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A PROPOSED INSTRUMENT TO INVESTIGATE UNIVERSITY STUDENTS' CRITICAL READING STRATEGY USE IN ENGLISH READING COMPREHENSION

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Abstract: This study introduces the Survey of Critical Reading Strategies (SOCRS), a newly developed instrument designed to assess university students' application of critical reading strategies in English reading comprehension. Conducted among EFL (English as a Foreign Language) students at a university in Vietnam, the study aimed to examine the reliability, validity, and practical relevance of the SOCRS, positioning it as a robust measure of critical reading strategy use. A total of 799 undergraduate students from diverse academic disciplines participated in the study. The reliability of SOCRS was confirmed through Cronbach's Alpha coefficients, yielding high internal consistency for all three subscales (α=0.85, 0.89, and 0.83) and an overall reliability of α=0.91. The construct validity of SOCRS was established using Exploratory Factor Analysis (EFA), which revealed a clear two-factor structure corresponding to the three stages of critical reading. The Kaiser-Meyer-Olkin (KMO) test (0.92) and Bartlett's Test of Sphericity ($p < 0.001$) confirmed the adequacy of the sample and the suitability of the factor structure. Additionally, normality assessments using Skewness, Kurtosis, Kolmogorov-Smirnov, and Shapiro-Wilk tests supported the appropriateness of the data for statistical analysis. The findings establish SOCRS as a psychometrically robust, reliable, and valid instrument for assessing EFL university students' critical reading strategies, offering a structured and multidimensional framework that captures students' strategic engagement with texts throughout all phases of reading. These results highlight its potential not only for diagnostic purposes but also for guiding targeted pedagogical interventions. The study recommends incorporating SOCRS into curricula and further research to strengthen critical reading instruction and foster higher-order thinking skills among EFL learners.

Keywords: critical reading strategies, reading comprehension, SOCRS, reliability, validity

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ĐỀ XUẤT MỘT CÔNG CỤ NGHIÊN CỨU VIỆC SỬ DỤNG CHIẾN LƯỢC ĐỌC PHẢN BIỆN TRONG ĐỌC HIỂU TIẾNG ANH CỦA SINH VIÊN ĐẠI HỌC

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Tóm tắt: Nghiên cứu này° đề xuất một công cụ mới (SOCRS), được thiết kế nhằm nghiên cứu việc áp dụng các chiến lược đọc phản biện của sinh viên đại học trong việc đọc hiểu tiếng Anh. Nghiên cứu được thực hiện đối với sinh viên EFL (học tiếng Anh như một ngoại ngữ) tại một trường đại học ở Việt Nam, với mục tiêu xác định độ tin cậy, tính hợp lệ và khả năng ứng dụng của SOCRS như một công cụ toàn diện để đo lường việc sử dụng chiến lược đọc phản biện. Tổng cộng có 799 sinh viên đại học từ nhiều ngành học khác nhau tham gia vào nghiên cứu. Độ tin cậy của SOCRS được xác định thông qua hệ số Cronbach's Alpha, cho thấy mức độ nhất quán nội tại cao đối với cả ba thang đo (các chiến lược trước, trong và sau khi đọc) (α=0.85, 0.89 và 0.83) và độ tin cậy tổng thể đạt α=0.91. Độ giá trị cấu trúc của SOCRS được kiểm chứng bằng Phân tích nhân tố khám phá (EFA), cho thấy một cấu trúc ba nhân tố rõ ràng tương ứng với ba giai đoạn của quá trình đọc phản biện. Đồng thời, kết quả kiểm định Kaiser-Meyer-Olkin (KMO= 0.92) và kiểm định Bartlett's ($p < 0.001$) xác nhận sự phù hợp của mẫu và tính hợp lệ của cấu trúc nhân tố. Ngoài ra, kết quả đánh giá độ chuẩn của dữ liệu thông qua Skewness, Kurtosis, Kolmogorov-Smirnov và Shapiro-Wilk cũng chứng minh sự phù hợp của dữ liệu trong phân tích thống kê. Kết quả nghiên cứu cho thấy SOCRS là một công cụ đáng tin cậy, có giá trị và phù hợp trong việc tìm hiểu về việc áp dụng các chiến lược đọc phản biện của sinh viên cùng những hỗ trợ sư phạm. SOCRS cung cấp một công cụ đánh giá có cấu trúc, đa chiều, giúp nắm bắt cách sinh viên tiếp cận văn bản với chiến lược phản biện ở tất cả các giai đoạn đọc. Nghiên cứu khuyến nghị tích hợp SOCRS vào chương trình giảng dạy và nghiên cứu học thuật nhằm nâng cao khả năng đọc phản biện cũng như thúc đẩy kỹ năng tư duy bậc cao của sinh viên.

Từ khóa: chiến lược đọc phản biện, đọc hiểu, SOCRS, độ tin cậy, độ giá trị

1. Introduction

Reading comprehension is a fundamental skill that plays a crucial role in academic success and lifelong learning. In an era characterized by an abundance of information and diverse sources, the ability to critically analyze and interpret texts has become increasingly essential. Therefore, critical reading is deemed pivotal for learners striving to become proficient readers (Rohmah, 2018). With regard to university students in English as a foreign language (EFL) context, the engagement as critical readers when navigating a variety of academic texts in their second language is required, aiming for both educational progress and academic achievement (Kurt Taşpınar & Çubukçu, 2020; Şahin & Han, 2020; Wallace & Wray, 2011). Research has shown that employing structured strategies can significantly improve learners' abilities to navigate complex texts, discern underlying arguments, and assess the credibility of information.

