educators must therefore equip students of all ages to properly interpret diverse media and comprehend the multimodal texts they encounter daily.

Moreover, the primary driver of demotivation among EFL learners is their immediate learning environment, with teacher-related elements being the most prominent (Wang & Littlewood, 2021). Notably, the teacher-related factor is a critical demotivating factor for first- and second-year students (Wang & Guan, 2020). Common complaints among freshmen include a lack of instructional enthusiasm, insufficient preparation, monotonous courseware, and an overreliance on exam-centered teaching methods (Wang & Guan, 2020). Sophomores similarly report that a lack of supplementary knowledge, uninspiring teaching methods, and limited interactive class activities (Wang & Guan, 2020) mostly demotivate them. These highlight a critical need for teachers to focus their class design, as structured teaching can realize the personalized and systematic instruction of language

skills by using a series of corresponding activities in a logical arrangement (Majeed & Ilankumaran).

Furthermore, the pedagogical challenge is compounded by a systemic trend: a nationwide reduction in credits for the College English Course in China in recent years. Between 2007 and 2017, the national academic hour requirement was reduced from 280 to a range of 144-216 (Yu & Liu, 2018), increasing conflicts between instructional time and instructional effects. A survey indicated that the credit allocation was reduced to an average of ten among 100 universities (Cai, 2017). Such credit reductions inevitably compress classroom hours, intensifying the pressure to cover a comprehensive curriculum effectively.

In summary, learners and instructors in the College English Course in China face several challenges, including students' struggles in reading comprehension, an expanding definition of literacy, outdated teaching methods that fail to engage students, and a systemic contraction of instructional hours. Those problems interlace and demand a solution that uses multimodal learning to make instruction more efficient, engaging, and relevant. The present research responds to this imperative by proposing and testing a targeted English reading comprehension module that integrates multimodal principles to bridge this gap.

The following research questions guided this study:

1. What are students' needs in enhancing reading comprehension performance?
2. How can different modes (visual, auditory, etc.) be systematically integrated into the English reading comprehension module incorporating multimodal learning?
3. What are the merits and challenges of using the English reading comprehension module incorporating multimodal learning in reading instruction based on students' performance and students' perceptions?

## 2. LITERATURE REVIEW

### 2.1. *Schemata Theory*

Schema theory, a fundamental psychological concept first introduced by Bartlett (1995), holds that knowledge is not stored randomly but is organized into structured mental frameworks known as schemata. These schemata represent a reader's past experiences and reactions, which are actively reconstructed to make sense of new information. In 1980, Rumelhart applied the theory to the field of reading comprehension, explaining how background knowledge serves as a critical foundation for

interpreting texts.

Within this framework, four distinct schemata are essential for comprehension. First, linguistic schemata refer to a reader’s foundational knowledge of the language itself, encompassing vocabulary, syntax, and grammar (An, 2013). Second, content schemata refer to the reader’s topical knowledge about the subject matter of a text, enabling them to grasp its specific facts and concepts (Carrell, 1987). Third, formal schemata involve an understanding of the text’s rhetorical structure and genre conventions, guiding the reader through its organizational flow. Finally, cultural schemata refer to mental

frameworks that concern cultures, helping us understand and interpret other cultures, as well as the general cognitive process of making sense of the world. (Shahghasemi, 2017).

In this study, to facilitate students' reading comprehension, the researcher integrated various modes of materials into the prereading and in-class activities, such as pictures, videos, discussions, and role-play. Therefore, schema theory, with its emphasis on building or activating prior knowledge, directly guided the design of the multimodal reading comprehension module in this study.

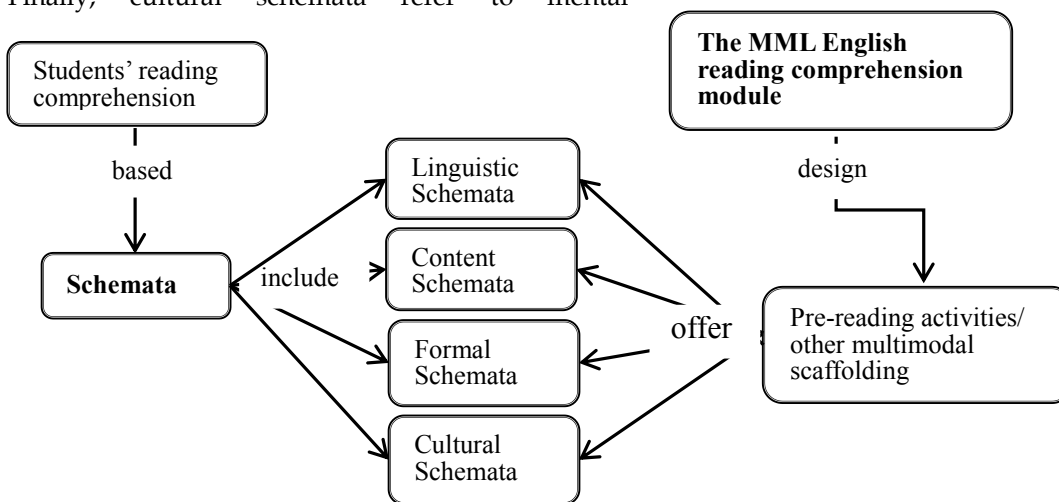


Figure 1: The Schema Theory and the English reading comprehension module.

