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Critical digital literacy, digital epistemic beliefs, and teachers' instructional modeling of reasoning: Predictors of pre-service teachers' online evaluative reading literacy

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Abstract

Aim: Digital environments increasingly require pre-service teachers to evaluate conflicting and potentially unreliable information. However, limited empirical evidence explains how critical digital literacy, digital epistemic beliefs, and teachers' instructional modeling of reasoning collectively relate to online evaluative reading literacy. This study examined these three variables as predictors of pre-service teachers' online evaluative reading literacy, particularly their abilities to judge the validity of ideas, identify bias and fairness, assess authorial purpose and intent, and make value judgments.

Methodology: A descriptive-correlational research design was employed involving 227 fourth-year pre-service teachers from a private teacher education institution in Northern Mindanao, Philippines, selected through cluster random sampling. Data were collected using validated measures of the three predictor variables and an objective Online Evaluative Reading Literacy Assessment. Descriptive statistics and multiple regression analysis were used to examine the data.

Results: Findings revealed very high levels of critical digital literacy, digital epistemic beliefs, teachers' instructional modeling of reasoning, and online evaluative reading literacy, although judging the validity of ideas remained comparatively less developed. Multiple regression analysis showed that the three predictor variables collectively explained only 2.6% of the variance in online evaluative reading literacy ($R^2 = .026$). However, the overall regression model was not statistically significant, $F(3, 223) = 1.963$, $p = .120$. Furthermore, none of the three predictors individually demonstrated a statistically significant predictive relationship with online evaluative reading literacy.

Conclusion: Online evaluative reading literacy is a complex competence that cannot be sufficiently explained by the three variables examined in this study. These findings highlight the importance of strengthening teacher education programs through more direct instructional approaches that develop source-evaluation strategies, lateral reading, information corroboration, metacognitive regulation, and evidence-based reasoning. Integrating these competencies into teacher preparation may help equip future educators to critically evaluate digital information and make informed judgments in increasingly complex online environments.

Keywords: *critical digital literacy, digital epistemic beliefs, instructional modeling of reasoning, online evaluative reading literacy, pre-service teachers.*

INTRODUCTION

Digital technologies have expanded access to information and transformed how learners read, research, and participate in educational activities. Online readers encounter information across websites, digital publications, social media, and other platforms, where claims may differ in accuracy, credibility, evidence, and purpose. Reading in these environments therefore involves more than understanding a text: readers must evaluate sources, examine supporting evidence, recognize bias, consider authorial intentions, and make judgments based on corroborated information. The OECD (2021) identifies evaluating the quality and credibility of information across multiple sources as a central demand of contemporary reading. These demands have become more complex as generative artificial intelligence can produce realistic text and other synthetic media at scale. Such material may contain fabricated claims, fabricated sources, manipulated images, or convincing audio and video, making surface-level judgments increasingly unreliable (Chu-Ke & Dong, 2024; Hanley & Durumeric, 2024).

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The information environment is also shaped by algorithmic curation. Search engines and social platforms rank, recommend, and personalize content, influencing which claims and perspectives users encounter. Although these systems can make information easier to access, their curation may narrow exposure to diverse viewpoints and make the processes shaping visibility less apparent to users (Lazer et al., 2024; Reid, 2025). Consequently, digital citizenship requires more than responsible device use or online participation; it includes understanding how information is produced, selected, circulated, and monetized, as well as evaluating credibility, respecting rights, and participating ethically. UNESCO's (2024) Media and Information Literacy Curriculum explicitly connects these competencies with artificial intelligence, digital citizenship, and responses to misinformation and disinformation (UNESCO, 2024).

International developments in teacher education increasingly recognize that educators need the knowledge, skills, and values to address AI-related opportunities and risks in teaching and learning. UNESCO's AI Competency Framework for Teachers (Miao & Cukurova, 2024) emphasizes human-centered approaches, ethics, AI foundations and applications, AI pedagogy, and professional learning. Research with pre-service teachers also indicates that evaluating online information involves more than reaching a credibility judgment: learners must justify that judgment through evidence about authors, publishing venues, motives, evidence, and corroboration (Kulju et al., 2024). These developments are relevant to Philippine teacher education, where future teachers will need to select and create instructional resources, respond to synthetic and algorithmically circulated content, and model responsible information practices. The present study is situated in a teacher education institution in Northern Mindanao; its findings should therefore be interpreted as context-specific evidence rather than as representative of all Philippine pre-service teachers.

Online Evaluative Reading Literacy (OERL) in this study refers to the demonstrated ability to evaluate online information through four dimensions: Judging the Validity of Ideas, Identifying Bias and Fairness, Assessing the Author's Purpose and Intent, and Making Value Judgments. These dimensions involve examining claims and evidence, recognizing partial or unfair representations, determining the purpose of online content, and reaching reasoned conclusions. They reflect the evaluating process in Revised Bloom's Taxonomy (Anderson & Krathwohl, 2001).

Three variables were examined as potential predictors of OERL. Critical Digital Literacy concerns the critical evaluation of digital content and sources. Digital Epistemic Beliefs refer to beliefs about the nature of online knowledge, the reliability of sources, and the evidence required to justify claims. Teachers' Instructional Modeling of Reasoning concerns the extent to which pre-service teachers perceive their instructors as demonstrating and scaffolding reasoning processes. These constructs represent distinct cognitive, epistemic, and instructional dimensions that may be relevant to online information evaluation.