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Despite this recognition, there remains a notable gap in the availability of practical and validated instruments specifically designed to measure EFL students' use of critical reading strategies. Existing instruments often focus broadly on general reading strategies rather than on the cognitive and metacognitive processes unique to critical reading, such as evaluating evidence, questioning assumptions, and detecting bias (Chou, 2011).

To address this gap, the present study proposes the development of a specialized instrument to investigate university students' use of critical reading strategies in English reading comprehension. This instrument aims to (1) provide researchers with a reliable and valid tool for assessing learners' critical reading strategy use in EFL contexts, and (2) offer practical insights for educators to design targeted instructional interventions to foster students' critical reading competence-ultimately contributing to improved academic literacy and learning outcomes.

2. Literature Review

2.1. Critical Reading

Critical reading has been widely explored in academic discourse, with various scholars offering distinct but complementary definitions that emphasize the importance of deeper engagement with texts. At its core, critical reading is a multifaceted cognitive process that extends beyond understanding the surface meaning of a text, requiring readers to engage actively with the content to analyze, interpret, and evaluate information (McWhorter, 2012). It involves questioning the author's intent, assessing the validity of arguments, and reflecting on the broader implications of the ideas presented.

Critical reading is also clearly defined as "a very high-level comprehension of written materials requiring interpretation and evaluation skills that enable readers to separate important from unimportant information, distinguishing between facts and opinions, and determine the writer's purpose and tone" (Pirozzi, 2003). In a very similar way, Wang and Gierl (2011) signified that critical reading could be conceptualized as the ability to think critically and make inference about a text by applying a questioning attitude, logical analysis and assessing its value.

In summary, the above definitions suggest that critical reading involves the ability to evaluate whether readers can justify their interpretations and demonstrate a deep understanding of the topic (Kurland, 2000; Wallace & Wray, 2011).

2.2. Critical Reading Strategies

Critical reading (CR) strategies encompass a range of deliberate techniques that readers employ to actively engage with texts, enhancing their ability to analyze, interpret, and evaluate information (Larkin, 2017). These strategies encourage readers to go beyond surface-level comprehension, fostering deeper understanding through questioning assumptions, identifying biases, recognizing rhetorical devices, and interpreting the cultural and ideological contexts of a text (Nasrollahi et al., 2015a; Le et al., 2022). The primary aim of these strategies is to cultivate critical thinking skills, equipping readers with the capacity to assess the validity of arguments and reflect on the implications of the presented information (Le et al., 2023).

The consistent use of CR strategies plays a crucial role in developing higher-order thinking skills such as inference-making, synthesis, evaluation, and reflection. Halpern (2014) emphasizes the significance of cognitive strategies in CR, including identifying causation, assessing probabilities, and evaluating evidence-processes that enhance comprehension and equip readers with the ability to make well-reasoned judgments and solve problems across various contexts (Le et al., 2021; Le et al., 2024).

Based on the literature, in this study, critical reading strategies in the EFL context are defined as deliberate and reflective techniques that enable learners to move beyond literal understanding, critically evaluate arguments, and recognize underlying assumptions and biases in English texts. These strategies foster higher-order thinking and support the development of both language proficiency and critical literacy.

2.3. Critical Reading Strategy Classifications

Over the years, scholars have proposed various classifications of critical reading strategies, emphasizing different cognitive and metacognitive processes.

One widely accepted framework divides critical reading strategies into pre-reading, while-reading, and after-reading stages (Khabiri & Pakzad, 2012; Nasrollahi et al., 2015b). Pre-reading strategies, such as setting a purpose for reading, planning for reading, previewing the text, predicting content, and identifying key ideas help readers activate prior knowledge and establish a context for understanding, anticipate content and establish reading goals (Tovani, 2000; Axelrod and Cooper, 2002; Carrigus, 2002).

While-reading strategies, including questioning, annotating, and recognizing textual structures, assist readers in constructing meaning and maintaining comprehension as they navigate the text (Axelrod & Cooper, 2002; LeMaster, 2011). In addition, Carrigus (2002) emphasizes distinguishing fact from opinion and recognizing biases to sharpen analytical skills.

The post-reading stage guiding readers in consolidating knowledge, drawing inferences, and critically assessing the text's implications (Linkon, 2008) emphasizes reflection, synthesis, and evaluation. Tovani (2000), Anuar and Sidhu (2017) highlight summarizing key points and reflecting on the reading as crucial for consolidating information and verifying understanding.

Other scholars propose alternative frameworks, focusing on skill levels rather than stages. For instance, Nasrollahi et al. (2015a) identify two primary skill levels: basic critical reading skills - such as identifying main ideas and understanding transitional signals, and higher-order skills like making inferences and evaluating materials. Similarly, Carrigus (2002) distinguishes between lower-order thinking skills and higher-order thinking skills, emphasizing the need for both foundational comprehension and deeper analytical engagement.

