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Investigating the effects of multimodal tasks-critical reading integrated instruction on rural senior high school students' reading achievement, reading motivation and confidence in Hohhot Inner Mongolia, China

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Abstract

One of educational reforms that China is undertaking is to improve her citizen's English language proficiency, and more specifically, to be competent in critical reading. However, there is a tendency to pay too much attention to grammar to improve students' reading comprehension, which may bring great reading pressure to students, but it will not improve their critical reading ability. This can be frustrating to the students and possibly affect their motivation to further pursue reading. In addition, a teacher-centered approach may have improved students' vocabulary and grammatical rules, but not to read critically. Therefore, this study reports the effects of integrating critical reading content with multimodal tasks which aims at providing English Language teachers in China with an alternative approach for teaching critical reading. A quasi-experimental design with pretest and post-test is used to investigate the effects of multimodal tasks integrated lessons on Grade 2 rural senior high school students' critical reading achievement. Their motivation and confidence is also examined. Two questionnaires are used to examine students' motivation and confidence to read critically. The findings reveal that the experimental groups with the intervention of multimodal tasks has a higher critical reading test scores than the control groups. The questionnaires also show that the experimental group receiving multimodal task also has a significantly better motivation and confidence to read critically as compared to the control group after the intervention. Multimodal tasks have a positive impact on the critical reading ability, motivation and confidence.

Keywords: China rural senior high school students, multimodality, critical reading

Introduction

In recent years, China has put great effort towards improving and strengthening its social and economic development through education (Mu & Li, 2019). Despite China's technological advancement and encouragement, teachers in rural schools appear not to embrace multimodality in their classrooms (Amalia, et al, 2021). According to Amalia, et al, (2021), is this because they do not know how to use multimodal in class, or because teachers have not deviated from teacher-centered teaching methods. According to Zhou, Jiang and Yao (2015) and Lin and Chen (2021), teacher-centered approach may have improved students' vocabulary and grammatical rules, but not read critically. Part of the teacher-centered approach is the practice among teachers and students that doing a lot of reading exercises is the only way to improve reading (Li, Shi, & Xue, 2020). Unfortunately, the belief by many teachers in rural schools in China that the main reason for teaching English is to make students obtain a high-test score and to help them to enter a good school. This appears to be prevalent in the students' senior high school years to get them ready for the College Entrance Examination (Li, Shi, & Xue, 2020). When it comes to the schools in rural areas, both teachers and students take this belief more seriously.

The teachers' drill and practice methods of instruction creates issues for students in the reading comprehension sections where they find it difficult to critically analyze the passages or discern facts from the text (Hashemifardnia, Namaziandost & Shafiee, 2018). This can be frustrating to the students and possibly make them lose confidence in reading and may affect their motivation to further pursue reading. A monomodal teacher-centered instructional approach has resulted in a gap that needs to be overcome – between what is being taught

and what is needed to teach reading to the students. This gap has made many students lack creativity, analytical and critical thinking, and problem-solving skills (Lin & Chen, 2021). Therefore, it can be regarded as literally ineffective in learning. In fact, Kim et al (2021) lament that more discussion of multimodality and its use to teach specific aspects of critical reading is still needed. The authors contend that the integration of multimodality is able to bring advantages to the enhancement of critical reading ability of high school students in rural schools in China. Therefore, the authors have set out to inculcate the integration of multimodality in the form of multimodal tasks as an alternative to the conventional method of teaching critical reading. This article reports the results of the application of multimodal tasks in English reading classes.

Critical reading is not simply close and careful reading. It entails rational thinking in the reading process (Al Roomy, 2022; Zhou, Jiang, & Yao, 2015). Reading now requires students to achieve certain goals in order to identify the author's intention, understand the tone, and persuasively identify bias (Li, 2010). In other words, to read critically, students need to infer from the evidence in the text. Students must be able to recognize, not only the author's purpose, but to distinguish facts from opinions, and make inferences. Through critical reading, students are able to sieve through data rationally, and analyze this information to enable them to determine if what they are reading contains truthful and reliable information (Kereluik et al, 2014). In fact, critical reading skills are related to critical thinking skills (Paul & Elder, 2002). According to Paul and Elder (2002), when you read a text, you judge the text, read it for a purpose, use your own assumptions, concepts and ideas, make inferences, and think from a personal perspective. It must be noted that rural students in China have fewer opportunities to practice their English language compared to students living in the city.

The definition of motivation is described differently as the reality of human experience. Most scientists believe that motivation is a hypothetical cause of behavior, which means that motivation is a psychological event that determines the process and effort of action (Seven, 2020). Simply speaking, motivation is the reason for the certain activities or behavior of organisms. According to (Reeve, 2024), it is the desire to do and that arouses, sustains and regulates human behavior. It is also a driving force responsible for the initiation, persistence, direction, and vigor of goal-directed behavior (Reeve, 2024). Motivation is about how a person is induced to act in a certain way that stimulates a person's desire to participate (Seven, 2020).

When people learn and make decisions, they receive specific feedback about their abilities, thereby cultivating faith in these abilities (Greenacre et al, 2014). These beliefs are described as confidence (Park et al., 2007). Confidence is about someone who is self-confident and behaves confidently because they feel sure of their abilities or value (Tracy, 2012). Similarly, it is also the belief or assurance in oneself, trusting one's abilities, judgements, or decisions, either in general or in relation to a specific situation or activity (Tracy, 2012). Confidence, in simple terms, is an individual's expectation of whether he/she can complete a certain task, which is also a positive and effective self-expression (Gao et al, 2022).