Prior research provides related but not interchangeable evidence. Studies of lateral-reading instruction show that explicit teaching can improve source-evaluation strategies (Breakstone et al., 2021; McGrew, 2024), while assessment research cautions that conventional measures may not reveal the reasoning processes learners use when evaluating live online sources (Breakstone et al., 2024). Research on internet-specific epistemic justifications examines how learners explain credibility judgments, whereas studies of pre-service teachers document continuing difficulty justifying those judgments with adequate evidence (Hämäläinen et al., 2021; Kulju et al., 2024). Research on scaffolding and instructional modeling, in turn, focuses on teaching practices and reading comprehension rather than the same performance-based OERL outcome (Teiku, 2022; Uçak & Kartal, 2023). These studies establish the relevance of the constructs but do not establish that self-reported digital literacy, epistemic beliefs, and perceived instructional modeling jointly predict performance across the four OERL dimensions. The present study addresses this specific gap by examining the three predictors together and assessing OERL through an objective, four-dimensional assessment among fourth-year pre-service teachers in one Philippine teacher education institution. It tests statistical prediction, not causal effects.

Review of Related Literature and Studies

This section presents the relevant literature and studies concerning Online Evaluative Reading Literacy (OERL), Critical Digital Literacy, Digital Epistemic Beliefs, and Teachers' Instructional Modeling of Reasoning. It discusses the importance of evaluating online information, the cognitive and epistemic processes involved in digital reading, and the instructional experiences that may support the development of evaluative reasoning. It also identifies research gaps that provide the basis for examining the predictive contributions of the three independent variables to the online evaluative reading literacy of pre-service teachers.

Online Evaluative Reading Literacy in the Digital Age

Research on online reading shows that digital environments require readers to coordinate comprehension with source evaluation, evidence checking, and comparison across texts. Studies of lateral reading emphasize that readers should investigate the source of a claim and consult independent sources rather than rely only on information presented on the original webpage (Breakstone et al., 2021; McGrew, 2024). This literature supports the relevance of Critical Digital Literacy to OERL. However, critical engagement with digital content as a reported disposition should be distinguished from demonstrated performance on evaluative reading tasks.

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Critical Digital Literacy and Reading

Critical Digital Literacy involves critically examining digital information by assessing the credibility, accuracy, relevance, and reliability of online sources. Beyond technical skills, it requires interpreting and evaluating digital content. Castellví et al. (2020) emphasized the importance of developing these competencies among pre-service teachers. Breakstone et al. (2024) highlighted the need to assess actual source-evaluation skills, while McGrew and Kohnen (2024) emphasized critical strategies for addressing online misinformation. Cognitive Flexibility Theory (Spiro et al., 1988) further explains how readers adapt their understanding when encountering complex information and competing perspectives. Thus, Critical Digital Literacy is relevant to OERL because both require readers to examine digital information critically rather than passively accept online claims.

Digital Epistemic Beliefs in Reading

Research on epistemic beliefs provides a complementary perspective. Beliefs about the certainty, structure, and justification of knowledge may shape whether readers accept claims based on authority, examine evidence, or seek corroboration (Hofer & Pintrich, 1997; Lee, 2018). Internet-specific epistemic judgments are especially relevant when information varies in quality and credibility (Hämäläinen et al., 2021). Nevertheless, holding evidence-oriented beliefs does not automatically establish that a reader can apply effective evaluation strategies in a performance task.

Teachers' Instructional Modeling of Reasoning

Instructional modeling offers a third perspective. Through scaffolding, guided participation, and observation, teachers may make reasoning processes more visible by demonstrating how to question claims, compare sources, assess evidence, and justify conclusions (Vygotsky, 1978; Bandura, 1977). Studies on reading strategies and lateral reading provide support for explicit instructional guidance (Teiku, 2022; Uçak & Kartal, 2023; McGrew, 2024). However, the present study measures pre-service teachers' perceptions of such instructional practices rather than directly observing classroom behavior or measuring the effectiveness of a particular intervention.

Gaps in Existing Literature

The literature establishes the relevance of critical digital engagement, epistemic beliefs, and instructional guidance to information evaluation. However, these constructs are often investigated separately or in relation to broader digital literacy, reading, or learning outcomes. Less attention has been given to examining their combined statistical contribution to performance-based OERL across the specific dimensions of validity, bias and fairness, authorial purpose and intent, and value judgment. A further limitation is the reliance in some studies on self-reported competencies, which may not reflect actual performance. To address these gaps, this study examines the three predictors in one multiple regression model and uses an objective 34-item assessment of OERL among fourth-year pre-service teachers in a Philippine teacher education institution. The study does not assume that the predictors cause OERL; it tests whether they significantly account for variation in the measured performance.

Theoretical Framework

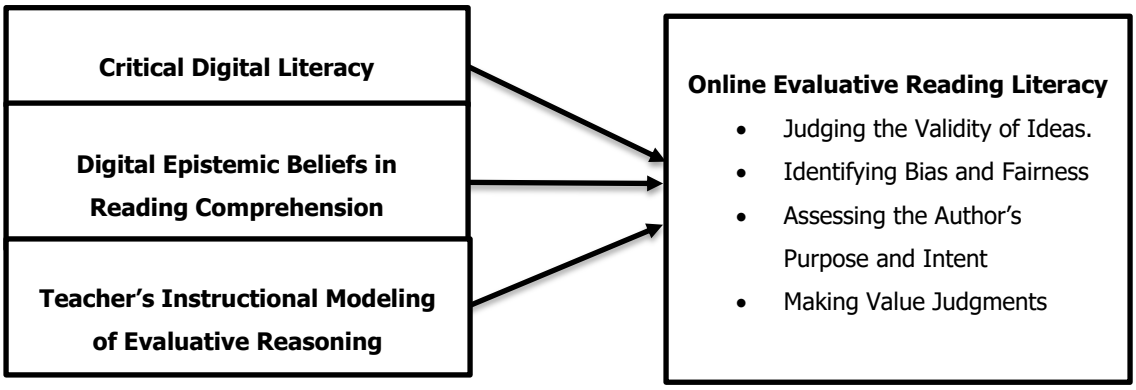


Figure 1
Schematic Presentation of the interplay of the variables of the study.