Khabiri and Pakzad (2012) suggest a hierarchical framework of critical reading proficiency, encompassing structural analysis, rhetoric analysis, social relevance, and holistic evaluation, each contributing to a comprehensive assessment of the text.

Taken together, the literature review suggests that while different classification systems each contributes valuable insights, the stage-based approach is particularly effective in promoting systematic, reflective, and adaptive critical reading. This study builds on this model, aiming to explore how the three-stage classification can be applied to develop students' critical reading skills more effectively.

2.4. Instruments to Investigate University Students' Reading Strategy Use in English Reading Comprehension

An overview of instruments used in investigating the application of critical reading strategies followed by the discussion of their reliability, validity, effectiveness, and applicability in diverse educational contexts is provided in the Appendix 1.

To begin with, self-report surveys, such as the Metacognitive Awareness of Reading Strategies Inventory (MARSI) (Mokhtari & Reichard, 2002) and the Survey of Reading

Strategies (SORS) (Sheorey & Mokhtari, 2001), are widely used to evaluate students' metacognitive awareness of reading strategies. These instruments categorize strategies into global, problem-solving, and support strategies, offering insights into how students regulate their reading processes. However, a major drawback of self-report surveys is their reliance on students' self-perception, which introduces the risk of social desirability bias and inaccurate reporting (Zhang et al., 2021). This means that students may either overestimate or underestimate their strategy use, leading to data that may not accurately reflect actual reading behaviors. Moreover, these surveys primarily assess what students believe they do, rather than capturing how they engage with texts in real-time, which significantly limits their ability to account for the complexities of critical reading.

In contrast, think-aloud protocols, a well-established method in reading strategy research (Pressley & Afflerbach, 1995), provide a more direct insight into students' cognitive processes. This method requires students to verbalize their thoughts while reading, making it highly effective in identifying strategies such as inferencing, questioning, and evaluating arguments. Indeed, studies employing this method (Akyel & Ercetin, 2009; Block, 1992) have demonstrated its usefulness in revealing implicit reading strategies that students may not consciously recognize. However, despite its advantages, think-aloud protocols have considerable limitations. First and foremost, they are time-consuming, require expert interpretation, and disrupt the natural reading flow, potentially altering how strategies are applied (Ericsson & Simon, 1993).

Similarly, standardized reading comprehension tests, such as the Watson-Glaser Critical Thinking Appraisal (WGCTA) (Watson & Glaser, 2002) and the Critical Reading Assessment (CRA) (Ennis & Weir, 1985), offer another approach to evaluating higher-order reading skills. These instruments assess abilities such as analyzing arguments, distinguishing facts from opinions, and drawing inferences. While they effectively measure reading outcomes, their primary limitation is that they focus on the final product of critical reading rather than the process itself (Facione, 1990). As a result, they do not provide insights into which strategies students use to engage with texts critically, making them less useful for instructional interventions aimed at improving reading comprehension.

Beyond traditional methods, advancements in technology have introduced new tools for assessing reading strategies. Eye-tracking technology, for example, has been used to examine real-time reading behaviors, such as fixation duration, regressions, and saccades (Rayner, 2009). Research has shown that proficient readers allocate attention differently, making eye-tracking an objective tool for understanding reading engagement and cognitive load (Miellet et al., 2013). However, despite its benefits, eye-tracking technology has significant drawbacks. Not only does it require specialized expertise, but it is also costly and technologically demanding, making it impractical for widespread use in educational settings (Hyönä, 2010). Additionally, while eye-tracking reveals where students focus their attention, it does not explain why they engage with specific textual elements, necessitating complementary qualitative methods. However, these methods predominantly focus on behavioral engagement metrics rather than directly measuring cognitive reading strategies, making them less effective for assessing critical reading development.

To summarize, while both traditional tools such as self-report surveys, comprehension tests, think-aloud protocols, or tests, and advancements in technology such as Eye-tracking technology have provided valuable insights into students' reading behaviors, they also present quite significant limitations. Therefore, it is in urgent need for a more comprehensive and

practical tool that captures both cognitive and metacognitive dimensions of critical reading. This prompted the author to design a more effective and comprehensive instrument to investigate the use of critical reading strategies by university students.

2.5. Reliability and Construct Validity in Critical Reading Strategy Instruments

Instruments developed to assess critical reading strategies must meet the basic psychometric requirements of reliability and construct validity to ensure that their findings are both trustworthy and theoretically sound.

2.5.1. Reliability

Reliability refers to the consistency and stability of an instrument in measuring a construct across different items and contexts. Among various forms of reliability, internal consistency is the most relevant for survey instruments. It is commonly assessed using Cronbach's Alpha (α), which evaluates how closely related a set of items are as a group. According to Nunnally and Bernstein (1994), a reliability coefficient of 0.70 or higher is generally acceptable, although higher thresholds are desirable in high-stakes research settings.

Instruments such as the Metacognitive Awareness of Reading Strategies Inventory (MARSI) (Mokhtari & Reichard, 2002) and the Survey of Reading Strategies (SORS) (Mokhtari & Sheorey, 2002) have demonstrated strong internal consistency, with Cronbach's Alpha values often exceeding 0.80. Reliability, in this context, provides essential evidence that the measured constructs are stable and not influenced by random error.

2.5.2. Construct Validity

Construct validity concerns whether an instrument accurately reflects the theoretical construct it is designed to measure (Messick, 1995; Cronbach & Meehl, 1955).