2.2. Multiliteracy (Cazden et al., 1996)

In response to the limitations of traditional literacy pedagogy in a rapidly diversifying and digitalizing world, the New London Group raised the concept of multiliteracies (Cazden et al., 1996). This pedagogical approach contends that literacy must extend beyond the decoding and production of written language to encompass the various modes of representation used in contemporary communication (Cazden et al., 1996). The framework

is built upon the concept of “design”, which involves the interplay of six meaning-making resources, or “Design Elements”, including the linguistic, visual, audio, gestural, spatial, and multimodal elements (Cazden et al., 1996).

Based on the pedagogy of multiliteracies, this study developed a reading comprehension module to enhance students’ competence in multimodal meaning-making. It aimed to equip learners with the skills to navigate the complex and changing terminology used in today’s workplace and academic disciplines.

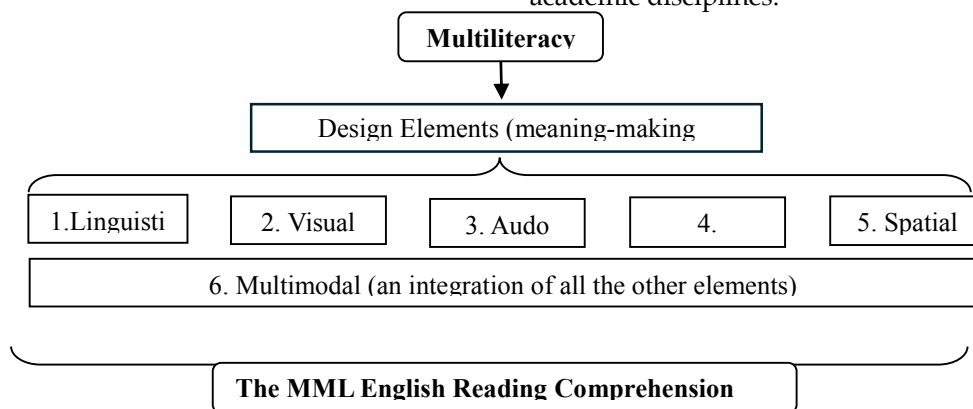


Figure 2: Multiliteracy and the English Reading Comprehension Module.

### 2.3. Multiple Intelligences

Howard Gardner first challenged the narrow, traditional view of intelligence by introducing his multiple intelligences (MI) in *Frames of Mind* (1983). Gardner (1983) argued that intelligence is not a simple, monological attribute measured only by linguistic and logical mathematical skills. Instead, Gardner (1983) redefined it as a biopsychological

capacity to solve problems or create products that are valued within a particular cultural context. To support this more inclusive framework, Gardner proposed a taxonomy of eight distinct, semi-autonomous intelligences, each representing a different domain of human ability. In this study, the researcher integrated the first seven intelligences into the English reading comprehension module incorporating multimodal learning.

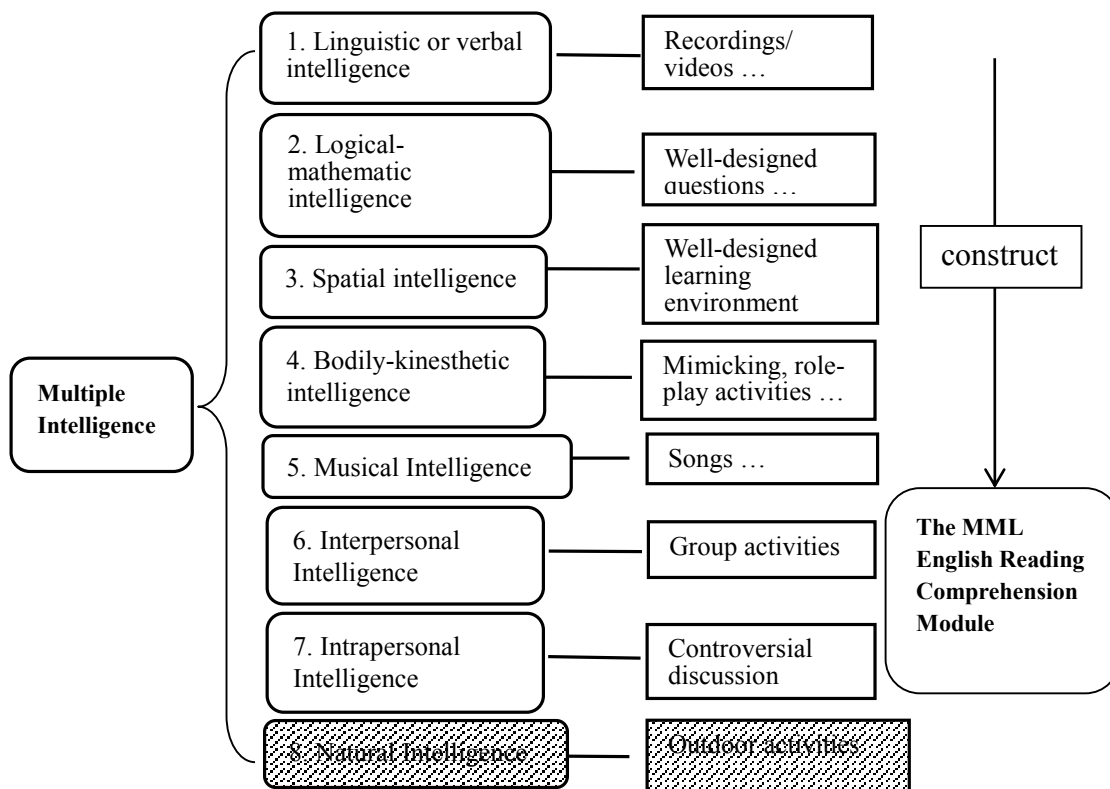
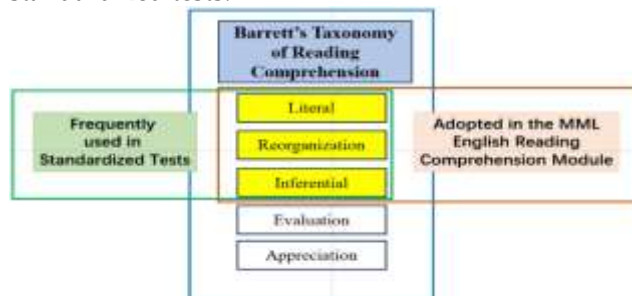