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The study is informed by five complementary perspectives. Revised Bloom's Taxonomy (Anderson & Krathwohl, 2001) serves as the overarching foundation because OERL requires the higher-order process of evaluating information against criteria and evidence. Cognitive Flexibility Theory (Spiro et al., 1988) provides a perspective on Critical Digital Literacy by explaining the need to consider multiple viewpoints and adjust interpretations when encountering complex or conflicting information. Personal Epistemology Theory (Hofer & Pintrich, 1997) supports the examination of Digital Epistemic Beliefs by explaining how beliefs about knowledge and justification shape the evaluation of claims.

Sociocultural Theory (Vygotsky, 1978) and Social Learning Theory (Bandura, 1977) inform Teachers' Instructional Modeling of Reasoning. The former emphasizes guided participation and scaffolding, while the latter explains how learners may acquire strategies through observing modeled behavior. Together, these perspectives provide a theoretical rationale for examining the three measured predictors in relation to OERL. The study tests selected variables associated with these theoretical perspectives; it does not empirically test the theories as complete systems.

Statement of the Problem

The increasing availability of digital information requires learners to evaluate online sources, examine claims, recognize bias, identify authorial intent, and make evidence-based judgments. These competencies are particularly important among pre-service teachers, who are expected to evaluate information critically and guide future learners in the responsible use of digital information. However, access to digital information does not necessarily ensure the ability to evaluate it effectively. Readers may encounter difficulties distinguishing credible sources, assessing supporting evidence, recognizing bias, and determining the intentions behind online content. Such difficulties may affect their ability to make informed judgments and engage critically with information in digital environments. This highlights the importance of examining Online Evaluative Reading Literacy (OERL) among future teachers.

Critical Digital Literacy, Digital Epistemic Beliefs, and Teachers' Instructional Modeling of Reasoning are potentially relevant factors associated with the development and demonstration of evaluative reading competencies. Nevertheless, their individual and combined predictive contributions to pre-service teachers' actual OERL performance require further empirical investigation. In particular, examining these variables together may provide evidence on whether they significantly account for differences in pre-service teachers' ability to evaluate online information. Addressing this concern is important for teacher education because the ability to critically assess digital information is relevant to both future instructional practice and the development of learners' responsible information-use competencies. Thus, this study examines Critical Digital Literacy, Digital Epistemic Beliefs, and Teachers' Instructional Modeling of Reasoning as predictors of Online Evaluative Reading Literacy among fourth-year pre-service teachers in a private teacher education institution in Northern Mindanao, Philippines.

Research Objectives

General Objective

The study aimed to determine whether Critical Digital Literacy, Digital Epistemic Beliefs, and Teachers' Instructional Modeling of Reasoning significantly predict the Online Evaluative Reading Literacy of fourth-year pre-service teachers in a private teacher education institution in Northern Mindanao, Philippines.

Specific Objectives

Specifically, the study sought:

1. To determine the level of Critical Digital Literacy of pre-service teachers.
2. To determine the level of Digital Epistemic Beliefs of pre-service teachers.
3. To determine the extent of Teachers' Instructional Modeling of Reasoning as assessed by pre-service teachers.
4. To determine the level of Online Evaluative Reading Literacy of pre-service teachers in terms of:
    - Judging the Validity of Ideas;
    - Identifying Bias and Fairness;
    - Assessing the Author's Purpose and Intent; and
    - Making Value Judgments.
5. To determine whether Critical Digital Literacy, Digital Epistemic Beliefs, and Teachers' Instructional Modeling of Reasoning significantly predict the Online Evaluative Reading Literacy of pre-service teachers.

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Research Questions

This study sought to answer the following questions:

1. What is the level of critical digital literacy of pre-service teachers?
2. What is the level of digital epistemic beliefs of pre-service teachers?
3. What is the extent of teachers' instructional modeling of reasoning as assessed by pre-service teachers?
4. What is the level of online evaluative reading literacy of pre-service teachers in terms of the following:
   - 4.1 Judging the validity of ideas;
   - 4.2 Identifying bias and fairness;
   - 4.3 Assessing the author's purpose and intent; and
   - 4.4 Making value judgments?
5. Do critical digital literacy, digital epistemic beliefs, and teachers' instructional modeling of reasoning significantly predict the online evaluative reading literacy of the pre-service teachers?

Hypotheses

The following null hypotheses were tested at the 0.05 level of significance:

H01: The overall multiple regression model involving Critical Digital Literacy, Digital Epistemic Beliefs, and Teachers' Instructional Modeling of Reasoning does not significantly predict the Online Evaluative Reading Literacy of pre-service teachers.

H02: Critical Digital Literacy does not significantly predict the Online Evaluative Reading Literacy of pre-service teachers when Digital Epistemic Beliefs and Teachers' Instructional Modeling of Reasoning are statistically controlled.

H03: Digital Epistemic Beliefs do not significantly predict the Online Evaluative Reading Literacy of pre-service teachers when Critical Digital Literacy and Teachers' Instructional Modeling of Reasoning are statistically controlled.

H04: Teachers' Instructional Modeling of Reasoning does not significantly predict the Online Evaluative Reading Literacy of pre-service teachers when Critical Digital Literacy and Digital Epistemic Beliefs are statistically controlled.

METHODOLOGY

Research Design

The study employed a quantitative descriptive-correlational research design to determine the levels of the identified variables and examine their predictive relationships. The descriptive component established the levels of Critical Digital Literacy, Digital Epistemic Beliefs, and Online Evaluative Reading Literacy, as well as the extent of Teachers' Instructional Modeling of Reasoning. The correlational-predictive component examined whether the three independent variables significantly predicted the respondents' OERL performance. This design was appropriate because the study examined relationships among existing variables without manipulating them or establishing causal effects.