To assess construct validity, researchers often employ Exploratory Factor Analysis (EFA), which identifies the underlying factor structure of a set of observed variables. EFA helps determine whether the items in a questionnaire cluster into coherent factors that correspond to theoretical expectations (Fabrigar & Wegener, 2012). Before conducting EFA, data suitability must be confirmed using two standard tests:

- **The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy**, which evaluates the proportion of common variance among variables, and
- **Bartlett's Test of Sphericity**, which tests whether the correlation matrix is significantly different from an identity matrix (Hair et al., 2010).

These procedures have been widely used in the development and validation of reading strategy instruments. For example, the MARSI was validated using EFA, which revealed a three-factor structure consistent with the authors' theoretical model (Mokhtari & Reichard, 2002).

2.5.3. Implications for the Current Study

Given the success of previous instruments in validating reading strategies through factor analysis and reliability testing, the current study adopts similar procedures in the validation of the Survey of Critical Reading Strategies (SOCRS). Internal consistency is examined using Cronbach's Alpha to confirm the reliability of the scale and its subscales. Construct validity is explored through EFA, using KMO and Bartlett's Test to ensure the dataset is appropriate for factor extraction. These methods collectively provide strong empirical support for the instrument's psychometric soundness, aligning it with established practices in the field.

3. Methodology

3.1. Research Design

This study employed a quantitative research design to develop, validate, and assess the Survey of Critical Reading Strategies (SOCRS) as a reliable instrument for measuring university students' critical reading strategy use. The SOCRS consists of two parts:

- Part *One* was designed to gather the information about individual characteristics of the participants. It required the subjects to supply their ethnographic data, such as gender, age, time of English study, major, their self- assessment on English and English reading proficiency.

- Part *Two* included twenty statements appropriate to twenty different strategies categorized in three subscales applied in critical reading process: pre-reading, while-reading, and after-reading phases. The strategies were formulated based on existing theoretical frameworks of critical reading strategies (Mokhtari & Reichard, 2002; Wallace & Wray, 2011) and previous validated instruments such as the Metacognitive Awareness of Reading Strategies Inventory (MARSI) (Mokhtari & Reichard, 2002); the Survey of Reading Strategies (SORS) (Sheorey & Mokhtari, 2001) and others by Khabiri & Pakzad, 2012; Zhang & Wu, 2009; and Nasrollahi et al., 2015b. The content validity of the instrument was verified through expert evaluation, where two specialists in applied linguistics and reading comprehension reviewed the items for clarity, relevance, and theoretical alignment. Based on expert feedback, redundant or ambiguous items were eliminated, resulting in a final version with three subscales corresponding to the three phases of critical reading.

The Pre-reading stage which consists of four strategies helps readers approach a text thoughtfully and efficiently before diving into the actual reading process which sets the foundation for understanding and analyzing the material critically.

The While-reading Phase with 11 strategies focuses on readers' active engaging with the text to deepen understanding, analyze arguments, and make meaningful connections.

Finally, 5 After-reading strategies help readers consolidate understanding, evaluate the text's arguments, and reflect on its broader implications.

These strategy groups are linked, interact, and support each other, helping readers to be proactive and focused to achieve the highest reading efficiency (Appendix 2).

For each statement, five alternative choices were provided. Participants were asked to select one from among the followings: (1). for Never or almost never true of me; (2). for Usually not true of me; (3). for Somewhat true of me; (4). for Usually true of me; (5). for Always or almost true of me

The higher the number that respondents indicate applied to them, the more frequent the use of the particular strategy was reflected. The strategy statements were in both English and Vietnamese for students' better understanding (Appendix 3).

3.2. Research Questions

The study addresses the following research questions:

Question 1: Does the SOCRS demonstrate acceptable reliability for measuring university students' critical reading strategies?

Question 2: Does the SOCRS demonstrate construct validity that reflects the theoretical dimensions of critical reading strategies?

3.3. Procedures

The research was conducted in two distinct phases: a pilot study to test the initial instrument and a main study to establish its validity, reliability, and usability through advanced statistical analysis.

3.3.1. Phase 1: Pilot Testing

An initial version of the proposed instrument was developed based on an extensive review of relevant literature and existing frameworks on critical reading strategies (e.g., Wallace & Wray, 2011; Chou, 2011). The draft questionnaire consisted of 20 items covering key dimensions such as evaluating arguments, identifying author's purpose, detecting bias, and questioning assumptions.

To ensure content validity and clarity, the draft instrument was reviewed by two lecturers experienced in teaching English, especially in reading instruction. While they may not be formal researchers in the field of critical reading, their pedagogical expertise in teaching reading comprehension provides a valid basis for their role in the content validation process. Based on their feedback, several items were revised or removed to improve clarity and relevance.

The revised version was then pilot-tested with a group of 150 university EFL students. During this pilot phase, students completed the questionnaire online via Google Forms and were invited to share comments about any confusing or unclear items. Responses from the pilot were analyzed to identify items that needed further refinement and to assess preliminary reliability.

3.3.2. Phase 2: Main Data Collection

After final adjustments, the validated instrument was distributed to a larger sample of university students majoring in English and other disciplines. The survey was administered entirely online through Google Forms to facilitate accessibility and broader participation.

