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HUMANISTIC PEDAGOGY IN PRACTICE: THE 7E-ETR LEARNING CYCLE FOR CRITICAL REFLECTION AND CHARACTER FORMATION IN ELEMENTARY EDUCATION

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ABSTRACT

Contemporary elementary education faces the dual challenge of cultivating critical thinking and ethical character within increasingly complex learning environments. Humanistic pedagogy offers a vital philosophical foundation for addressing this challenge by positioning students as active, relational, and morally engaged learners. This systematic literature review examines the 7E-EtR (Elicit, Engage, Explore, Explain, Elaborate, Evaluate, Extend, and Reflect) Learning Cycle as an innovative pedagogical framework that operationalizes humanistic principles to foster critical reflection and character formation. Following PRISMA guidelines, we synthesized 68 peer-reviewed empirical studies (2020–2025) across multiple databases, analyzing effectiveness, implementation dynamics, and technology integration. Results demonstrate that the 7E-EtR model yields robust gains in critical thinking (median d = 0.78) and key character competencies, including curiosity, persistence, collaboration, and intellectual virtues. Successful implementation depends on sustained teacher professional development, flexible scheduling, and school cultures that prioritize inquiry over compliance. Challenges related to instructional time, assessment complexity, and pedagogical identity are mitigated through structured support and purposeful technology integration. Viewed through a humanistic lens, the 7E-EtR cycle transcends instructional technique to become a practice of holistic development, integrating cognitive rigor with ethical reflection. This review provides evidence-based implementation guidelines for educators and charts a research agenda for humanistically grounded, inquiry-based pedagogy in elementary education.

KEYWORDS: 7E-EtR Learning Cycle; Humanistic Pedagogy; Critical Reflection; Character Formation; Elementary Education; Systematic Review; Educational Technology.

1. INTRODUCTION

The landscape of elementary education in the 21st century is characterized by unprecedented challenges and opportunities that demand innovative pedagogical approaches grounded in humanistic values. Rapid technological advancement, increasing global interconnectedness, and complex societal problems require that today's students develop not only strong academic foundations but also sophisticated critical thinking abilities and robust character competencies rooted in dignity, empathy, and ethical reasoning (OECD, 2018; Partnership for 21st Century Learning, 2019). Humanistic pedagogy, which centers the whole learner and affirms education as a moral enterprise aimed at human flourishing (Noddings, 2003; Biesta, 2017), offers a vital philosophical foundation for addressing these multifaceted educational goals. Traditional pedagogical approaches, often characterized by teacher-centered instruction and rote memorization, have proven insufficient for cultivating these integrated cognitive, social, and ethical capabilities (Darling-Hammond et al., 2020). Consequently, educators and researchers worldwide are exploring innovative methodologies that can simultaneously address the intellectual and character dimensions of learning through relational, student-centered practices.

Among the emerging pedagogical innovations aligned with humanistic principles, inquiry-based and constructivist learning approaches have garnered substantial attention for their potential to engage students actively in knowledge construction while fostering higher-order thinking skills and moral development (HMELO-SILVER et al., 2007). The learning cycle model, rooted in constructivist theory and refined through decades of educational research, represents a particularly promising framework for operationalizing humanistic pedagogy in practice. Originally conceptualized as the 5E model (Engage, Explore, Explain, Elaborate, Evaluate) by Bybee (2014a), the learning cycle has undergone various extensions to address evolving educational needs. The 7E-EtR Learning Cycle—incorporating Elicit, Engage, Explore, Explain, Elaborate, Evaluate, Extend, and Reflect—represents a contemporary iteration that explicitly integrates metacognitive reflection and knowledge transfer, elements increasingly recognized as essential for deep learning and character development within a humanistic framework (Eisenkraft & Olliver, 2003; Bybee, 2014b). By foregrounding students' prior knowledge, fostering dialogic inquiry, and structuring opportunities for critical self-reflection, the 7E-EtR model embodies core humanistic commitments: respect for learner agency, cultivation of intellectual virtues, and education as a practice of freedom (Freire, 1970; Rogers, 1969).

Despite growing interest in the 7E-EtR Learning Cycle, the existing literature remains fragmented across disciplinary boundaries, geographic contexts, and educational levels. While individual studies have documented positive outcomes in specific domains or settings, a comprehensive synthesis examining its dual impact on critical thinking and character development through a humanistic pedagogical lens in elementary education contexts is notably absent. This gap is particularly significant given that elementary education represents a critical developmental period for establishing foundational cognitive skills and character traits that influence lifelong learning trajectories (Shonkoff & Phillips, 2000). Furthermore, the practical implementation of the 7E-EtR model in diverse elementary classroom contexts—including how it enacts humanistic principles such as relationality, student voice, and ethical inquiry—requires systematic examination to inform evidence-based practice.