Since the 1990s, the term 'multimodality' has been the focus of linguistic research. Gu (2007) believes that 'multimodality' refers to the way in which human beings interact with the external environment (such as people, machines, objects and animals) through senses (such as vision, hearing, touch, etc.). The interaction of single senses is called single mode, and the interaction of multiple senses is called 'multimodality', which is a method to understand various representations of knowledge and generate meaning by examining the contributions of language, motion and image (Amos & Abas, 2021; Canals, 2021; Jewitt & Kress, 2003). The multimodal approach also focuses on the interaction and combination in the process of text coherence, considering how language and visual choices impact the goals of text, audience and context, and how they collaborate in the composition and construction of information and ideas. (Amos, & Abas, 2021; Canals. 2021). Visual mode refers to the use of colors, vectors, scene, perspective, and viewpoint in both still and moving images. Audio mode is the rhythm of music and sound effects. Gestural mode contains the physical act of signings and a wide range of movements. Spatial mode is direction, position of layout, and organization of objects (Mills & Unsworth, 2018). In teaching and learning, researchers and educators have a particular interest in how multimodality, multimodal-based tasks or teaching approaches can serve to motivate today's students and enhance their learning performances (Townsend, Brock & Morrison, 2018). Paul and Elder (2002) and Varaporn & Sitthitikul (2019) have shown that multimodality and the use of multimodal tasks are able to promote critical reading skills, which in turn boost students' self-confidence and motivation.

Learning by Design emerges from Gardner's Theory of Multiple Intelligence. It emphasizes the value of learning through creating, programming, or participating in other forms of designing. It is a reiterative pedagogical construct Cope & Kalantzis, 2005). The 'Learning by Design' provides teachers with a construct to cope with the constantly changing instructional environment. Cope and Kalantzis (2009) point out that the learning by design provides a teaching guide for teachers who want students to actively learn, explore, and solve problems, and integrate multiple models into their learning. The Learning by Design has been extensively used in teaching and learning, specifically in English language learning (Cope & Kalantzis, 2005).

The Learning by Design' construct provides four main knowledge processes for teachers to design classroom activities and tasks, which do not only allow students to participate in active learning, exploration and problem solving, but also allows them to immerse themselves in a multimodal environment, in which

multimodality can be used to ask questions and exchange ideas and expressions (Varaporn & Sithikul, 2019). These four knowledge processes are experiencing (situated practice), conceptualizing (overt instruction), analyzing (critical framing), and applying (transformed practice). The learning by design construct emphasizes the importance of students taking a leading role throughout the stages of learning (see Table 1). The authors have integrated this construct to assist in the teaching of critical reading in China. Such integration is expected to develop rural students' understanding and ability to use multimodality as alternatives to making meaning in their reading tasks, and to adjust to the use of digital modes.

Table 1

The learning by design construct

Learning by Design Construct (Cope and Kalantzis, 2005)	
Experiencing	**the known** Learners reflect on their own familiar experiences, interests and perspectives
	the new Learners observe or take part in something that is unfamiliar.
Conceptualizing	**by naming** Learners group things into categories, apply classifying terms, and define these terms.
	with theory Learners combine concepts in order to generalize schemas or develop theories in discipline knowledge.
Analyzing	**functionally** Learners analyze logical connections, cause and effect, structure and function.
	critically Learners evaluate their own and other people's perspectives, interests and motives.
Applying	**appropriately** Learners apply knowledge in a typical, expected situation
	creatively Learners transfer their learning to a different context through a creative innovation