Population and Sampling / Sources of Data

The respondents consisted of 227 fourth-year pre-service teachers enrolled in a private teacher education institution in Northern Mindanao, Philippines. The study population comprised approximately 524 students distributed across 11 class sections. The required sample size of 227 was determined using Taro Yamane's formula at a 0.05 margin of error. A one-stage cluster random sampling technique was employed, whereby the 11 class sections were assigned corresponding identifiers and five sections were randomly selected using a random selection tool. The selected sections had a combined enrolment of 241 students. All eligible students in these sections were invited to participate in the study. Participation was voluntary, and 227 students returned valid responses that were included in the final analysis. Students who were absent during the data-gathering period or did not submit responses were not included in the final dataset.

Instrumentation

The validity of the research instruments was established through expert evaluation and statistical examination. Before pilot testing and actual data collection, the proposed instruments were submitted to the panel members for content validation. Their comments and recommendations were used to improve the clarity, relevance, appropriateness, and alignment of the items with the intended constructs and research objectives. Revisions were subsequently incorporated into the instruments.

The study used four instruments: three five-point Likert questionnaires and one performance-based assessment. Critical Digital Literacy Questionnaire. This researcher-adapted questionnaire drew on the Cognitive Flexibility Inventory (Dennis & Vander Wal, 2010)

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and related literature (Castellví et al., 2020; Breakstone et al., 2024; McGrew & Kohnen, 2024). From the initial 15 items, seven were retained after content validation and CFA. It obtained a McDonald's omega of .853. Digital Epistemic Beliefs Questionnaire was adapted using the Epistemological Beliefs Survey (Wood & Kardash, 2002) and related literature (Hofer & Pintrich, 1997), the questionnaire initially contained 15 items, with six retained after validation and CFA. Its reliability coefficient was .870. Teachers' Instructional Modeling of Reasoning Questionnaire was adapted from Teiku (2022), this instrument initially contained 15 items, with eight retained after validation and CFA. It measured pre-service teachers' perceptions of teachers' reasoning-modeling practices and obtained a reliability coefficient of .887. Online Evaluative Reading Literacy (OERL). Researcher-developed and adapted from relevant OECD (2021, 2023), Wineburg et al. (2022), and Breakstone et al. (2024) materials, the assessment initially contained 40 items, with 34 retained after content review and pilot testing. The items covered four dimensions: Judging the Validity of Ideas (8 items), Identifying Bias and Fairness (10 items), Assessing the Author's Purpose and Intent (8 items), and Making Value Judgments (8 items). Each correct answer received one point, while incorrect or unanswered items received zero, producing a total score of 0–34.

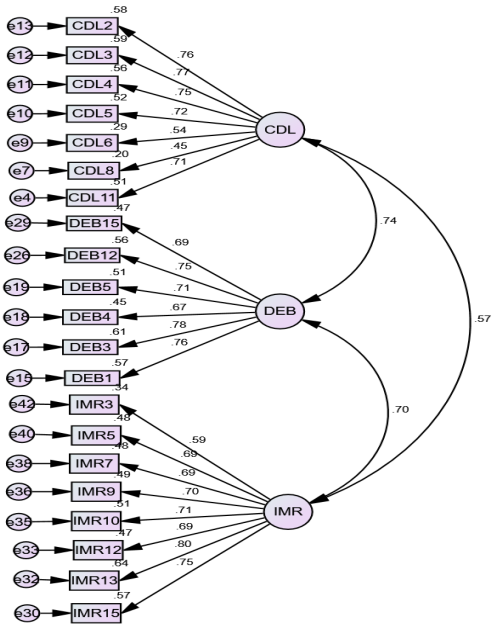


Figure 2
Confirmatory Factor Analysis (CFA) Best-fit Model of Critical Digital Literacy, Digital Epistemic Beliefs, and Instructional Modeling of Reasoning
Legend: CDL = Critical Digital Literacy, DEB = Digital Epistemic Beliefs, IMR = Instructional Modeling of Reasoning

Table 1
Model Fit Indices

Index	Estimate	Cut-off Criterion	Interpretation
Cmin/df	1.575	Between 0 and 3	Excellent
CFI	0.952	≥0.90	Excellent
SRMR	0.053	≤0.08	Excellent
RMSEA	0.050	<.08	Excellent
PClose	0.461	>0.05	Excellent

Note. Cmin/df = Minimum Discrepancy divided by Degrees of Freedom; CFI = Comparative Fit Index; SRMR = Standardized Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation; PClose = Probability of Close Fit. Source: Hu and Bentler (1999), "Cutoff Criteria for Fit Indexes in Covariance Structure Analysis

The CFA results demonstrated a good overall model fit, with all five indices meeting the reported criteria: CMIN/DF = 1.575, CFI = 0.952, SRMR = 0.053, RMSEA = 0.050, and PClose = 0.461. These findings indicate that the measurement model adequately

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represented the observed data. Thus, the retained indicators of Critical Digital Literacy, Digital Epistemic Beliefs, and Instructional Modeling of Reasoning were considered suitable for subsequent analyses.

Table 2

Reliability of the Retained Research Instrument Items

Variable	N	McDonald's Omega	Result
Critical Digital Literacy	7	0.853	Reliable
Digital Epistemic Beliefs	6	0.870	Reliable
Instructional Modeling of Reasoning	8	0.887	Reliable

To ensure the consistency of the data, reliability was evaluated using the McDonald's Omega. McDonald's omega was used to estimate internal consistency reliability, as omega provides a useful alternative to coefficient alpha when estimating the reliability of multidimensional/congeneric measures (Kalkbrenner, 2023; Shaw, 2022).