Figure 3: The Multiple Intelligences and the English Reading Comprehension Module.

### 2.4. The Barrett's Taxonomy of reading comprehension

The Barrett's Taxonomy classifies reading comprehension into five progressively complex cognitive levels: literal comprehension, reorganization comprehension, inferential comprehension, evaluation comprehension, and appreciation comprehension (as cited in Aqeel & Farrah, 2019). At the literal level, students understand and recall the facts and details from a text. At the reorganization level, students process information through tasks like summarizing. At the inferential level, students deduce implicit meanings and predict outcomes beyond the written words. The evaluation level involves making judgments and forming well-reasoned conclusions about the text.

Finally, the appreciation level focuses on the emotional and aesthetic engagement with the material. This study developed an English reading comprehension module incorporating multimodal learning (MML English reading comprehension module) to improve students' reading performance at the literal, reorganization, and inferential levels, as these three levels are most frequently assessed in standardized tests.

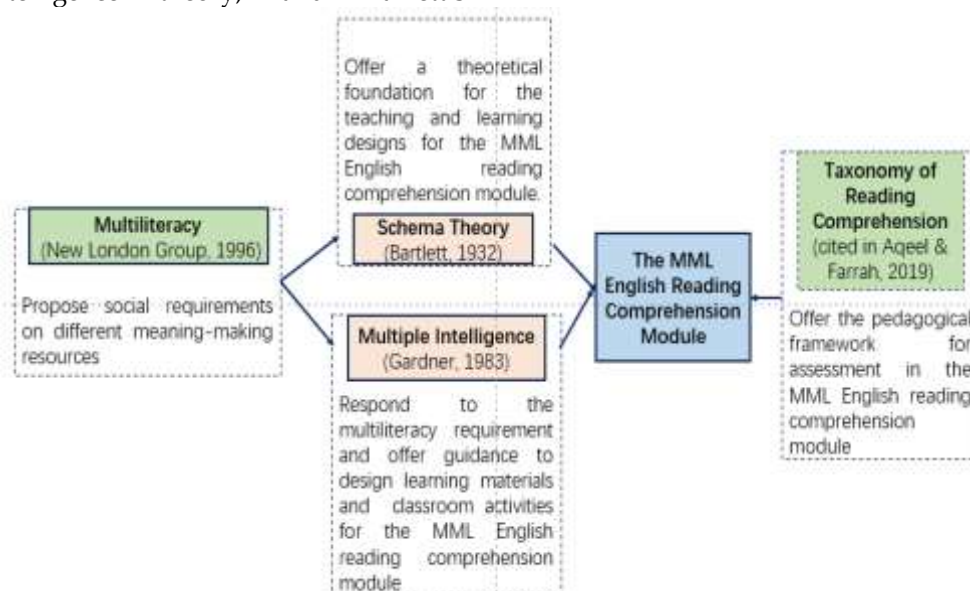


**Figure 4. The Barrett's Taxonomy and the English Reading Comprehension Module.**

### 2.5. The theoretical framework for this study

A theoretical framework is a logically developed structure of concepts, derived from existing theories, that serves as the foundational scaffold for a study (Varpio, et al, 2020). In the previous sections, the researcher reviewed schema theory, multiliteracy, multiple intelligence theory, and Barrett's

Taxonomy, and explained their relation with the English reading comprehension module. These theories are synthesized and interwoven to form an integrated framework that addresses the cognitive, multimodal, individual, and assessment dimensions of reading comprehension, thus guiding not only the module's content but also its pedagogy and assessment, ensuring an overall approach to improve reading comprehension.



**Figure 5. Theoretical Framework.**

The overall relationship and interaction between these theories are shown in Figure 5. To be multiliterate in a digital world, people must learn to comprehend information from diverse sources, such as texts, images, and videos. However, processing these varied forms of information requires effective scaffolding, which can be built upon students' existing knowledge or schema. Therefore, this study employs the theory of multiple intelligences to construct scaffolds. The goal is to create learning materials and classroom activities that can activate diverse schemata by integrating different intelligences, thereby directly supporting the development of multiliteracy.

The effectiveness of this approach was then measured through a series of reading comprehension exercises within the MML English reading comprehension module, which records and assesses students' performance. This process resulted in the construction of an English reading comprehension module that incorporates multimodal learning, designed to develop the multiliteracy skills essential for the digital world.