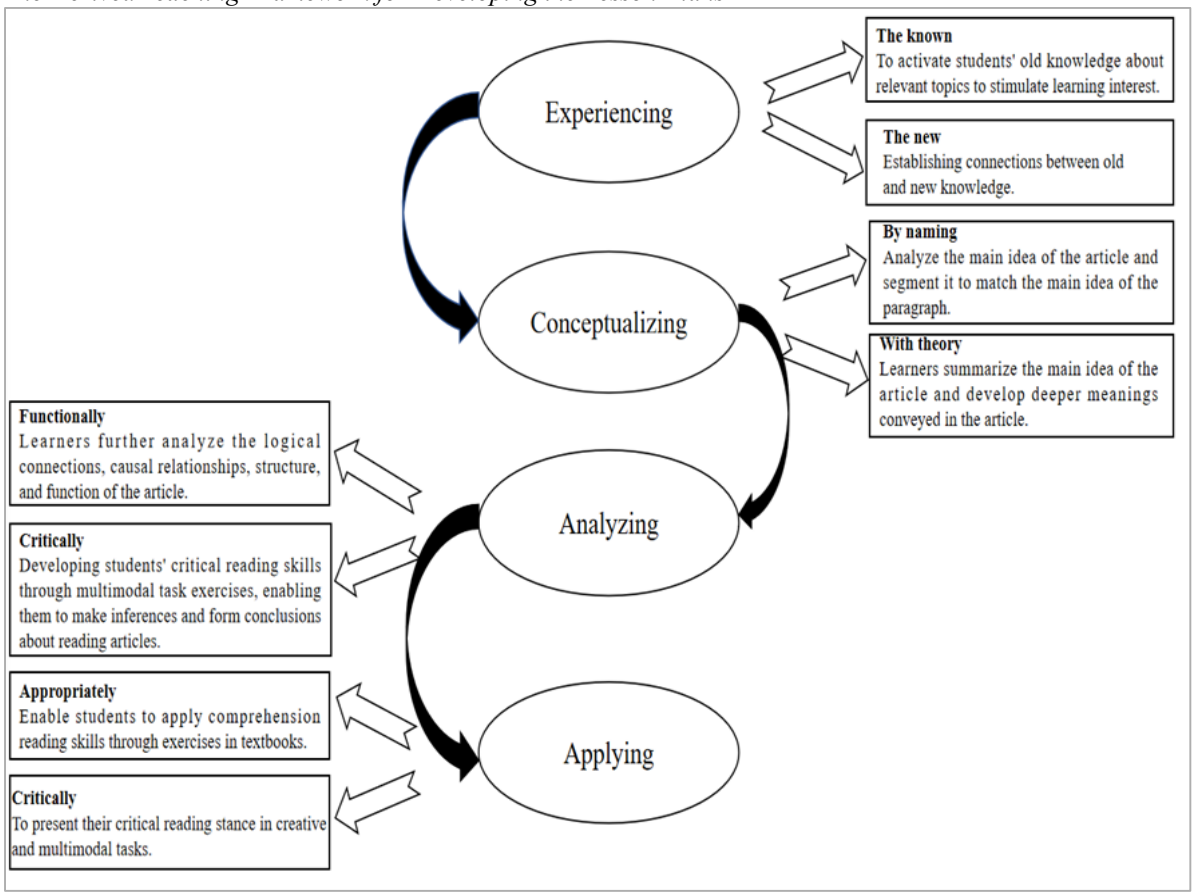
Conceptual framework

The learning by design construct was translated into a teaching framework as shown in Figure 1. The teaching method started by activating students' schemata, including previous knowledge or experience. This was mainly accomplished through classroom discussion. The purpose of activating schemas was to activate students' old knowledge about relevant topics to stimulate learning interest and establish connections between old and new knowledge.

The conceptualizing stage was a direct teaching and discussion conducted in a very clear manner (Varaporn & Sitthitikul, 2019). In this study, students were asked to read the text to increase the depth of understanding of text practice and enrich the understanding of the text. Students read the text and delve deeper into it by identifying the theme, identifying the main ideas and supporting details, and discussing key terms. Then, the students synthesized the concepts obtained from the text to summarize or form a hypothesis. The conceptualizing stage was the core of the course, which was about analyzing the text. The activities included designing a graphic organizer, completing a KWL chart, and creating a mind map. Learners further analyzed the logical connections, causal relationships, structure, and function of the article and developing students' critical reading skills through multimodal task exercises, enabling them to make inferences and form conclusions about reading articles.

Figure 1

The Derived Teaching Framework for Developing the Lesson Plans

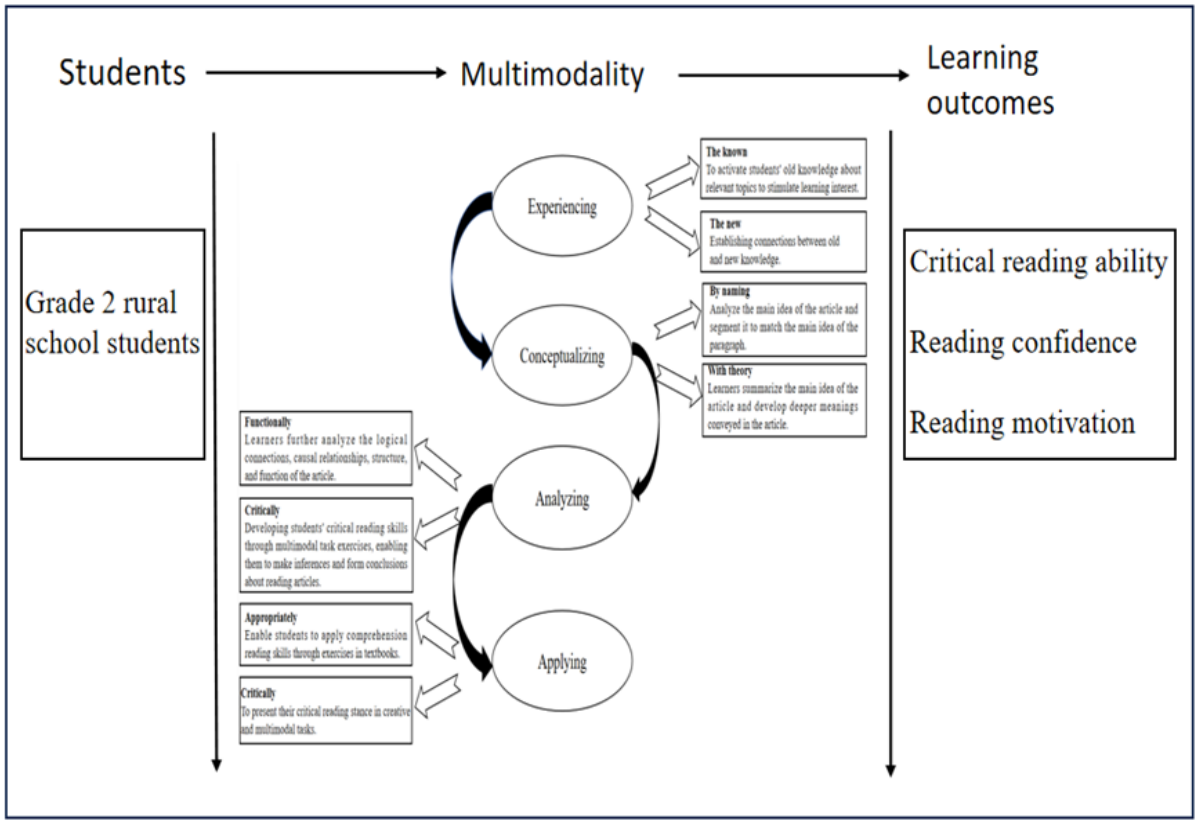


Finally, in appropriate applications, students needed to demonstrate their understanding and critical reading ideas gained from reading paragraphs through multimodal representations. Creative application was where multimodal tasks occurred. After reading, students created multimodal representations, such as video clips, posters, comics, or collages, as a way to transfer their understanding and present their critical reading stance, including their judgment and evaluation of the reading text. At this stage, students had the opportunity to learn various types of patterns and extensive readings, which enhance their critical reading ability.