Data Collection Procedure

Institutional permission and ethical clearance (20262027317-CLB) were secured before the administration of the research instruments. The selected respondents were informed about the purpose, procedures, and voluntary nature of the study. Informed consent was obtained before data collection. The questionnaires and Online Evaluative Reading Literacy Assessment were administered in person at one of the private teaching institutions during September 2026. The instruments were administered in the following sequence: Critical Digital Literacy, Digital Epistemic Beliefs, and Teachers' Instructional Modeling of Reasoning were administered, followed by the Online Evaluative Reading Literacy (OERL). Respondents were given enough time to complete the instruments. Completed responses were collected, reviewed for completeness, and prepared for data processing and statistical analysis. Participation remained voluntary, and respondents were informed of their right to withdraw without penalty.

Data Analysis

Descriptive statistics, particularly the mean and standard deviation, were used to determine the levels of Critical Digital Literacy, Digital Epistemic Beliefs, and Online Evaluative Reading Literacy, as well as the extent of Teachers' Instructional Modeling of Reasoning, in addressing Research Questions 1–4. Questionnaire scores were interpreted using the corresponding Likert scale ranges and verbal interpretations established for each instrument. The Online Evaluative Reading Literacy (OERL) was scored based on the number of correct responses, with one point assigned to each correct answer and zero points assigned to incorrect or unanswered items. The resulting scores were summarized according to the four dimensions of OERL and the overall assessment score.

For Research Question 5, multiple regression analysis was employed to determine whether Critical Digital Literacy, Digital Epistemic Beliefs, and Teachers' Instructional Modeling of Reasoning, taken together, significantly predicted the Online Evaluative Reading Literacy of pre- service teachers. Prior to conducting multiple regression analysis, diagnostic procedures were considered to assess the assumptions underlying the statistical technique. Multicollinearity was examined using tolerance and Variance Inflation Factor (VIF) values. The normality of residuals was assessed using the Shapiro–Wilk test and the Q–Q plot. The regression analysis examined the individual and combined predictive contributions of Critical Digital Literacy, Digital Epistemic Beliefs, and Teachers' Instructional Modeling of Reasoning to Online Evaluative Reading Literacy. The overall model was evaluated using the F-test, while the individual contributions were assessed through regression coefficients, t-values, and significance levels. The coefficient of determination (R^2) and adjusted R^2 were also examined to determine the proportion of variance explained by the predictors. Statistical significance was set at the .05 level.

Ethical Considerations

The questionnaires and assessment materials were distributed personally to the selected respondents in their respective classrooms and collected after completion. The researcher ensured that the data collection environment was safe, comfortable, and conducive to privacy. Appropriate measures were also implemented to prevent coercion and potential conflicts of interest. All responses were anonymized and stored in encrypted devices accessible only to authorized individuals. The collected data were used exclusively for research purposes and prepared for appropriate statistical analysis. These measures were guided by ethical research and data protection practices (BERA, 2018; Pina et al., 2024).

The study adhered to the three ethical principles of the Belmont Report (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979):

Respect for Persons. Respondents were fully informed about the study and voluntarily provided consent, with their privacy, confidentiality, and autonomy protected throughout the research process.

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Beneficence. The researcher minimized potential risks and ensured that participation would not cause unnecessary discomfort or disrupt the respondents' academic responsibilities.

Justice. Cluster random sampling was employed to ensure fair participant selection and equal treatment among eligible pre-service teachers.

To further protect respondents' information, only necessary data were collected, and identifiable information was anonymized. Digital records were encrypted, while physical documents were kept in secured storage accessible only to authorized individuals. Research data were retained for five years in accordance with institutional guidelines and were securely disposed of after the retention period through permanent deletion of digital files and shredding of physical documents. Overall, the data gathering and management procedures upheld ethical research standards, protected respondents' rights, and ensured the integrity and credibility of the study.

RESULTS AND DISCUSSION

Problem 1. What is the level of critical digital literacy of pre-service teachers?

Table 3.1
Descriptive Statistics of the Respondents' Critical Digital Literacy

Score Range	Description	Interpretation	Frequency	Percentage
4.51 – 5.00	Strongly Agree	Very High	138	60.79
3.51 – 4.50	Agree	High	78	34.36
2.51 – 3.50	Neither Agree or Disagree	Moderate	10	4.41
1.51 – 2.50	Disagree	Low	1	0.44
1.00 – 1.50	Strongly Disagree	Very Low	0	0.00
		Total	**227**	**100.00**
		Mean	**4.52**	
		SD	**0.48**	
		Interpretation	**Very High**	

Table 3.1 shows that pre-service teachers demonstrated a Very High level of Critical Digital Literacy (M = 4.52, SD = 0.48). Of 227 respondents, 138 (60.79%) were classified as Very High, 78 (34.36%) as High, 10 (4.41%) as Moderate, and one (0.44%) as Low; none were Very Low. The results indicate that the respondents had a positive evaluation of their own role as active evaluators of Internet content, particularly when it comes to checking the source identity, evidence, and currency.

Table 3.2
Item-Level Descriptive Statistics for Critical Digital Literacy

Indicator	Mean	SD	Description
1. I examine the author's qualifications or background before trusting online content.	4.51	0.70	Strongly Agree
2. I verify if online information comes from an official or trusted organization.	4.69	0.58	Strongly Agree
3. I check the publication date of online sources to confirm that the information is updated.	4.56	0.67	Strongly Agree
4. I evaluate whether a website provides references or evidence to support its claims.	4.60	0.63	Strongly Agree
5. I identify biased language in online articles, posts, or videos.	4.32	0.70	Agree
6. I detect fake news or misinformation through careful reading.	4.49	0.63	Agree
7. I cross-check information using reliable academic or government websites.	4.44	0.74	Agree

Table 3.2 presents the highest item mean concerned which is checking whether information came from an official or trusted organization (M = 4.69, SD = 0.58), whereas identifying biased language had the lowest mean (M = 4.32, SD = 0.70). The relatively lower ratings for bias recognition and cross-checking indicate that explicit practice is warranted for these skills, among others, such as comparing different accounts, exploring sources beyond the original webpage, and providing evidence to support credibility judgements (McGrew, 2024; McGrew & Breakstone, 2023; Trixa & Kaspar, 2024).