### 3. METHODOLOGY

In this study, a mixed-methods approach was employed, as it is best suited for examining the effect of a multimodal learning method on students' reading comprehension. A mixed-method approach integrates quantitative and qualitative data collection, analysis, and interpretation within a unified investigation or a series of studies to explore and understand a specific phenomenon (Leech & Onwuegbuzie, 2009).

This methodological choice enables a comprehensive exploration of the research topic's diverse facets, combining the strengths of quantitative data for statistical analysis with qualitative data for in-depth understanding.

On the one hand, the researcher must analyze the textbook texts and previous multimodal learning modules in reading (qualitative data) to prepare for this study. On the other hand, the empirical evidence was provided by using test scores (quantitative data) to measure students' learning outcomes when using this reading module.

At the same time, students' perception (qualitative data) on using this English reading comprehension module is also collected through open-structured interviews, and analyzed through

thematic analysis

**Table 1: Research Design.**

Research Questions	Materials/Instruments	Research Methods
RQ1. What are students' needs in enhancing reading comprehension performance?	Textbook, previous multimodal learning modules in reading	Qualitative
	Pretest	Quantitative
RQ2. How can different modes (visual, auditory, etc.) of resources be systematically integrated into lesson plans in the reading comprehension module?	Learning objectives	Qualitative (opinions from content experts) and quantitative (five-point Likert scale for content validity and KR-20 for reliability)
	Lesson plans	
	Teaching materials	
	Teaching activities	
	Reading texts and reading comprehension questions	
RQ3. What are the merits and problems of the English reading comprehension module based on students' performance and students' perceptions?	In-class exercises	Quantitative
	Post-test	Quantitative
	Interview	Qualitative (thematic analysis)

#### 4. THE ENGLISH READING COMPREHENSION MODULE INCORPORATING MULTIMODAL LEARNING

##### 4.1. Learning Objectives

Learning objectives describe what learners must do to complete an educational activity (Chatterjee & Corral, 2017) and are the core elements in any teaching activity (Sewngegn, 2020). The selection of learning objectives is partly based on the needs of learners and society (Sewngegn, 2020). In modern times, multiliteracies require people to be equipped with adequate reading and writing skills in multimodal resources. Therefore, the researcher conducted a careful and rigorous analysis of the textbooks and previous reading modules. The qualitative data analysis reveals students' need to

enhance their reading comprehension abilities to meet the social demands of multiliteracy. Based on this learning need, the researcher designed detailed learning objectives for each lesson.

##### 4.2. Classroom Activities

Classroom activities help students learn, stay engaged, and achieve educational objectives. They can be done alone or with others and come in many forms, such as group discussions, collaborative projects, practical experiments, educational games, technology-based tasks, and creative work like drawing or drama. In this study, the researcher also created various classroom activities based on the Schema Theory and Multiple Intelligences to enhance students' learning experiences in the English comprehension module incorporating multimodal learning.

**Table 2: Example Multimodal Classroom Activities.**

Theories Related	Classroom Activities	Examples in This Module
Multiple Intelligence Theory - visual	Individual Activities	Show students a picture to strengthen their understanding of key words. 1. Show them a picture and ask them to locate the person according to the teacher's description. a) Please find the person with a bag. b) Please find a girl with a bag. c) Please find a girl in red with a bag.
Multiple Intelligence Theory - kinesthetic	Group Competition	Give them two printed exercises on scanning and ask them to locate and fill in the information according to the requirements. Each group can discuss and submit its agreed-upon answer to the teacher. If there is any mistake, the teacher will give it back to the group for correction. It continues until the winning group can submit a perfect answer sheet.
Multiple Intelligence Theory - visual	Movie Appreciation	Enjoy the Movie clip - The pursuit of happiness, and try to understand the pressure when facing challenges
Multiple Intelligence Theory - kinesthetic	Online Activities	Raise a question in Teachermate and ask students to submit their answers through the platform: Q: Please use several words to describe your desired job. After students submit their answers, use Teachermate to form a word cloud and display it on the screen.

		Compare and ask some students to explain their answers. Tell students that what they wrote down is a part of corporate culture.
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### 4.3. Developing Reading Texts and Reading Comprehension Questions

Ideal reading tests should provide detailed, diagnostic feedback to help teachers tailor instruction and track student progress (Lin et al, 2016). To evaluate students' performance and progress in

using the English reading comprehension module, a set of reading comprehension texts and multiple-choice reading comprehension questions was developed. A tripartite assessment structure, including a pretest, 21 in-class exercises, and a posttest, was developed in this study.

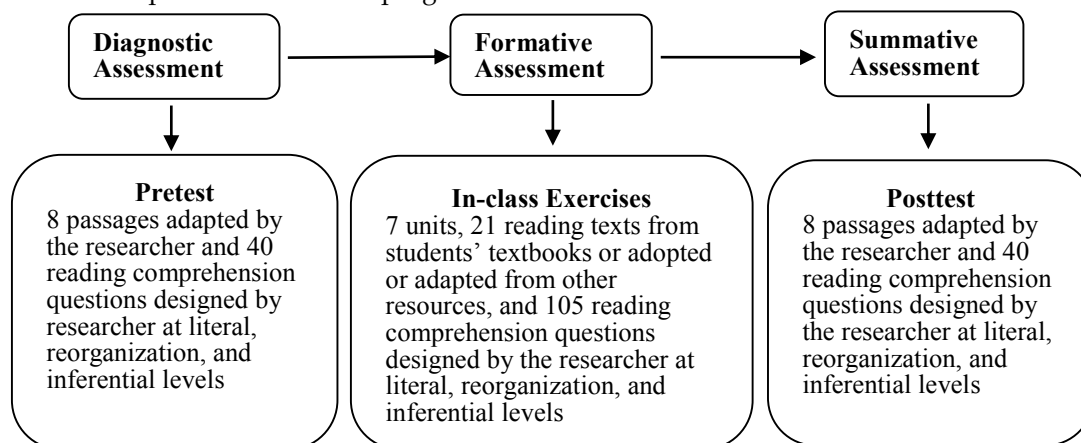


Figure 6. Tripartite assessment structure of the English reading comprehension module.