Based on this derived framework by the researcher, the authors then developed the conceptual framework as shown in Figure 2. This conceptual framework, not only guided the study, but also shows that an intervention with the use of the framework can cause some changes to students' learning outcomes.

Figure 2

The Conceptual Framework of This Study



The study was characterized by the integration of multimodal tasks aimed at providing teachers with an alternative approach for teaching critical reading. The overarching aim of the current study was to examine the effects of the use of multimodal tasks with rural senior high school students in China. Based on the overarching research aim, the research questions (RQ) and accompanying hypothesis (H) which guided the study were as follows:

RQ 1: Will the experimental group of rural senior high school students have a statistically significantly higher critical reading ability scores compared to the control group of rural senior high school students after the use of multimodal tasks?
H1: The experimental group of rural senior high school students will have a statistically significantly higher critical reading ability scores compared to the control group of rural senior high school students after the use of multimodal tasks.

RQ 2: Will the experimental group of rural senior high school students have a statistically significantly better motivation compared to the control group of rural senior high school students after the use of multimodal tasks?
H2 : The experimental group of rural senior high school students will have a statistically significantly better learning motivation compared to the control group of rural senior high school students after the use of multimodal tasks.

RQ 3: Will the experimental group of rural senior high school students have a statistically significantly greater reading confidence compared to the control group of rural senior high school students after the use of multimodal tasks?
H3: The experimental group of rural senior high school students will have a statistically significantly greater reading confidence compared to the control group of rural senior high school students after the use of multimodal tasks.

Methodology

Research design

The study used a quasi-experimental research design with four intact groups of participants (Classes A, B, C and D). All participants completed a pre-test, two prior self-report questionnaires, two post self-report questionnaires and a post-test for investigating the effects of the use of multimodal tasks in teaching critical reading (please see Table 2).

Table 2

General Research Design in the Current Research

Week	1	**2**		**3**		**4**		**5**		**6**		**7**		**8**	
Lesson	*O1*	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	*O2*
Experimental group (n=80）	Critical reading multimodal tasks integrated lessons															
Control group （n=80)	Conventional critical reading tasks lessons															

L1-L14---- Lesson 1 to Lesson 14
O1----Pre test, two self-report questionnaires
O2----Post test, two self-report questionnaires

The independent variable which was defined as the causal variable was the Learning by Design framework that integrated multimodal tasks into the teaching of critical reading. The two experimental groups (Class A and Class B) received 14 lessons in 8 weeks of critical reading multimodal tasks integrated lessons. The participants in the two control groups (Class C and Class D) received conventional critical reading tasks lessons. The conventional group of students used pen-paper practice, drill-practice, and answering questions on worksheets. Textbook was used extensively. In addition, grammar-translation method, referring to the method of using English grammar concepts to translate sentences was used. For all groups, the dependent variables were students' critical reading ability scores, motivation to learn critical reading and their confidence in critical reading. The settings and the environments remained the same for all groups.

Research setting

The school where this research study was carried out was in the rural district of ChaSuQi in Hohhot, Inner Mongolia, China. Senior high schools in ChaSuQi operated by six semesters. The first semester ran from September – January every year, while the second semesters was from March-July every year. Senior high school Banner 1 was randomly selected as the research site. The research took place in the first semester of the school calendar for 2023/2024 for 8 weeks (from September – November 2023). The participants for this study were Senior Grade 2 students (17 years old) from senior high school Banner 1. Senior Grade 2 students were chosen because they entered the second year of their senior high school and would be exposed to a higher-level skill set of the English curriculum.

There were 14 classes in Senior Grade 2 of the 2023/2024 first semester study period of senior high school Banner 1. All the eight classes of similar-ability, heterogeneous students in Senior Grade 2 intact classes were randomly selected. Two classes with a total of 80 students were assigned as the multimodal tasks integrated instruction groups (experimental groups) while the next two classes of 80 students were assigned as the non-multimodal tasks integrated instruction groups (control groups). For ease of identification, the researcher has named the experimental groups as Class A and Class B, while the control groups were named Class C and Class D.

Inner Mongolia uses the same English language textbooks for all senior high schools. The Senior Grade 2 English language textbooks is published by 人民教育出版社 [the People's Education Press]. In Senior Grade 2, there are 4 textbooks (2 textbooks in each semester, books 5-8). The Senior Grade 2, book 7 is the setting of this study because it is used in the first semester of 2023/2024 academic year.

Senior Grade 2 Book 7 has 5 units each with its own topics. Unit 1 is on topic 'Living Well', Unit 2 is on 'Robots'. Each topic in the units has sections for listening, speaking, reading, and writing. In reading, students are required to understand, interpret and make inferences about what they read. Also, they are required to identify the main idea, analyze the passages, conclude, interpret and express opinions on passages they read in the textbook.