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Problem 2. What is the level of digital epistemic beliefs of pre-service teachers?

Table 4.1
Descriptive Statistics of the Respondents' Digital Epistemic Beliefs

Score Range	Description	Interpretation	Frequency	Percentage
4.51 – 5.00	Strongly Agree	Very High	125	55.07
3.51 – 4.50	Agree	High	94	41.41
2.51 – 3.50	Neither Agree or Disagree	Moderate	8	3.52
1.51 – 2.50	Disagree	Low	0	0.00
1.00 – 1.50	Strongly Disagree	Very Low	0	0.00
		Total	**227**	**100.00**
		Mean	**4.52**	
		SD	**0.48**	
		Interpretation	**Very High**	

Table 4.1 shows that pre-service teachers demonstrated a Very High level of Digital Epistemic Beliefs (M = 4.52, SD = 0.48). Of 227 respondents, 125 (55.07%) were classified as Very High, 94 (41.41%) as High, and eight (3.52%) as Moderate; none were classified as Low or Very Low. This pattern suggests that respondents generally endorsed questioning online claims and using evidence or multiple sources to justify knowledge.

Table 4.2
Item-Level Descriptive Statistics for Digital Epistemic Beliefs

	Indicator	Mean	SD	Description
1.	I verify information from different online sources before accepting it as true.	4.57	0.62	Strongly Agree
2.	I compare different websites before deciding which information is more trustworthy.	4.48	0.63	Agree
3.	I think critically before accepting information from social media as factual.	4.60	0.53	Strongly Agree
4.	I evaluate the author's qualifications before using online information in my academic work.	4.41	0.67	Agree
5.	I examine the quality of evidence before accepting an online claim.	4.53	0.60	Strongly Agree
6.	I can evaluate whether an author's claims are supported by credible evidence.	4.50	0.65	Agree

Table 4.2 presents the highest item mean concerned which is thinking critically before accepting social-media information as factual (M = 4.60, SD = 0.53), while evaluating an author's qualifications before using online information in academic work had the lowest mean (M = 4.41, SD = 0.67). The comparatively lower emphasis on author qualifications and website comparison indicates that instruction can continue to connect beliefs about justified knowledge with concrete source-investigation routines and evidence-based explanations (Hämäläinen et al., 2021; Hofer & Pintrich, 1997; Lee, 2018).

Problem 3. What is the extent of teachers' instructional modeling of reasoning as assessed by pre-service teachers?

Table 5.1
Descriptive Statistics of the Respondents' Instructional Modeling of Reasoning

Score Range		Interpretation	Frequency	Percentage
4.51 – 5.00	Strongly Agree	Very High	136	59.91
3.51 – 4.50	Agree	High	85	37.44
2.51 – 3.50	Neither Agree or Disagree	Moderate	6	2.64
1.51 – 2.50	Disagree	Low	0	0.00
1.00 – 1.50	Strongly Disagree	Very Low	0	0.00
		Total	227	100.00
		Mean	4.57	
		SD	0.43	
		Interpretation	Very High	

Table 5.1 reveals a Very High level of Instructional Modeling of Reasoning (M = 4.57, SD = 0.43). Of the 227 respondents, 97.35% rated their teachers' practices as High or Very High, while only 2.64% rated them as Moderate. These findings indicate consistent

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perceptions that teachers effectively model reasoning through active participation, guided instruction, metacognitive awareness, and collaborative learning.

Table 5.2
Item-Level Descriptive Statistics for Perceived Teachers' Instructional Modeling of Reasoning

No	Indicator My professor…	Mean	SD	Description
1	always breaks a task (words, sentences etc.) into small, more manageable parts with feedback.	4.53	0.60	Strongly Agree
2	demonstrates how words, expressions, and their meanings are interconnected.	4.54	0.56	Strongly Agree
3	always guides us to develop awareness of our own knowledge.	4.60	0.58	Strongly Agree
4	provides a cue to shift our attention to focus on specific information, errors, or partial understandings.	4.52	0.61	Strongly Agree
5	puts us into mixed ability groups to help us share experiences and learn from our peers during lessons.	4.53	0.60	Strongly Agree
6	helps us solve challenging reading tasks by providing appropriate guidance and support until we can accomplish them independently.	4.58	0.55	Strongly Agree
7	serves as a facilitator by guiding discussions and encouraging collaboration among students during reading activities.	4.61	0.55	Strongly Agree
8	uses child-centered teaching strategies that encourage active participation during reading lessons.	4.69	0.53	Strongly Agree

Table 5.2 shows the highest item mean concerned instructors' use of child-centered strategies that encourage active participation (M = 4.69, SD = 0.53), while providing cues to focus attention on specific information, errors, or partial understandings had the lowest mean (M = 4.52, SD = 0.61). The lower score for focused cues indicates a potential opportunity to make reasoning steps more explicit, such as explicitly showing how to recognize a claim, test supporting evidence, identify gaps, and adjust an interpretation. These practices are compatible with kinds of teaching strategies that support students' understanding by gradually transferring ownership of their thinking to them (Pijeira-Díaz et al., 2023; Uçak & Kartal, 2023).

Problem 4. What is the level of online evaluative reading literacy of pre-service teachers in terms of the following: Judging the validity of ideas; Identifying bias and fairness; Assessing the author's purpose and intent; and Making value judgments?