To facilitate students' study, the researcher adopts 14 texts from students' textbooks as the reading texts in in-class exercises. The other reading texts in the reading comprehension module were adopted or adapted by the researcher from different resources (corporate official websites, instruction manuals). The researcher originally developed all the reading comprehension questions used in the module. Based on the analysis of Barrett's reading comprehension questions, the researcher prioritized three levels of reading comprehension questions (literal, reorganization, and inferential) in designing comprehension questions for this English reading module. Reading comprehension questions at these three levels are aligned with the dominant question types in college English proficiency exams in China (e.g., CET 4/6), and address students' developmental needs by systematically scaffolding skills - from basic information retrieval (literal), to text structure analysis (organization), and critical interpretation (inferential). This purposefully balanced students' learning needs with pedagogical goals, fostering both academic success and improving reading proficiency.

### 4.4. Lesson Plans

A lesson plan describes how to organize teaching materials, tools, and activities to realize the learning

objectives. A teaching plan or lesson plan includes basic information (such as students, class, semester, time allocation...), learning objectives, teaching materials, and assessments, etc. (Nor et al., 2022). Therefore, based on the designed learning objectives, the researcher developed 14 different lesson plans targeted at 14 texts in 7 units. Each lesson plan was designed based on the learning objectives for each lesson, and integrated teaching texts, reading comprehension questions, classroom activities, and in-class exercises together to form a systematic and step-by-step guidance for instructors to follow.

### 4.5. Pilot Study

The researcher conducted a pilot study before the main study to test the reliability of the constructed reading comprehension module. The pilot study involved 30 students and was meant to test the validity and reliability of the reading comprehension module. The appropriateness of the reading module's content was assessed through content validity, because content validity measures how well an instrument covers the research content and related skills, guaranteeing that the findings are meaningful and truly reflect what is being examined (Creswell, 2005). Three content experts were invited to evaluate the content validity of the learning objectives, lesson plans, classroom activities, reading texts, and reading comprehension questions. The results showed a high

validity, and all the teaching materials are appropriate. In addition, the Kuder-Richardson 20 (KR-20) formula was used to measure the reliability of the prototype reading comprehension module based on students' performance in the exercises, because this formula can effectively measure the internal consistency of instruments, especially for multiple-choice tests. The results indicate that the reliability of every exercise in this module is above 0.8, which means the exercises are reliable to test students' reading comprehension performance at three levels.

**4.6. Main study**

238 non-English majors from a public university in China were invited to participate in the instruction of the English reading comprehension module incorporating multimodal learning. Students are required to complete a total of four semesters of courses, and they have completed College English I and College English II as the prerequisite courses. Students received a pretest before using the module, instruction of 7 units according to the steps described in the lesson plans, and a posttest after using the module.

**4.7. Students' Interviews**

After the main study, five students were invited to interviews to obtain their perceptions on the reading comprehension module. Seven interview questions were designed to discover whether the reading comprehension module can benefit students' reading comprehension performance from students' perceptions. Thematic analysis was used to analyze the qualitative data in interview transcripts.

**4.8. Findings**

**4.8.1. Students' Learning Needs in English Reading Comprehension**

To identify students' learning needs in English reading comprehension (answer Research Question 1), a diagnostic pretest was conducted among 238 students before using the English reading comprehension module. The pretest, comprising eight passages and 40 reading comprehension questions, was designed to assess students' reading comprehension performance across three specific levels: literal comprehension (remembering, recognizing, and identifying details from a text), reorganization comprehension (synthesizing information from across a passage), and inferential comprehension (interpreting implied meaning). This multi-level design was implemented to pinpoint

specific deficits in students' reading

**Table 3: The Mean Percentages of the Pretest.**

	Literal Comprehension Questions	Reorganization Comprehension Questions	Inferential Comprehension Questions
Mean Percentage	66%	53.89%	61.58%

The overall average score of students in the pretest is barely above a passing threshold. This generally low performance indicates that students struggle with reading comprehension, particularly with the multimodal texts used in the assessment, highlighting the urgency for targeted instructional intervention.

Table III provides further diagnostic insights based on the scores across the three comprehension levels. Students performed best on literal comprehension questions (Mean percentage = 66%), which test lower-order information retrieval skills. Their performance was poorer on inferential questions (Mean percentage = 61.58%) and lowest on reorganization questions (Mean percentage = 53.89%). Their varied performance in the pretest partly aligns with the increasing cognitive demands of Barrett's Taxonomy, reflecting a pronounced weakness in higher-order thinking skills.