The lesson plans were designed to cover the 8-week learning objectives and contents of 'Living well' and 'Robots' of the Senior Grade 2 English language textbook. The authors mapped the learning objectives and contents of the reading topics with the four knowledge processes (experiencing, conceptualizing, analyzing, applying) and the lesson plans covered 14 lessons of teaching out of 8 weeks of classes.

Instruments

These tests, although were designed by the researcher, had been adopted from the 2022 standardized High School English Examination of Inner Mongolia for Senor Grade 2 and were used in assessing students' critical reading abilities between the multimodal tasks integrated instruction groups (experimental groups) and the non-multimodal tasks integrated instruction groups (control groups). This standardized High School English Examination had multiple-choice questions and short structured questions. Two parallel versions of the tests were designed for the pre-test and the post-test. During the test development process, the test items were developed under the supervision of the supervisor of the study. It was then sent for review and revision to an English language school teachers in Huhhot. Specifically, the pre-and-post-tests critical reading ability tests contained 25 questions items in total. There were 15 multiple choice questions. It also consisted of 5 fill-in-the-blank questions that required students to choose the correct words/phrases from a list provided. There were 5 open ended questions, which assessed students' ability to inference from different perspectives.

Two self-report questionnaires were used in this research. The two questionnaires were used to investigate students' motivation and reading confidence in both the experimental and control groups.

The Motivation Questionnaire (MQ) was a self-reporting instrument designed to measure students' judgments of their own motivation towards critical reading in English. The motivation survey was adapted from Gardner's Attitude/Motivation Test Battery (AMTB) which has been proven to have good validity and internal consistency (Garner & Smythe, 1981). For the purpose of this research, the researcher only adapted and modified the composition of 'motivation' for use. Please see Appendix 1 for the items in MQ.

The 12-item Confidence to Critically Read English questionnaire (CCRE) was re-structured and modified from Shelton-Strong and Mynard's (2018) 'Confidence Questionnaire'. Please see Appendix 2 for the items in the CCRE. Using the CCRE, participants reflected on their perceived level of confidence by responding to a set of questions related to self-confidence to critically read in English. There were a total of 12 items, all of which related to the statement: 'How confident am I'.

Both the questionnaires had a 4-point Likert scale (4 = Strongly Agree, 3 = Agree, 2 = Disagree, 1 = Strongly Disagree) that required the participants to select the option corresponding to their situations. To reduce the effort to understand each item, all the items in the questionnaires were presented in Chinese.

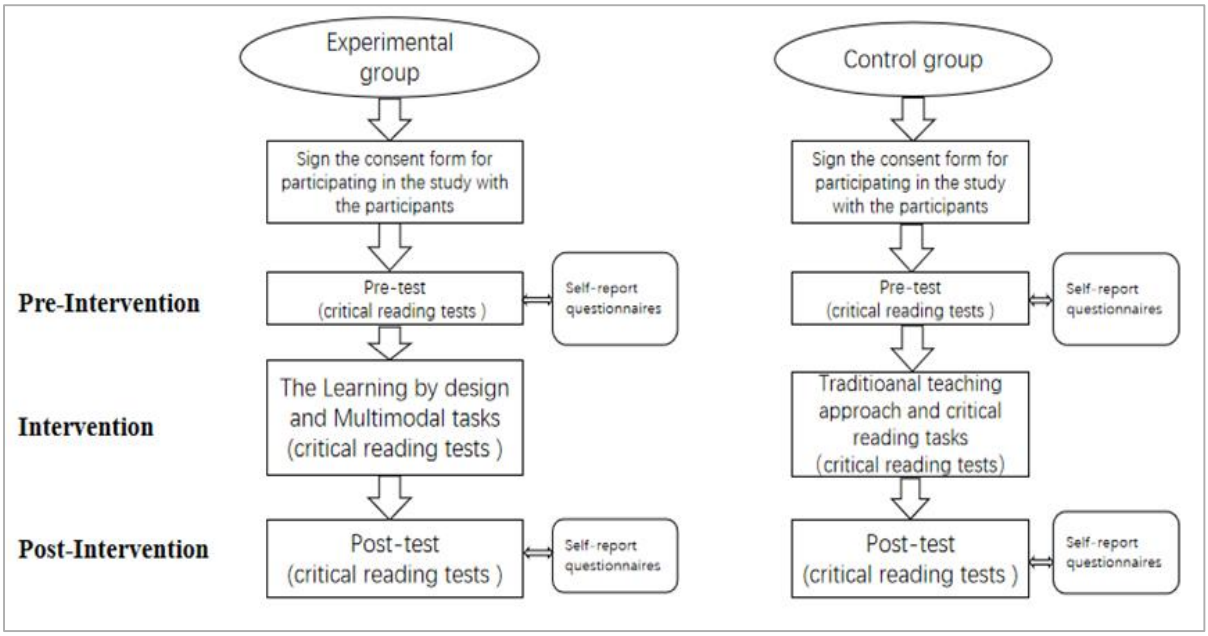
The MQ and the CCRE questionnaires were validated by two experts. The researcher prepared a content validity form for each item found in the instrument by using a four-point Likert scale that starts from 4 (strongly agree) to 1 (strongly disagree). The Kappa Cohen statistics was also used towards calculating the agreement between raters (inter rater agreement). An open-ended section was also provided for additional comments and suggestions the experts may have had (Özönder, 2015). The experts were Mrs Zhao (eight years teaching experience) and Mrs Li (ten years teaching expedience). For the MQ, the Cohen's kappa score for inter-rater reliability was calculated to be 0.77. For the CCRE, the Cohen's kappa score for inter-rater reliability was calculated to be 0.75. The kappa scores suggested that the experts' ratings were highly consistent, with minimal discrepancies in their evaluations.