Students were recruited through class announcements, university mailing lists, and direct invitations. Before participating, students were informed about the purpose of the study, assured of the confidentiality of their responses, and told that participation was voluntary. Completing the questionnaire took approximately 20-30 minutes.

The data collected were carefully screened for incomplete responses and potential outliers before analysis. The final dataset was used to examine the reliability and validity of the instrument through statistical procedures such as reliability analysis (Cronbach's alpha), exploratory factor analysis (EFA), and confirmatory factor analysis (CFA).

3.4. Participants

To ensure the clarity, reliability, and initial construct validity of the newly developed Survey of Critical Reading Strategies (SOCRS), a pilot study was first conducted. A convenience sample of 150 undergraduate students from a university in Hanoi, Vietnam, participated in this stage. The sample consisted of 86 female and 64 male students, majoring in English, medicine, and administration.

Following the pilot study and subsequent revisions to the instrument, the finalized version of the SOCRS was administered to 802 students from the same university. The students were diverse in terms of gender, major, time length and experiences in English learning including English/English reading comprehension proficiency, etc. The participants aged from 20-22, majoring mostly in English, Economics, Technology, Medicine, and Administrating are

from the first to fourth year students. After the data cleansing process the number of valid participants was 799. All participants were enrolled in English as a Foreign Language (EFL) course, ensuring a consistent context for examining the utilization of critical reading strategies.

3.5. Data Analysis

The collected data were analyzed using SPSS (Statistical Package for the Social Sciences) version 22 to examine the validity, internal consistency, and factor structure of the SOCRS instrument. The analysis followed a two-stage validation process, including internal consistency (Cronbach's Alpha), assessment of normality (Skewness, Kurtosis, Kolmogorov-Smirnov, and Shapiro-Wilk tests), and exploratory factor analysis (KMO and Bartlett's Test).

Before conducting factor analysis, the normality of the data was assessed to ensure that the statistical assumptions for parametric testing were met. The normality of SOCRS data was evaluated using Skewness, Kurtosis, Kolmogorov-Smirnov (K-S) test, and Shapiro-Wilk test, which provide insights into the distribution of the responses across the pre-reading, while-reading, and after-reading strategies, supporting the assessment of reliability (Field, 2018).

4. Findings and Discussions

4.1. The Pilot Study

Cronbach's Alpha was used to check the reliability of the scale inside which indicates the degree of correlation among the variables in each strategy group. In other words, Cronbach's Alpha measures the internal consistency of the scale, where values above .70 are considered acceptable, and above .80 are excellent (Hair et al., 2010).

Table 1 below shows the figures for all three strategy groups.

Table 1

Cronbach's Alpha Scores for Strategy Groups

No.	Strategy groups	No. of Items	Cronbach's Alpha
1	Pre- reading strategies	4	.872
2	While-reading strategies	11	.925
3	After reading strategies	5	.890

The pre-reading stage serves as a crucial foundation for critical reading. The high reliability with Cronbach's Alpha at 0.872 showing good internal consistency indicates that using multiple pre-reading strategies in combination enhances comprehension.

While-reading stage has the highest reliability (Cronbach's Alpha at 0.925 indicating excellent internal consistency) suggesting that while-reading strategies form the backbone of critical reading. Strategies such as relating ideas within and between paragraphs, taking notes, monitoring comprehension, and making inferences are tightly interconnected. Readers who employ multiple strategies simultaneously tend to build a more comprehensive understanding of the text.

Lastly, after-reading strategies help consolidate understanding and encourage deeper reflection. The strong reliability with Cronbach's Alpha at 0.890 indicates that these strategies complement each other well in promoting critical thinking.

The data for each strategy in each group is shown in Table 2.

Table 2

Cronbach's Alpha Scores for Each Item of Critical Reading Strategies

No.	Statements	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
I	**Pre-reading**				
1	I determine the aim of my reading.	10.110	8.654	.722	.838
2	I preview the text by focusing on headings, pictures, clauses, phrases, and words (in bold) to accustom generally.	10.117	7.674	.788	.810
3	I pay attention to the generic structures and the language features of the text.	10.366	8.942	.677	.854
4	I predict the content of the text from the heading and subheadings.	9.979	8.298	.720	.838
II	**While-reading**				
1	I divide the text passage to meaningful parts.	33.317	71.940	.713	.918
2	I guess the meaning of words or sentences based on information available.	32.752	72.480	.706	.918
3	I check the odd words, phrases, clauses in dictionary or ask from teacher.	32.579	74.843	.574	.924
4	I relate the ideas and concepts within a paragraph.	33.028	71.208	.774	.915
5	I relate the ideas and concepts between paragraphs.	33.034	71.547	.790	.914
6	I write some notes and connect the information from the text I read to my prior knowledge or experience.	33.179	72.037	.737	.917
7	I take notes of the main points, synonyms, antonyms, and so on.	33.207	73.290	.671	.920
8	I work out the meaning of the text by considering its historical, biographical, and cultural contexts.	33.317	74.718	.584	.924
9	I differentiate the relevant points from the irrelevant to comprehend the text more quickly.	33.297	72.974	.708	.918
10	I monitor my comprehension of the text.	33.138	72.745	.726	.917
11	I reread for better understanding.	32.807	72.310	.703	.918
III	**After reading**				
1	I find fact and opinion, cause and effect relationships, claim and support, premise and conclusion of the text.	11.786	13.989	.753	.861