However, their notably poor performance in reorganization comprehension is worthy of pedagogical concern. This result confirms the significant difficulty these questions posed to students, suggesting students lack the specific ability to synthesize, reorder, and reconstruct information from across a text to discern deeper implications.

Consequently, these findings collectively highlight two critical learning needs: a broad requirement to improve overall comprehension engagement and a specific need to develop higher-order cognitive skills, with a special focus on reorganization strategies. This diagnosis directly informs the design of the reading module, necessitating the explicit integration of skill-based instruction to address these deficits.

**4.8.2. The Integration of Multimodal Resources in the English Reading Comprehension Module**

The systematic integration of multimodal resources is not merely an "add-on" but a strategic pedagogical process that enhances engagement, scaffolds reading comprehension, and deepens analysis for diverse learners. The previous analysis identified students' basic learning needs in reading comprehension. Based on this analysis, a series of lesson plans was developed to integrate multimodal resources, based on Schema Theory and Multiple Intelligences, to activate students' prior knowledge,

cater to different learning preferences, and foster deeper textual engagement.

The lesson plans in the English reading comprehension module follow a “prereading”, “during reading”, and “after reading” structure. In the prereading phase, some low-cognitive load resources or activities were used to engage students and build a context before reading the texts. For example, in Lesson 2, the song Change was used to lead students to understand the topic of Unit 1. During the reading phase, more multimodal resources were interlaced to break down the reading texts and make thinking visible. For instance, in Lesson 1, five infographics were used to represent five qualities for chance events in text A. In Lesson 6, a time zone table drawing activity was designed to help students understand the difficulty of remote teamwork. Ultimately, the systematic integration of multimodal resources is achieved through a deliberate organizational architecture within the lesson plans.

#### 4.9. Merits And Challenges of Using the English Reading Comprehension Module

##### 4.9.1. Students' Performance in the English Reading Comprehension Module

To evaluate students' reading achievement after using the instructional module, a posttest was conducted. The posttest used the same question structure as the pretest. The eight passages in the posttest are also connected to the textbook topics, including various real-world formats, such as news reports and company annual reports. Diagrams or tables accompany some texts to test students' ability to interpret multimodal information. With 40 questions covering different comprehension levels, the results could be directly compared to the pretest.

Students were given one hour to complete both the pretest (administered before using the module) and the posttest (administered after using the module) in the classroom. Following the intervention, students showed significant improvement in reading comprehension performance, raising their average score from roughly 60 to above 70. This result demonstrates that the English reading comprehension module was effective in enhancing students' general reading performance.

Besides students' general performance, their reading comprehension performance at each level was also collected and compared by the researcher in Figure 7.

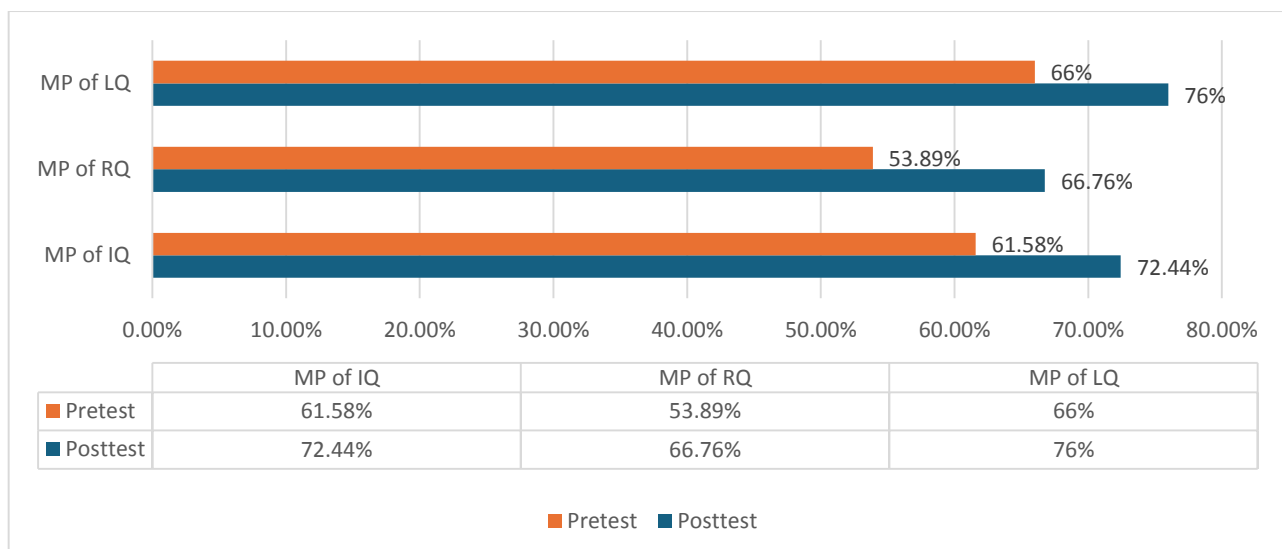


Figure 7: Students' Performance at Different Question Types.

Note: MP means mean percentage; LQ, RQ, and IQ mean literal, reorganization, and inferential comprehension questions, respectively.