Data collection procedures

The data collection procedure was divided into three sequential stages: pre-intervention, intervention and post-intervention (please refer to Figure 3 for a diagrammatical representation). Participants signed the necessary consent and assent forms before the research commenced.

Figure 3

Data Collection Procedures



The participants in both the multimodal tasks integrated instruction groups (experimental groups) and the non-multimodal tasks integrated instruction groups (control groups) completed the pre-test and the self-report questionnaires (the MQ and CCRE) before intervention stage. The pre-test was to determine that all groups were equivalent in terms of their critical reading ability, motivation and confidence. In addition, the pre-test scores were also used as a baseline data for comparison with the subsequently acquired test scores. All tests were administered in the form of 'pen and paper' type of tests.

The intervention of this research was the integration of multimodal tasks to the teaching of critical reading. The participants in the experimental groups were taught critical reading through the Learning by Design Framework and they were assigned the multimodal tasks. On the other hand, the participants in the control groups did not receive any treatment. They were taught critical reading in the conventional approach and were assigned reading tasks according to what was required in the textbook.

After the intervention, participants from both the experimental and control groups completed the post-test and the self-report questionnaires (the MQ and the CCRE). All tests were administered in the form of 'pen and paper' type of tests.

Ethical compliance in research is considered as a prerequisite for achieving the quality and integrity of a research work (Bryman, 2016; Stutchbury & Fox, 2009). Since the participants were under 18 years old, a consent form were provided to the parents of both the experimental and control groups. An assent form were also filled up by each of the students who participated. The consent and assent forms were kept with the researcher in a safe locker under lock and key. Confidentiality will be guaranteed.

Findings and discussions

Analysis of the scores before the intervention

The scores of the participants in the experimental groups and the control groups were analysed to measure the similarity or dissimilarity of the critical reading ability scores, motivation to learn and reading confidence before the intervention began. Both descriptive and inferential statistics were used for the analysis. All statistical tests were conducted on the SPSS version 27.

The Independent Samples *t*-Test in Table 3 showed that on the pre-tests there were no statistically significant differences between the multimodal task groups (experimental groups) and non-multimodal groups (control groups) of participants at the $p<0.05$ level (Sig. =. 737). In other words, all groups were equivalent in terms of their critical reading ability level before receiving the intervention.

Table 3

The Comparison of Pre-Test Scores

Group	N	Mean （X）	Std. Deviation	Std. Error Mean	t	Sig. (2-tailed)
Experimental group	80	41.79	2.637	.295		
Control group	80	41.93	2.534	.283	-.336	.737

Note. p<0.05

Table 4 also revealed the average pre-reading motivation scores of the experimental group and control group participants were 26.05 and 25.85 respectively. The mean scores of the experimental and control groups were compared using the Independent Sample t-Test. The result indicated that there was no significant difference between the groups at the $p<0.05$ level (sig.= .355). This indicated that that the participants in the two groups were roughly equivalent in terms of their motivation to learn before the start of the intervention.

Table 4

The Comparison of Motivation (MQ) Scores

Group	N	Mean （X）	Std. Deviation	Std. Error Mean	t	Sig. (2-tailed)
Experimental group	80	26.05	1.231	1.231	.927	.355
Control group	80	25.85	1.484	1.485		

Note. p<0.05

Table 5 also revealed the average pre-reading confidence scores of the experimental group and control group participants were 25.70 and 25.78 respectively. The result from the Independent Sample t-Test indicated that there was no significant difference between the two groups at $p<0.05$ level (sig.= .850), meaning that the participants in the two groups were also equivalent in terms of their reading confidence before the intervention.

Table 5

The Comparison of Reading Confidence (CCRE) Scores

Group	N	Mean （X）	Std. Deviation	Std. Error Mean	t	Sig. (2-tailed)
Experimental group	80	25.70	2.523	.282	-.189	.850
Control group	80	25.78	2.490	.278		

Note. p<0.05

Analysis of the Scores after the Intervention

Research Question 1 Will the experimental group of rural senior high school students have a statistically significantly higher critical reading ability scores compared to the control group of rural senior high school students after the use of multimodal tasks?

The post-test scores of the participants in the two groups were analyzed using both descriptive and inferential statistics (Independent sample *t*-Test). The results in Table 6 showed that the average score of the experimental group was higher, at 64.54, while the average score of control group was 62.63 (out of 100). The result of the inferential statistical analysis suggested that the difference between the post-test scores of two groups were significant at the $p<0.05$ level (sig.= .011). This indicated that the participants in the experimental groups performed better than those in the control groups in the critical reading ability post-test at a significant level.

Table 6

The Comparison of Post-Test Scores

Group	N	Mean （X）	Std. Deviation	Std. Error Mean	t	Sig. (2-tailed)
Experimental group	80	64.54	4.37	.48	2.562	.011
Control group	80	62.63	5.04	.56		

Note. p<0.05

While there a significant difference in the scores between the experimental and control group, it is also necessary to determine if the results are of practical significance to be meaningful in the real world (Lipsey et al, 2012). Statistical significance is denoted by p values, whereas practical significance is represented by effect sizes. In the context of a research, the term 'statistical significance' means that the results are not caused by random variations in the data, but rather by the independent variables or interventions. Cohen's *d* is a type of effect size between two means of equal group sizes to determine the practical significance of a research outcome.