2	I make a summary of the key points/main ideas of the text.	11.393	14.504	.694	.874
3	I ask questions about the content of the text.	11.634	14.317	.721	.869
4	I restate, paraphrase, analyze, interpret, and argue about the text.	11.690	13.702	.775	.856
5	I compare and contrast some related texts to know the similarities and differences among the texts to obtain a better reading comprehension.	11.731	13.948	.716	.870

The Cronbach's Alpha values in Pre-reading stage range from .810 to .854, indicating good internal consistency, which means the pre-reading items work well together. In the pre-reading stage, strategies such as previewing the text (Pre-reading 2) and determining the aim (Pre-reading 1) are particularly effective for setting expectations and providing context. Readers who take time to scan headings and bolded words develop a clearer sense of the text's structure, making comprehension easier. The slightly lower correlation of Pre-reading 3 (Paying attention to generic structures) indicates that focusing on the text's structural features may not be as impactful as forming predictions or setting goals. Strategies in this phase work well together to help readers activate prior knowledge and mentally prepare for the text.

Obviously, while-reading strategies play a pivotal role in maintaining engagement with the text. It can be seen from the table that While-reading 5 (Relating ideas between paragraphs) has the strongest item-total correlation at .790, suggesting that understanding connections across paragraphs is crucial for deeper comprehension. In addition, While-reading 4 (Relating ideas within paragraphs) and While-reading 6 (Connecting information to prior knowledge) also show strong correlations of .774 and .737, respectively, emphasizing the value of linking new ideas to existing knowledge. Thus, these strategies stand out as particularly beneficial. The high internal consistency suggests that these strategies are tightly interconnected and collectively contribute to a coherent reading approach. Readers who employ multiple strategies simultaneously tend to build a more comprehensive understanding of the text.

After-reading strategies are essential for reinforcing comprehension and developing critical insights. Same as the results in the previous 2 stages, Cronbach's Alpha for this stage ranges from .856 to .874, showing strong internal consistency among after-reading strategies. Restating and analyzing the text appears to be the most impactful technique, helping readers solidify their understanding and engage with the text more deeply (the highest correlation at .775). After-reading 1 (Identifying fact vs. opinion, cause/effect) also scores highly at .753, pointing to the value of distinguishing between different types of information post-reading and After-reading 2 (Summarizing key points) has a slightly lower correlation at .694, implying that while summarizing is important, it may not contribute as much to overall critical comprehension as analyzing or comparing texts. The consistency across these items suggests that a combination of summarizing, questioning, and comparing texts is highly effective for enhancing reading comprehension.

Following the pilot study with 150 undergraduate students, the instrument was carefully reviewed and refined to enhance its clarity, validity, and reliability. An item that demonstrated slightly lower item-total correlations- Pre-reading 3 ("Paying attention to generic structures") was rephrased to improve comprehensibility and better capture students' actual reading strategies. Particularly, the wording of Pre-reading 3 was clarified by adding concrete examples of structural features (introduction, headings, conclusion) to help respondents better understand the intended meaning.

4.2. The Main Study

After collecting the data, a series of analyses based on SPSS 22 were conducted to assess the reliability and validity of the instrument measuring the use of pre-reading, while-reading, and after-reading strategies. These analyses included internal consistency (Cronbach's Alpha), assessment of normality (Skewness, Kurtosis, Kolmogorov-Smirnov, and Shapiro-Wilk tests), and exploratory factor analysis (KMO and Bartlett's Test).

4.2.1. Question 1: Does the SOCRS Demonstrate Acceptable Reliability for Measuring University Students' Critical Reading Strategies?

a. Internal Consistency (Cronbach's Alpha) Analysis

The internal consistency of the instrument evaluated using Cronbach's Alpha shown in Table 3 indicates excellent reliability with the overall Cronbach's Alpha of 0.91 (George & Mallery, 2003). Subscale reliabilities were also high with $\alpha = 0.85$, 0.89 and 0.83 for Pre-reading Strategies, While-reading strategies and After-reading strategies, respectively, showing strong internal consistency across all subscales.

Table 3

Internal Consistency (Cronbach's Alpha)

Subscale	Cronbach's Alpha	Interpretation
Pre-reading Strategies	0.85	Good
While-reading Strategies	0.89	Excellent
After-reading Strategies	0.83	Good
Overall	0.91	Excellent

In addition, the results from each item in the scale were analyzed to confirm the above preliminary findings.

The Pre-reading strategies scale consisted of four items, yielding a Cronbach's Alpha of 0.857, indicating good internal consistency. Corrected item-total correlations ranged from 0.677 to 0.745, with Pre-reading 2 showing the highest correlation (0.745), suggesting it aligns most closely with the overall scale. The "Cronbach's Alpha if Item Deleted" values ranged from 0.799 to 0.828, meaning that removing any item would slightly reduce reliability, confirming that all items contribute positively to the scale. Item-level details are presented in Table 4.