Table 6
Descriptive Statistics for Judging the Validity of Ideas

Score Range	Interpretation	Frequency	Percentage
6.40 – 8.00	Very High	90	39.65
4.80 – 6.39	High	106	46.70
3.20 – 4.79	Moderate	22	9.69
1.60 – 3.19	Low	9	3.96
0.00 – 1.59	Very Low	0	0.00
Total		227	100.00
Mean		6.06	
SD		1.34	
Interpretation		High	

For Judging the Validity of Ideas, 106 respondents' (46.70%) were classified as High and 90 (39.65%) as Very High; 22 (9.69%) were Moderate and nine (3.96%) Low, with none Very Low. The mean was 6.06 (SD = 1.34), interpreted as High. This was the lowest-rated of the four OERL dimensions, indicating a relative area for further development in evaluating the validity of online claims and their supporting evidence. Effective evaluation requires source investigation, evidence checking, and corroboration rather than reliance on surface features alone (Breakstone et al., 2024; McGrew, 2024; Trixa & Kaspar, 2024).

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Table 7

Descriptive Statistics for Identifying Bias and Fairness

Score Range	Interpretation	Frequency	Percentage
8.00 – 10.00	Very High	150	66.08
6.00 – 7.99	High	52	22.91
4.00 – 5.99	Moderate	19	8.37
2.00 – 3.99	Low	3	1.32
0.00 – 1.99	Very Low	3	1.32
Total		227	100.00
Mean		8.01	
SD		1.95	
Interpretation		Very High	

For Identifying Bias and Fairness, 150 respondents (66.08%) were classified as Very High and 52 (22.91%) as High; 19 (8.37%) were Moderate, while three (1.32%) each were Low and Very Low. The mean was 8.01 (SD = 1.95), interpreted as Very High. This result indicates strong performance on the assessment items in this dimension. Critical evaluation of bias also requires comparing perspectives, investigating source interests, and grounding judgments in evidence (Kulju et al., 2024; Trixa & Kaspar, 2024).

Table 8

Descriptive Statistics for Assessing the Author's Purpose and Intent

Score Range	Interpretation	Frequency	Percentage
6.40 – 8.00	Very High	170	74.89
4.80 – 6.39	High	42	18.50
3.20 – 4.79	Moderate	6	2.64
1.60 – 3.19	Low	8	3.52
0.00 – 1.59	Very Low	1	0.44
Total		227	100.00
Mean		6.93	
SD		1.36	
Interpretation		Very High	

For Assessing the Author's Purpose and Intent, 170 respondents (74.89%) were classified as Very High and 42 (18.50%) as High. Six (2.64%) were Moderate, eight (3.52%) Low, and one (0.44%) Very Low. The mean was 6.93 (SD = 1.36), interpreted as Very High. The results suggest that most respondents answered the assessment items in this dimension successfully, although identifying less explicit persuasion and organizational interests remains an important instructional focus. Source evaluation involves examining authorship, motives, and information beyond the original text (Kulju et al., 2024; McGrew, 2024).

Table 9

Descriptive Statistics for Making Value Judgments

Score Range	Interpretation	Frequency	Percentage
6.40 – 8.00	Very High	170	74.89
4.80 – 6.39	High	41	18.06
3.20 – 4.79	Moderate	7	3.08
1.60 – 3.19	Low	4	1.76
0.00 – 1.59	Very Low	5	2.20
Total		227	100.00
Mean		7.07	
SD		1.55	
Interpretation		Very High	

For Making Value Judgments, 170 respondents (74.89%) were classified as Very High and 41 (18.06%) as High; seven (3.08%) were Moderate, four (1.76%) Low, and five (2.20%) Very Low. The mean was 7.07 (SD = 1.55), interpreted as Very High. This was the highest mean among the four OERL dimensions. The result indicates strong performance on the assessment items requiring respondents to weigh information and formulate judgments. Such judgments should be supported by credible evidence and consideration of competing perspectives (McGrew, 2024).

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Table 10

OERL Across Four Dimensions

OERL dimension	Mean	SD	Interpretation	Very High n (%)	High n (%)	Moderate n (%)	Low n (%)	Very Low n (%)
Judging the Validity of Ideas	6.06	1.34	High	90 (39.65)	106 (46.70)	22 (9.69)	9 (3.96)	0 (0.00)
Identifying Bias and Fairness	8.01	1.95	Very High	150 (66.08)	52 (22.91)	19 (8.37)	3 (1.32)	3 (1.32)
Assessing the Author's Purpose and Intent	6.93	1.36	Very High	170 (74.89)	42 (18.50)	6 (2.64)	8 (3.52)	1 (0.44)
Making Value Judgments	7.07	1.55	Very High	170 (74.89)	41 (18.06)	7 (3.08)	4 (1.76)	5 (2.20)

Across the four OERL dimensions, the mean scores were 6.06 (SD = 1.34) for Judging the Validity of Ideas, 8.01 (SD = 1.95) for Identifying Bias and Fairness, 6.93 (SD = 1.36) for Assessing the Author's Purpose and Intent, and 7.07 (SD = 1.55) for Making Value Judgments. The first dimension was interpreted as High, whereas the other three were interpreted as Very High. Thus, the profile was not uniform: respondents performed comparatively less strongly on judging the validity of ideas and most strongly on making value judgments. This dimension-level synthesis is more informative than treating OERL as a single undifferentiated skill. It points to the need for explicit practice in examining the credibility of sources and corroborating claims while continuing to develop bias recognition, author-purpose analysis, and evidence-based judgment (Breakstone et al., 2024; Kulju et al., 2024; McGrew, 2024).

Problem 5. Do critical digital literacy, digital epistemic beliefs, and teachers' instructional modeling of reasoning significantly predict the online evaluative reading literacy of the pre-service teachers?