The Paired *t*-test on the critical reading ability scores was conducted between the experimental group and control group within the pre-test and within the post-test (see Table 7). With regard to practical significance tests, small effect sizes were found between the experimental group and control group within pretest, while moderate effect sizes were found between experimental group and control group within posttest. For example, a small effect size was found between the experimental group and control group within pretest on the critical reading ability scores (*d*=0.10), while moderate (medium) effect sizes were found between the experimental group and control group within the post-test on the critical reading ability scores (*d*=0.41). The results of the effect size suggested desired effects and a moderate practical significance of the intervention.

Table 7

The Paired *t*-test Results on Critical Reading Ability Scores

Paired *t*-test		Pre-test		Post-test	
		Experimental group n=80	Control group n=80	Experimental group n=80	Control group n=80
Critical reading ability scores achievement	Means	41.79	41.93	64.54	62.63
	SD	2.64	2.53	4.37	5.04
	t-value	-0.34		2.56	
	p-value	0.74		＜0.05	
	Cohen's *d*	0.10		0.41	

Note. p<0.05

The results of descriptive and inferential statistical analysis of pre-test and post-test scores indicated that multimodal tasks had a significant positive effect on improving students' critical reading ability. The findings showed that the multimodal task groups of students and non-multimodal task groups of students had similar scores on critical reading ability scores on the pretest; however, after the intervention, the multimodal task groups of students displayed statistically significant higher scores on their critical reading ability scores when compared to the non-multimodal task groups of students. In conclusion, the findings supported the hypothesis for research question one indicating there was statistically significant difference on the critical reading ability scores between the multimodal task groups of students (*n*=80) and the non-multimodal task groups of students (*n*=80).

Research Question 2 Will the experimental group of rural senior high school students have a statistically significantly better motivation compared to the control group of rural senior high school students after the use of multimodal tasks?

The post-MQ scores of the participants in the two groups were analyzed using the independent sample t-Test. The results in Table 8 showed that the average score of the experimental group was higher, at 65.64, while the average score of control group was 64.98 (out of 80). The result of the inferential statistical analysis suggested that the difference between the post-MQ scores of two groups was significant at $p<0.05$ level (sig.= .031). This indicated that the participants in the experimental group has a higher level of motivation than those in the control group in the learning motivation at a significant level.

Table 8

The Comparison of Post-MQ Scores

Group	N	Mean （X）	Std. Deviation	Std. Error Mean	t	Sig. (2-tailed)
Experimental group	80	65.64	2.01	.225	2.171	.031
Control group	80	64.98	1.84	.206		

Note. p<0.05

In conclusion, the findings supported the hypothesis for research question two indicating that there was statistically significant difference on the learning motivation scores between the experimental group (n=80) and the control group (n=80). The findings showed that the multimodal task groups of students and non-multimodal task groups of students had similar scores on critical reading motivation scores on the pretest; however, after the intervention, the multimodal task groups of students displayed statistically significant higher scores on their learning motivation scores when compared to the non-multimodal task groups of students.

Research Question 3 Will the experimental group of rural senior high school students have a statistically significantly greater reading confidence compared to the control group of rural senior high school students after the use of multimodal tasks?

The post-CCRE scores of the participants in the two groups were analyzed using the independent sample t-Test. The results in Table 9 showed that the mean of the experimental groups were higher, at 39.39, while the mean of control groups were 38.83. The result of the inferential statistical analysis suggested that the difference between the post-CCRE scores of two groups was significant at $p<0.05$ level (sig.= .012). This indicated that the participants in the experimental group has a higher level of confidence than those in the control group in the reading confidence at a significant level.

Table 9

The Comparison of Post-CCRE Scores

Group	N	Mean （X）	Std. Deviation	Std. Error Mean	t	Sig. (2-tailed)
Experimental group	80	39.39	1.479	.165	2.533	.012
Control group	80	38.83	1.257	.141		

Note. p<0.05

In conclusion, the findings supported the hypothesis for research question three indicating that there was statistically significant difference on reading confidence between the experimental groups (n=80) and the control groups (n=80). The findings showed that the multimodal task groups of students and non-multimodal task groups of students had similar scores on reading confidence on the pre-test; however, after the intervention, the multimodal task groups of students displayed statistically significant higher scores on their reading confidence when compared to the non-multimodal task groups of students.

This study found that multimodal tasks have a positive impact on the critical reading ability, motivation and confidence of Chinese middle school students in Chasuqi, Inner Mongolia. The research results indicate that students who perform multimodal tasks significantly improve their critical reading abilities. In addition to

cultivating analytical thinking and critical reading skills, it is believed that multimodal tasks help to enhance their motivation to read critically and reading confidence.

Based on the results of this study, multimodal tasks can be incorporated into the development of English reading courses, as evidence suggests that multimodal learning can enable students to fully utilize their critical reading abilities（Varaporn & Sitthitikul, 2019). For teachers planning to integrate multimodality into practice, the following are some guidelines on the teaching significance of multimodality in English reading.

Firstly, teachers should make full use of existing multimodal symbol resources (videos, images, projectors, body language, etc.) and proficiently master the design techniques of multimodal PPT courseware. Utilizing various modal symbol resources flexibly does not only attract students' attention and stimulate their initiative but also stimulate teachers' teaching enthusiasm (Amalia, et al, 2021)

Secondly, in order to adapt to the frequent and diverse multimodal teaching interactions in the classroom, teachers should prepare students for active interactions before, during, and after class (Al Roomy, 2022) At the same time, teachers should be good supervisors and facilitate interactions between students. Good multi-angle and multi-directional interaction can provide a harmonious learning atmosphere for critical reading teaching and pave the way for improving teaching effectiveness (Amos & Abas, 2021).