In Figure 7, the mean percentages of their reading comprehension performance at each level rise by 10%, indicating that students' reading comprehension performance improves greatly at all three targeted reading comprehension levels. In addition, the mean percentages of students' reading

comprehension performance at both literal and inferential levels were above 70%. The data indicate that students achieved a moderate level of proficiency in both literal comprehension and inferential comprehension levels after using the reading comprehension module. This revealed that students acquired reading skills in identifying details, recognizing main ideas, and identifying causes and effects in reading texts (for literal

comprehension questions), as well as making predictions, interpreting figurative language, making connections, and identifying underlying themes. However, it is noteworthy that students' performance in reorganization comprehension questions is still weak. This indicated that students may be weak at summarizing, categorizing, sequencing, comparing, identifying, and synthesizing from different sections of reading texts. Therefore, the researcher needed to refine the reading comprehension module to better support students with reorganization comprehension questions.

**4.9.2. Students' Perception of the Reading Comprehension Module**

Following the use of the reading comprehension module, the researcher conducted interviews with five students to gather their perceptions. A thematic analysis of the interview transcripts was then performed to identify crucial opinions of students, providing practical insights for refining the module. In this study, systematic identifiers were used for every data segment. The identifiers for interview segments are shown in Table IV.

*Table 5: Identifiers for Interview Segments.*

Individual		Question No.		Date	
S1-S5	Student 1- Student 5	Q1-Q7	Interview question 1 - Interview question 7	20250406	April 6, 2025

For example, the identifier of S2-Q1-20250406 identifies the transcript segment of student 2 obtained from the interview with this student on April 6, 2025.

- The benefits of the English reading comprehension module

"Well, it is also helpful. Because this, uh, college English reading module is really quite rich, quite, uh, quite intuitive, and quite simple and concise." (S4-Q3-20250406)

"Ah, I can accurately grasp the keywords when doing the questions, and then locate them in the corresponding paragraphs in the article, uh, to find the answers, and then I can answer the questions very quickly and correctly." (S4-Q1-20250406)

"Of course, the English reading module is helpful for me to understand the literal comprehension questions." (S1-Q1-20250406)

"Then, uh, it can help me capture a lot of, uh, implied meanings, and then help me, uh, better understand the main idea of this article." (S2-Q3-20250406)

Analysis of the interview transcripts revealed three principal benefits of the reading comprehension module as perceived by the students. First, students reported a clearer understanding of the characters of different reading comprehension questions. Second, they acquired reading strategies to answer different questions. At last, they also reflected an increasing learning interest in the instruction.

- Challenges faced by using the reading comprehension module

Based on participants' interview transcripts, four challenges were detected and summarized as: time challenge, multimodal challenge, vocabulary challenge, and question type challenge.

"Well, reading it may require you to spend more time understanding the content of the article." (S3-Q4-20250406)

"Um, for example, some reading comprehension questions are difficult for me because the texts are long and have many new words, ... (S4-Q4-20250407)

"Because of multimodal, um, this kind of teaching, it will have a lot of information to process, including text information and picture information, which may cause me a kind of information overload, that is, it is difficult to screen, analyze, and integrate this information." (S5-Q4-20250407)

"It is understandable that, um, it is difficult for me to answer reorganization comprehension questions." (S3-Q2-20250406)

Students reported that they need more time to read texts, answer questions, or take part in the group activities, suggesting that instructors should allocate more time to tasks to ensure students' full engagement. Some participants reflected a fear or worry in multimodal resources or technology, highlighting the need for structured scaffolding, such as introductory tutorials, peer-assisted learning, or low-stakes practice tasks, to build confidence and competence in grasping multimodal resources and using technology. In addition to time constraints and difficulties with multimodal resources and technology, some students reported facing vocabulary-related problems, which indicated that instructors should integrate possible ways of vocabulary instruction into the English reading comprehension module. Students' varied opinions focused on the literal comprehension questions and the reorganization questions revealed that students were good at retrieving and understanding explicitly stated information, but weak at synthesizing or reorganizing information across different parts of the text.

The thematic analysis of students' interview

transcripts revealed that, despite the overall practicability of the English reading comprehension module (as previously discussed), students encountered several challenges. These are primarily related to time constraints, vocabulary difficulties, multimodal learning resources/technology, and specific question types. Future refinements of the module should therefore prioritize addressing these areas for improvement.

#### 4.10. Limitation

The primary limitation of this study was its modest sample size (N = 238), a consequence of its single-institution design and time-constrained data collection, thereby limiting the immediate generalizability of the findings to broader contexts. This sample size may impact the statistical power of the analysis, increasing the risk of missing some possible connections. However, to mitigate this limitation, the selected sample size has already represented the maximum achievable within the available resources and constraints of this study. Despite the limitation, the sample size proved sufficient for the primary data analysis for this study.

### 5. CONCLUSION

This study developed and evaluated an English comprehension module incorporating multimodal learning grounded in theories of schema theory and multiple intelligences, aiming to enhance students' reading comprehension performance at literal, reorganization, and inferential levels. The results of the pretest suggested that students need to enhance their reading comprehension engagement broadly, with a particular need for improving reorganization comprehension questions. In response to students' learning needs, the reading comprehension module was designed to systematically form, activate, and

reorganize students' schemata through diverse multimodal inputs. Posttest results showed significant improvement in reading comprehension across all three levels, a finding reinforced by students' interviews in which participants attributed their progress to the reading comprehension module.