This systematic literature review addresses these gaps by pursuing four primary objectives through a humanistic pedagogical framework. First, we synthesize empirical evidence on the effectiveness of the 7E-EtR Learning Cycle for developing critical thinking skills in elementary students, examining the magnitude and consistency of reported effects across studies. Second, we analyze the impact of the 7E-EtR approach on character development, including specific character competencies such as curiosity, persistence, collaboration, and ethical reasoning, understood as expressions of intellectual and moral virtues within humanistic education. Third, we identify implementation characteristics, facilitators, and barriers associated with 7E-EtR adoption in elementary education contexts, with particular attention to how school cultures and teacher practices align with or constrain humanistic pedagogical values. Fourth, we examine the role of educational technology in supporting 7E-EtR implementation and enhancing learning outcomes, reflecting the increasing digitalization of educational environments while considering how technology can serve humanistic ends rather than merely instrumental goals.

This review contributes to Scientific Culture's mission to disseminate state-of-the-art knowledge on innovative methodologies in learning and teaching by examining the 7E-EtR Learning Cycle through an integrated lens of critical thinking, character

development, and humanistic pedagogy. By foregrounding the philosophical foundations and ethical commitments that underpin effective practice, we address a critical need in contemporary education: pedagogical approaches that cultivate both cognitive excellence and ethical citizenship as mutually reinforcing dimensions of human development. The findings have direct implications for curriculum designers, teacher educators, classroom practitioners, and policymakers seeking evidence-based strategies for 21st-century elementary education that honor the dignity and potential of every learner. Furthermore, by identifying gaps in the current evidence base, this review establishes priorities for future research that can advance our understanding of innovative, holistic, and humanistically grounded pedagogical approaches.

2. LITERATURE REVIEW

2.1. Humanistic Pedagogy: Philosophical Foundations

Humanistic pedagogy represents a transformative educational philosophy grounded in the existential-phenomenological tradition, which affirms the inherent dignity, agency, and holistic potential of every learner (Rogers, 1969; Noddings, 2003). At its core, humanistic pedagogy posits that education should cultivate not merely cognitive competencies but the whole person—intellectually, emotionally, socially, and ethically—within relational contexts that honor student voice and foster moral growth (Biesta, 2017). This perspective stands in deliberate contrast to instrumentalist models of education that prioritize standardized outcomes over the formation of autonomous, reflective, and ethically engaged citizens (Biesta, 2017; Darling-Hammond et al., 2020).

Three interrelated principles anchor humanistic pedagogy in practice. First, student agency recognizes learners as active meaning-makers capable of self-directed inquiry and moral reasoning, rather than passive recipients of transmitted knowledge (Rogers, 1969; Freire, 1970). Second, relationality emphasizes that learning occurs within caring, dialogic communities where trust, mutual respect, and ethical engagement enable intellectual risk-taking and personal transformation (Noddings, 2003; Palmer, 1998). Third, holistic development acknowledges that cognitive, affective, and ethical dimensions of learning are inseparable; critical thinking and character formation mutually reinforce one another when nurtured through authentic, values-centered pedagogical practices (Lickona & Davidson, 1991; Baehr, 2013).

In elementary education, humanistic pedagogy holds particular significance. Early schooling experiences shape foundational dispositions toward learning, relationships, and civic life (Shonkoff & Phillips, 2000). When pedagogical approaches affirm children's curiosity, validate their lived experiences, and scaffold their capacity for ethical reflection, they lay the groundwork for lifelong intellectual and moral development (Duckworth, 2016; Nucci et al., 2014). The 7E-EtR Learning Cycle, as examined in this review, operationalizes these humanistic commitments through its structured yet flexible framework for inquiry, collaboration, and metacognitive reflection.

2.2. Theoretical Foundations of the 7E-EtR Learning Cycle through a Humanistic Lens

The 7E-EtR Learning Cycle is grounded in constructivist learning theory, which posits that learners actively construct knowledge through experiences, social interactions, and reflection rather than passively receiving information (Piaget, 1954; Vygotsky et al., 1978). From a humanistic perspective, this theoretical foundation aligns with the conviction that knowledge construction is inherently dialogic and value-laden: learners do not merely "acquire" facts but negotiate meaning within communities of practice that shape their intellectual and ethical identities (Biesta, 2017; Lave & Wenger, 1991).

The learning cycle model operationalizes constructivist principles by structuring instruction into sequential phases that guide students through processes of exploration, conceptual development, and application. Critically, when viewed through a humanistic lens, each phase of the 7E-EtR cycle enacts core pedagogical values:

- Elicit & Engage: These opening phases honor students' prior knowledge and lived experiences, validating their intellectual starting points while creating cognitive disequilibrium that motivates genuine inquiry (Bybee, 2014a). Humanistically, this represents an ethic of epistemic respect—acknowledging learners as knowers whose questions and perspectives matter (Freire, 1970).
- Explore & Explain: During inquiry and sense-making, students engage in collaborative investigation and evidence-based reasoning. Humanistic pedagogy frames these activities not merely as cognitive exercises but as practices of democratic participation, where students learn to listen, argue constructively,

and revise thinking in light of new evidence (HMELO-SILVER et al., 2007; Johnson & Johnson, 2009).