Thirdly, in order to adapt to the favorable trends of advanced technology and high-speed information transmission in the new era, teachers should learn to effectively utilize online resources (Du, & Qian, 2022). Teaching resources should not be limited to limited textbooks, but should try to combine multimodal critical reading teaching with online teaching (Du & Qian, 2022). The internet does not only provide rich and colorful teaching resources, but is also capable in transforming traditional teaching that cannot be repeated in a short period of time into multi-modal network teaching that is not limited by time.

Fourthly, under the multimodal critical reading teaching, teachers are no longer the leaders of the classroom, but should play the roles of organizers, designers, guides, helpers, and facilitators in teaching activities (Velásquez, 2016). During and after the teaching process, teachers should conduct their own reflection and summary. By adopting the Learning by Design framework, teachers gradually scaffold students onto each knowledge process so that students know how to they can create and achieve a multimodal tasks.

Conclusions and recommendations

This study reveals some significant results of critical reading tests. However, it is important to acknowledge the limitations of this study in order to assist future researchers planning to use similar ideas and methods. This also paves the way for extending this research to any future studies. Firstly, this study was conducted among a small group of intact high school rural students. Participants are intact groups and not randomly selected, therefore, research on other student groups in a broader population should be conducted with caution. Secondly, this experimental study was conducted in a short period of time. Due to the focus of the study on the latter half of the course that requires critical reading skills, the intervention was implemented for only 8 weeks. Longer exposure to intervention measures should be provided to get stronger evidence and details related to research results.

Conflict of interest

The authors declare no conflicts of interest

Author contribution

Wang, Y. (corresponding author): Wang, Y conceived the interest of the study on multimodality. She saw the need for study with regards to improving critical reading among rural students. She then conceptualized the study, the study design, conducted data collection in difficult-to-access rural schools in inner Mongolia. She then performed the statistical analyses and subsequently drafted the manuscript.

Goh, P.S.C: Goh, P.S.C significantly assisted in re-fining the study design and helped developed the overall methodology for collection of data and its analyses. She also played a significant part in the multiple revisions of the manuscripts.

Tai, M.K: Tai, M.K contributed significantly to the reading of the final manuscript.

Data availability statement

The data that has been used is confidential

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Appendix 1

Motivation Questionnaire

No.	Items	Strongly	Agree	Disagree	Strongly disagree
1	I very frequently actively think about what I have learned in my critical reading class:	□	□	□	□
2	If critical reading were not taught in school, I would try to obtain lessons in critical reading somewhere else.	□	□	□	□
3	When I have a problem understanding something we are learning in critical reading class, I immediately ask the teacher for help.	□	□	□	□
4	When it comes to critical reading homework, I work very carefully, making sure I understand everything.	□	□	□	□
5	Considering how I study critical reading, I can honestly say that I really try to learn critical reading	□	□	□	□
6	If my teacher wanted someone to do an extra critical reading assignment, I would definitely volunteer.	□	□	□	□
7	After I get my critical reading assignment back, I always rewrite them, correcting my mistakes.	□	□	□	□
8	When I am in critical reading class, I volunteer answers as much as possible.	□	□	□	□
9	If there were a critical reading books, I would try to read it often.	□	□	□	□
10	When I meet a story that need to read critically, I read it critically.	□	□	□	□
11	During critical reading class, I would like to have only critical reading.	□	□	□	□
12	If I had the opportunity to learn critical reading outside of school, I would earn critical reading most of the time.	□	□	□	□
13	Compared to my other courses, I like critical reading the most.	□	□	□	□
14	If there were a critical reading Club in my school, I would be most interested in joining.	□	□	□	□
15	If it were up to me whether or not to take critical reading, I would definitely take it.	□	□	□	□
16	I find studying critical reading very interesting.	□	□	□	□
17	If the opportunity arose and I knew enough critical reading, I would tell other classmates to read critically as often as possible.	□	□	□	□
18	Whenever I have the opportunity to read a critical book, I will definitely do so.	□	□	□	□
19	If there were critical reading competition in my school, I would join critical reading competition as much as possible.	□	□	□	□
20	If I had the opportunity and knew enough critical reading, I would read magazines and newspapers critically as often as I could.	□	□	□	□

Appendix 2

Confidence Questionnaire (CCRE)

No.	Items	Strongly agree	Agree	Disagree	Strongly disagree
1	Learning critical reading is easy for you.	□	□	□	□
2	Learning how to critical read is easy for you.	□	□	□	□
3	Critically understanding the things you read at school is easy for you.	□	□	□	□
4	It is easy for you to critical understand the sentences you read.	□	□	□	□
5	It is easy for you to remember what you read.	□	□	□	□
6	You like reading critically in class.	□	□	□	□
7	You like participating in critical reading even if you feel nervous.	□	□	□	□
8	You ask your teacher for help in your critical reading learning.	□	□	□	□
9	You ask for help if you do not understand something that you read.	□	□	□	□
10	It is OK to make mistakes when critical reading.	□	□	□	□
11	If you make mistakes when reading in the class, you feel embarrassed.	□	□	□	□
12	If you make a mistake, you are willing to continue learning critical reading.	□	□	□	□