The findings of this study offered meaningful implications for pedagogy and material development in English reading comprehension instruction. A successful implementation of a multimodal reading comprehension module requires purposeful scaffolding. Teachers should invest in foundational preparation, such as vocabulary preview, platform familiarization, and targeted exercises to ensure students can fully engage with multimodal assignments. In addition, future module designers should systematically integrate more multimodal resources, tools, and activities into the reading comprehension class, such as interactive graphics, digital assistants, and interactive apps. These should not merely supplement reading texts, but be pedagogically sequenced to enhance students' multiliteracy, helping them improve their ability to interpret meaning across verbal, visual, and digital modes.

Although the purposive sampling of this study may limit the statistical generalizability of the research results, the significant improvement in students' reading comprehension provides compelling support for incorporating multimodal learning into the English reading comprehension module. Future research should validate these findings among wider and more diversified populations. Nevertheless, this research confirms that a carefully scaffolded multimodal framework can effectively address specific comprehension deficits and enhance overall engagement in reading comprehension, paving a hopeful path for innovative reading instruction.

### REFERENCES

- An, S.Y. (2013). Schema theory in reading. *Theory and Practice in Language Studies*, 3(1), 130-134.
- Aqeel, M., & Farrah, M. (2019). Eighth grade textbook reading comprehension questions and Barrett's taxonomy: Teachers' perspectives at Hebron district, Palestine. *Hebron University Research Journal (Humanities)*, 14(1), 229-260.
- Bartlett, F. C. (1995). *Remembering: A study in experimental and social psychology*. Cambridge University Press.
- Cai, J. Challenges to traditional college English teaching concepts: A study of college English teaching guidelines. *Foreign Language Education*, 38(1), 6-10. DOI : 10.16362/j.cnki.cn61-1023/h.2017.01.002
- Carrell, P. L. (1987). Content and formal schemata in ESL reading. *TESOL Quarterly*, 21(3), 461-481.
- Cazden, C., Cope, B., Fairclough, N., Gee, J., Kalantzis, M., Kress, G., ... & Nakata, M. (1996). A pedagogy of multiliteracies: Designing social futures. *Harvard Educational Review*, 66(1), 60-92.
- Chatterjee, D., & Corral, J. (2017). How to write well-defined learning objectives. *The Journal of Education in Perioperative Medicine: JEPM*, 19(4), E610.

- Creswell, J. W., & Creswell, J. D. (2017). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. Sage Publications.
- Danielsson, K., & Selander, S. (2021). *Multimodal Texts in Disciplinary Education: A Comprehensive Framework* (p.3). Springer Nature.
- Eisenmann, M., & Summer, T. (2020). Multimodal literature in ELT: Theory and practice. *CLELE Journal*, 8(1), 52-73.
- Gardner, H. (1983). *Frames of Mind: The Theory of Multiple Intelligences*. Basic Books.
- Hsieh, Y., & Huang, S. (2020). Using an E-book in the secondary English classroom: Effects on EFL reading and listening. *Education and Information Technologies*, 25, 1285-1301.
- Leech, N. L., & Onwuegbuzie, A. J. (2009). A typology of mixed methods research designs. *Quality & Quantity*, 43(2), 265-275.
- Lin, S. E., Mohamed, A. R., & Ismail, S. A. M. M. (2016). Systematic tracking of Malaysian primary school students' ESL reading comprehension performance to facilitate instructional processes. *International Journal of Instruction*, 9(1), 149-162.
- Majeed, A. C. T., & Ilankumaran, M. (2022). Teaching language skills in the ESL classroom through programmed instruction: A glimpse. *International Journal of Health Sciences*, 6(S6), 4803-4822. <https://doi.org/10.53730/ijhs.v6nS6.11465>
- Ministry of Education of the People's Republic of China. (2020). *College English teaching guide [《大学英语教学指南》]*. <http://www.moe.gov.cn/>
- Nor, H., Hizriani, N., & Kadariyah, N. L. (2022). Teachers' materials development, lesson planning, and teaching skills readiness in teaching English. *PANYONARA: Journal of English Education*, 4(1), 32-64.
- Oakhill, J., Cain, K., & Elbro, C. (2014). *Understanding and Teaching Reading Comprehension: A Handbook*. Routledge.
- Roe, B., Smith, S. H., & Kolodziej, N. J. (2018). *Teaching reading in today's elementary schools*. Cengage Learning.
- Rumelhart, D.E. (1980). Schemata: the building blocks of cognition. In Spiro, R.J., Bruce, B.C & Brewer, W. F (eds) *Theoretical Issues in Reading Comprehension*, Lawrence Erlbaum Associates.
- Sewagegn, A. A. (2020). Learning objective and assessment linkage: Its contribution to meaningful student learning. *Universal Journal of Educational Research*, 8(11), 5044-5052.
- Shahghasemi, E. (2017). Cultural schema theory. *The International Encyclopedia of Intercultural Communication*, 1-9.
- Varpio, L., Paradis, E., Uijtdehaage, S., & Young, M. (2020). The distinctions between theory, theoretical framework, and conceptual framework. *Academic Medicine*, 95(7), 989-994.
- Wang, S., & Littlewood, W. (2021). Exploring students' demotivation and remotivation in learning English. *System*, 103, 102617.
- Wang, Y., & Guan, H. (2020). Exploring demotivation factors of Chinese learners of English as a foreign language based on positive psychology. *Revista Argentina de Clínica Psicológica*, 29(1), 851.
- Yu, X., & Liu, C. (2018). Curriculum reform of college English teaching in China: From English for general purposes to English for specific purposes. *ESP Today*, 6(2), 140-160.