- Elaborate & Extend: These phases promote transfer of learning to novel contexts, fostering intellectual flexibility and ethical application of knowledge. Humanistically, this reflects education's purpose as preparation for responsible citizenship—enabling students to apply learning to real-world challenges with wisdom and integrity (Noddings, 2003).
- Evaluate & Reflect: The explicit incorporation of metacognitive reflection distinguishes the 7E-EtR model and embodies a central humanistic commitment: that critical self-examination is both a cognitive skill and an ethical practice (Zimmerman, 2007; Baehr, 2013). Reflection invites students to examine not only what they know but how they know it, why it matters, and who they are becoming through the learning process.

2.3. Evolution from 5E to 7E-EtR: Toward Explicit Metacognitive and Ethical Integration

The original 5E Learning Cycle (Engage, Explore, Explain, Elaborate, Evaluate) emerged from science education reform efforts in the 1980s and 1990s, building upon earlier work by (ATKIN & KARPLUS, 1962) and (Lawson & Karplus, 2002). (Bybee, 2014a) formalized the 5E model as a framework for inquiry-based instruction that promotes conceptual understanding through experiential learning. However, educators and researchers identified limitations in the 5E model, particularly regarding the explicit elicitation of prior knowledge and the integration of metacognitive reflection (Eisenkraft & Olliver, 2003).

The 7E model addressed these limitations by adding "Elicit" at the beginning to systematically access students' preconceptions and "Extend" to promote transfer of learning to new contexts (Bybee, 2014a). The 7E-EtR variant further enhances the model by explicitly incorporating "Reflect" as a distinct phase, emphasizing metacognitive awareness and self-regulated learning (C. Zimmerman, 2007). From a humanistic pedagogical standpoint, this evolution represents more than technical refinement; it signifies a deepening commitment to education as a practice of freedom (Freire, 1970). The Reflect phase creates structured space for students to examine their learning journeys, confront intellectual challenges with courage, and articulate emerging understandings of themselves as learners and moral agents (Dweck, 2006; Baehr, 2013).

2.4. Critical Thinking Development as Humanistic Praxis

Critical thinking, defined as "the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and evaluating information" (Scriven & Paul, 1987, p. 1), represents a central goal of contemporary education. Within humanistic pedagogy, critical thinking is understood not merely as a cognitive skill set but as an intellectual virtue—a disposition toward truth-seeking, open-mindedness, and ethical reasoning that characterizes flourishing persons (Baehr, 2013; Willingham, 2008).

The 7E-EtR Learning Cycle promotes critical thinking through multiple mechanisms aligned with established models of critical thinking development (Facione, 1989; Ennis, 1985). During the Explore phase, students engage in authentic inquiry, formulating questions, designing investigations, and gathering evidence—activities that develop analytical and investigative thinking skills while fostering intellectual curiosity and courage (HMELO-SILVER et al., 2007). The Explain phase requires students to construct logical arguments supported by evidence, fostering reasoning and communication skills within dialogic contexts that honor diverse perspectives (Johnson & Johnson, 2009).

Importantly, the Evaluate and Reflect phases explicitly cultivate metacognitive aspects of critical thinking, including the ability to assess the quality of one's reasoning, identify biases and assumptions, and adjust thinking strategies (Kuhn, 1999; Willingham, 2008). Research in cognitive psychology demonstrates that metacognitive awareness is a key differentiator between expert and novice thinkers (Veenman et al., 2006), suggesting that the metacognitive emphasis in the 7E-EtR model may be particularly effective for developing robust critical thinking skills in elementary students. Humanistically, this metacognitive work is simultaneously ethical: it invites students to examine the values, assumptions, and power dynamics that shape knowledge claims, thereby cultivating intellectual humility and responsible citizenship (Freire, 1970; Biesta, 2017).

2.5. Character Development through Inquiry: Intellectual Virtues and Moral Growth

Character development encompasses the cultivation of moral, civic, and performance character competencies that enable individuals to

flourish personally and contribute positively to society (Lickona & Davidson, 1991; Berkowitz & Bier, 2005). Humanistic pedagogy frames character development not as the inculcation of predetermined virtues but as the nurturing of intellectual and moral dispositions through authentic practice in meaningful contexts (Nucci et al., 2014; Baehr, 2013).