Table 11

Regression Analysis of Critical Digital Literacy, Digital Epistemic Beliefs and Instructional Modeling of Reasoning on Online Evaluative Reading Literacy

Predictor	Unstandardized Coefficients		β	95% CI		t	p
	B	SE		Lower	Upper		
Constant	20.82	3.29		14.34	27.30	6.330*	<.001
Critical Digital Literacy	-0.28	0.80	-0.032	-1.86	1.29	-0.356	0.722
Digital Epistemic Beliefs	0.72	0.86	0.082	-0.98	2.42	0.835	0.405
Instructional Modeling of Reasoning	1.16	0.85	0.116	-0.52	2.83	1.362	0.175
Model Summary							
$R=0.160$ $R^2=0.026$ Adj $R^2=0.013$ $F(3,223)=1.963$ $p=0.120$							

*Note. B = unstandardized beta coefficient, SE = standard error, β = standardized beta coefficient, 95% CI = 95% confidence interval, t = t statistic, p = probability value. *Significant at 0.05 two-tailed alpha level.*

Table 11 presents the regression coefficients for the three predictors of Online Evaluative Reading Literacy. None showed a statistically significant individual contribution: Critical Digital Literacy (p = .722), Digital Epistemic Beliefs (p = .405), and Instructional Modeling of Reasoning (p = .175). All confidence intervals included zero, indicating that none significantly predicted the outcome when controlling for the other variables. Thus, the three predictors did not independently explain variations in Online Evaluative Reading Literacy.

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Table 12
Anova

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	104.392	3	34.797	1.963	0.120
	Residual	3952.481	223	17.724		
	Total	4056.872	226			

a. Dependent Variable: ONLINE EVALUATIVE READING LITERACY
b. Predictors: (Constant), CRITICAL DIGITAL LITERACY, DIGITAL EPISTEMIC BELIEFS, INSTRUCTIONAL MODELING OF REASONING

Table 12 presents the ANOVA results, showing that the overall regression model was not statistically significant, $F(3, 223) = 1.963$, $p = .120$. Since the p-value exceeded the .05 significance level, the three predictors—Critical Digital Literacy, Digital Epistemic Beliefs, and Instructional Modeling of Reasoning—did not significantly predict Online Evaluative Reading Literacy when considered together. Thus, the null hypothesis was not rejected.

Conclusions

The findings address the first three research questions by showing that respondents reported Very High Critical Digital Literacy ($M = 4.52$, $SD = 0.48$) and Very High Digital Epistemic Beliefs ($M = 4.52$, $SD = 0.48$). They also rated Teachers' Instructional Modeling of Reasoning as Very High ($M = 4.57$, $SD = 0.43$). These questionnaire results describe respondents' self-reported practices, beliefs, and perceptions.

For the fourth research question, performance-based OERL results differed across the four dimensions. Judging the Validity of Ideas obtained a High interpretation ($M = 6.06$, $SD = 1.34$), while Identifying Bias and Fairness ($M = 8.01$, $SD = 1.95$), Assessing the Author's Purpose and Intent ($M = 6.93$, $SD = 1.36$), and Making Value Judgments ($M = 7.07$, $SD = 1.55$) each obtained Very High interpretations. Making Value Judgments had the highest mean, while Judging the Validity of Ideas had the lowest. This pattern indicates relative strengths in the latter three dimensions and a comparatively greater need to strengthen evaluation of the validity of online claims and supporting evidence.

For the fifth research question, the overall regression model was not statistically significant, $R = .160$, $R^2 = .026$, adjusted $R^2 = .013$, $F(3, 223) = 1.963$, $p = .120$. The three predictors therefore did not jointly explain a statistically significant amount of variation in OERL in this sample. None of the individual predictors was statistically significant: Critical Digital Literacy ($\beta = -.032$, $p = .722$), Digital Epistemic Beliefs ($\beta = .082$, $p = .405$), and Teachers' Instructional Modeling of Reasoning ($\beta = .116$, $p = .175$). Accordingly, the null hypotheses were not rejected. The results do not demonstrate causal relationships and do not establish that the predictors have no possible relevance; they indicate only that statistically significant prediction was not observed in the present sample using these measures and this model.

Taken together, the findings distinguish respondents' favorable self-reports from their measured performance and show that the three selected predictors explained only a small, statistically nonsignificant proportion of OERL variance. Teacher education programs may therefore complement self-report measures with authentic performance tasks that require source investigation, corroboration, evidence evaluation, and explicit justification. Future studies may examine additional variables, use larger and more diverse samples, and employ longitudinal or intervention designs to investigate how online evaluative reading competencies develop.

Recommendations

Based on the findings of the study, the following recommendations are offered:

1. Pre-service teachers may engage in structured online reading activities that require them to verify information through credible sources, compare different accounts, and provide evidence to support their judgments.
2. Pre-service teachers may participate in exercises that involve identifying biased language, examining omitted information, distinguishing factual claims from opinions, and evaluating the purpose and intent of online content.
3. Teacher educators may integrate performance-based online evaluative reading tasks into their courses to assess students' actual abilities to evaluate claims, examine supporting evidence, recognize bias, and make reasoned judgments.
4. Teacher educators may explicitly model source-verification procedures, evidence evaluation, and the comparison of information across independent sources during reading and research activities.
5. School administrators may consider providing professional development opportunities on digital information evaluation, misinformation recognition, and evidence-based instructional strategies for faculty members.

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6. Curriculum developers may consider integrating measurable online evaluative reading competencies into teacher education courses, particularly those involving literacy development, educational technology, research, and critical thinking.
7. Teacher education institutions may consider using both self-report instruments and objective performance assessments when evaluating students' digital literacy and online information-evaluation competencies. This may help distinguish perceived competence from demonstrated performance.
8. Future researchers may examine additional variables, such as prior knowledge, metacognitive regulation, source-verification strategies, and evidence-based reasoning, to investigate other factors potentially associated with OERL performance.
9. Future researchers may employ longitudinal, experimental, or mixed-methods research designs to investigate the development of online evaluative reading competencies and the possible contribution of specific instructional interventions.

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