Table 4

Item-Total Statistics for Pre-Reading Strategies Scale

Item	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Pre-reading 1	0.701	0.818
Pre-reading 2	0.745	0.799
Pre-reading 3	0.677	0.828
Pre-reading 4	0.684	0.826

The While-reading strategies Scale comprised 11 items and demonstrated excellent internal consistency with a Cronbach's Alpha of 0.932. Corrected item-total correlations ranged from 0.652 to 0.782, with While-reading 4 and While-reading 5 having the strongest correlations (0.780 and 0.782, respectively). The "Cronbach's Alpha if Item Deleted" values ranged from 0.923 to 0.928, showing that removing any item would marginally reduce

reliability. The results indicate that the scale effectively measures the intended construct, with all items contributing meaningfully.

Table 5

Item-Total Statistics for While-Reading Strategies Scale

Item	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
While-reading 1	0.674	0.927
While-reading 2	0.743	0.924
While-reading 3	0.652	0.928
While-reading 4	0.780	0.923
While-reading 5	0.782	0.923
While-reading 6	0.751	0.924
While-reading 7	0.664	0.928
While-reading 8	0.677	0.927
While-reading 9	0.734	0.925
While-reading 10	0.737	0.925
While-reading 11	0.696	0.926

Regarding the After-reading strategies scale, which consists of five items, we can see a Cronbach's Alpha of 0.879, reflecting high internal consistency. Corrected item-total correlations ranged from 0.649 to 0.751, with After-reading 4 having the highest correlation (0.751), suggesting it is the most representative item. The "Cronbach's Alpha if Item Deleted" values ranged from 0.844 to 0.868, indicating that removing any item would slightly lower reliability. All items contributed positively to the scale, with no item warranting removal.

Table 6

Item-Total Statistics for After-Reading Strategies Scale

Item	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
After-Reading 1	0.705	0.855
After-Reading 2	0.649	0.868
After-Reading 3	0.744	0.845
After-Reading 4	0.751	0.844
After-Reading 5	0.709	0.854

The reliability analysis confirmed that the Pre-, While-, and After-Reading Strategy scales showed good to excellent internal consistency. The inclusion of all items is justified, as removing any would slightly reduce reliability across the three scales. These results reveal that the items collectively form reliable measures of the reading strategies under investigation.

The results values mentioned above exceed the 0.70 threshold suggested by Nunnally and Bernstein (1994), confirming that the SOCRS consistently measures students' critical reading strategies. The high Cronbach's Alpha values prove strong internal coherence among the items, meaning that the different strategy items within each subscale are measuring related aspects of critical reading. This reliability suggests that SOCRS can be reliably administered in diverse educational settings to capture students' strategic reading behaviors.

b. Assessment of Normality

Skewness values for all items across the three categories ranged from -0.727 to 0.533,

while Kurtosis values ranged from -0.987 to 0.533. These values fall within the commonly accepted range of -1 to +1 for both Skewness and Kurtosis, indicating that the data distribution was approximately normal (Hair et al., 2010). The slight negative Skew across most items suggests that participants tended to report slightly higher engagement with these reading strategies. Additionally, Kurtosis values close to zero indicate no extreme peaks or flatness, implying that the data was relatively balanced and free from outliers. Furthermore, the Kolmogorov-Smirnov (K-S) test and Shapiro-Wilk test showed statistically significant results ($p < 0.05$), which suggests deviations from a perfectly normal distribution. However, given the large sample size ($n = 799$), such deviations are expected, and previous research suggests that large samples tend to produce significant normality tests even with minor deviations (Ghasemi & Zahediasl, 2012).

This approximate normality in the data distribution plays a crucial role in ensuring the reliability of the scales. Since the items displayed balanced distributions, the high Cronbach's Alpha values (above 0.8 for each scale) are unlikely to be artificially inflated due to extreme Skewness or Kurtosis. Instead, these results support the conclusion that the pre-reading, while-reading, and after-reading strategies scales demonstrate genuine internal consistency and reliably measure the intended constructs. Therefore, the Skewness and Kurtosis analysis reinforces the validity of the reliability findings.

4.2.2. Question 2: Does the SOCRS Demonstrate Construct Validity That Reflects the Theoretical Dimensions of Critical Reading Strategies? Exploratory Factor Analysis (EFA) - KMO and Bartlett's Test

To examine the underlying structure of the scale and assess construct validity, Principal Component Analysis (PCA) with Varimax rotation was performed. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.961, exceeding the threshold of 0.6 (Kaiser, 1974) and indicating that the sample size was adequate for factor analysis. Bartlett's Test of Sphericity was also significant ($\chi^2 = 10900.864$, $df = 190$, $p < .001$), confirming the suitability of the correlation matrix for factor extraction (Bartlett, 1954). The communalities after extraction ranged from 0.487 to 0.725, indicating that each item shared a moderate to high proportion of variance with the extracted components. Notably, items such as After-Reading 4 (0.725) and After-Reading 5 (0.715) demonstrated the strongest alignment with the factors.

Considering Total Variance Explained, two components with eigenvalues greater than 1 were extracted, explaining 61.11% of the total variance. The first component accounted for 52.96% of the variance, while the second component accounted for 8.15%. According to Hair et al. (2010), a cumulative variance above 60% is considered acceptable for social sciences research, confirming that these two components adequately capture the majority of the variance in critical reading strategies.

The data given shows that the rotated component matrix revealed two distinct components:

- *Component 1:* Pre- and While-reading strategies - representing strategies used before and during the reading process to enhance comprehension (e.g., Pre-reading 2 = 0.758, While-reading 2 = 0.797).

- *Component 2:* After-reading strategies - reflecting strategies employed after reading to reinforce understanding (e.g., After-Reading 4 = 0.836, After-Reading 5 = 0.834).

The two-component structure aligns with established reading strategy models, confirming that pre-reading, while-reading, and after-reading strategies are distinct yet

interconnected processes (Block, 1986; Pressley & Afflerbach, 1995).

Following these results, Principal Component Analysis (PCA) with Varimax rotation was performed, confirming a two-factor solution aligning with the pre-reading/while-reading, and after-reading theoretical framework of critical reading strategies. The factor loadings were all above 0.50, supporting the construct validity of SOCRS (Hair et al., 2014).

In summary, the findings offer empirical support for the reliability and construct validity of the SOCRS in measuring university students' critical reading strategies. The high internal consistency, as indicated by Cronbach's Alpha coefficients, demonstrates acceptable measurement reliability, while the normality assessments confirm the suitability of the data for further statistical analyses. Additionally, the results of the KMO measure and Bartlett's Test provide evidence for the appropriateness of the scale's construct structure. Collectively, these outcomes suggest that the SOCRS represents a psychometrically sound instrument with potential utility for assessing students' strategic reading behaviors within educational research and practice. Nonetheless, further research involving diverse educational contexts and learner populations is recommended to enhance the generalizability and robustness of these findings.

5. A Recommended Application of SOCRS

The Survey of Critical Reading Strategies (SOCRS) offers a structured approach to assessing and enhancing students' critical reading skills in English as a Foreign Language (EFL) contexts. Its systematic framework allows teachers to evaluate students' strategy use across the three stages of reading- pre-reading, while-reading, and after-reading, and to design targeted instructional practices accordingly. Below is a suggested step-by-step guide to applying the SOCRS in educational settings, accompanied by practical activities.

Step 1. Administration:

- Pre-assessment: Teachers should administer the SOCRS at the start of a reading-focused course or module to gauge students' initial use of critical reading strategies (Talebi and Marzban, 2015).

- Delivery method: Depending on classroom resources, the survey can be delivered as a paper-based questionnaire or through digital platforms like Google Forms, making it adaptable to both in-person and online learning environments (Le et al., 2022).

- Timing: Teachers allow adequate time for completion, ensuring students can reflect on their reading habits without feeling rushed.

Step 2. Data Collection and Analysis:

- Scoring: Teachers should use a standardized scoring system to evaluate students' frequency of strategy use. Subscale scores for pre-reading, while-reading, and after-reading stages, as well as an overall score are recommended to be calculated.

- Interpreting Results: This stage helps identify students' strengths and weaknesses in each stage, allowing educators to tailor their instruction to address specific gaps (Nasrollahi et al., 2015b). For example, if students score low on while-reading strategies, interventions can focus on activities that promote active engagement with the text.

Step 3. Pedagogical Interventions:

Based on SOCRS results, instructors can implement some common targeted activities for each reading stage:

Pre-reading activities:

- Predicting content from headings and visual cues: Have students skim headings, subheadings, and visual elements (e.g., images, graphs) to predict the text's content and structure. This primes their cognitive framework for comprehension (Wallace & Wray, 2011).

- K-W-L chart: Use a "Know-Want to Know-Learned" chart to activate prior knowledge and set reading goals (Ogle, 1986).

While-reading Activities:

- Chunking and annotation: Encourage students to break the text into meaningful parts and annotate key points in the margins, aiding comprehension and retention (Carillo, 2019).

-Questioning the text: Implement reciprocal questioning, where students generate questions about the text while reading. This enhances engagement and critical thinking (LeMaster, 2011).

After-reading activities:

- Summarizing and synthesizing: Assign students to write a summary of the text, focusing on main ideas, arguments, and supporting evidence. This reinforces comprehension and helps synthesize information (Wexler et al., 2020).

- Comparative analysis: Have students compare the text with other related readings, identifying similarities and differences. This strengthens intertextual connections and promotes higher-order thinking (Le et al., 2023).

- Questioning: Let students ask about the text as much as possible. When readers actively question the text, they move beyond surface-level understanding, engaging in a dynamic process that sharpens their ability to interpret, evaluate, and synthesize information (Paul & Elder, 2008).

6. Conclusion

This study developed and validated the Survey of Critical Reading Strategies (SOCRS) as an instrument for assessing EFL university students' critical reading strategies in English reading comprehension. The findings provide empirical evidence of the instrument's reliability and construct validity, as demonstrated by high internal consistency and supportive factor analysis results. The SOCRS offers a structured and multidimensional framework that captures students' strategic engagement across different stages of reading, contributing to a deeper understanding of critical reading behaviors in the EFL context. While these results highlight the potential value of the SOCRS for both research and pedagogical purposes, further studies across diverse educational settings and student populations are recommended to confirm and extend its applicability. Future research may also explore how the use of critical reading strategies, as measured by the SOCRS, relates to reading comprehension outcomes and higher-order thinking skills. Overall, the SOCRS represents a step toward enhancing the assessment and teaching of critical reading strategies among EFL learners in Vietnamese universities and similar contexts.

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