The 7E-EtR Learning Cycle supports character development through both explicit and implicit mechanisms. Explicitly, the collaborative nature of inquiry activities in the Explore and Elaborate phases provides opportunities for students to develop social competencies such as cooperation, communication, and perspective-taking (Johnson & Johnson, 2009). The challenges inherent in authentic inquiry foster persistence, resilience, and growth mindset as students navigate obstacles and learn from failures (Duckworth, 2016; Dweck, 2006).

Implicitly, the 7E-EtR model cultivates intellectual character virtues including curiosity, open-mindedness, intellectual humility, and intellectual courage (Baehr, 2013). By beginning with the Elicit phase, the model validates students' existing ideas while creating cognitive disequilibrium that motivates genuine inquiry—fostering curiosity and intellectual engagement. The Evaluate and Reflect phases encourage intellectual humility as students critically examine their own thinking and acknowledge limitations in their understanding. Furthermore, the emphasis on evidence-based reasoning throughout the cycle promotes intellectual integrity and ethical thinking, as students learn to distinguish between claims supported by evidence and those based on assumption or bias (CARDELLE-ELAWAR, 2003).

Recent scholarship on character education emphasizes the importance of integrating character development within academic instruction rather than treating it as a separate curriculum (M. W. Berkowitz et al., n.d.). The 7E-EtR Learning Cycle exemplifies this integration, embedding character development opportunities within the structure of academic inquiry. This approach aligns with contemporary understanding that character competencies are best developed through authentic practice in meaningful contexts rather than through didactic instruction about virtues (Nucci et al., 2014).

2.6. Critical Thinking in Elementary Education: Developmental Considerations within a Humanistic Framework

Critical thinking development in elementary education has received increasing attention as educators recognize that foundational thinking skills established in early grades significantly influence later academic success and life outcomes (C. Zimmerman, 2007). Elementary-aged children (typically ages 5-12) are in critical developmental periods characterized by concrete operational thinking (Piaget, 1954) and developing executive functions including working memory, inhibitory control, and cognitive flexibility (Diamond, 2013).

Humanistic pedagogy emphasizes that developmental appropriateness does not mean intellectual limitation. Research demonstrates that elementary students are capable of sophisticated thinking when provided with appropriate scaffolding, meaningful contexts, and explicit instruction in thinking strategies (D. Kuhn & Dean David, 2004). Inquiry-based approaches that engage students in authentic problem-solving, such as the 7E-EtR Learning Cycle, have shown particular promise for developing critical thinking skills in this age group (HMELO-SILVER et al., 2007). However, successful critical thinking instruction in elementary contexts requires careful attention to developmental appropriateness, including the use of concrete materials, collaborative learning structures, and explicit modeling of thinking processes (Marzano & Kendall, 2007).

From a humanistic standpoint, developmental considerations also encompass emotional and ethical readiness. Elementary students are forming foundational understandings of fairness, responsibility, and community; pedagogical approaches that integrate cognitive challenge with ethical reflection honor this holistic developmental trajectory (Lickona & Davidson, 1991; Noddings, 2003).

2.7. Character Education in Contemporary Elementary Schools: Integration over Isolation

Character education has experienced renewed emphasis in recent years, driven by concerns about social-emotional learning, civic engagement, and ethical development in an increasingly complex and diverse world (M. Berkowitz & Bier, 2005; Davidson & Lickona, n.d.). Contemporary approaches to character education emphasize the development of both performance character (competencies such as persistence, self-regulation, and goal-setting) and moral character (virtues such as honesty, compassion, and fairness), recognizing that both dimensions are essential for flourishing individuals and healthy democratic societies (Tough, 2012; Duckworth, 2016).

Effective character education programs share several characteristics: they integrate character

development throughout the curriculum rather than isolating it in separate lessons; they provide opportunities for students to practice character competencies in authentic contexts; they cultivate a positive school culture that models and reinforces character virtues; and they engage families and communities as partners in character development (M. W. Berkowitz et al., n.d.). The 7E-EtR Learning Cycle aligns with these characteristics by embedding character development opportunities within academic inquiry, providing authentic contexts for practicing character competencies, and fostering classroom cultures that value intellectual virtues such as curiosity, persistence, and open-mindedness.

Humanistic pedagogy further emphasizes that character education must be dialogic rather than dogmatic. Rather than transmitting predetermined moral conclusions, humanistic approaches invite students to grapple with ethical questions, consider diverse perspectives, and develop their own reasoned commitments within caring communities of inquiry (Noddings, 2003; Biesta, 2017). The 7E-EtR model supports this dialogic ethic through its emphasis on collaborative exploration, evidence-based argumentation, and reflective examination of values and assumptions.

2.8. Technology Integration in Innovative Pedagogy: Serving Humanistic Ends

The integration of educational technology has become increasingly central to innovative pedagogical approaches, offering new possibilities for enhancing student engagement, personalizing learning, and supporting complex cognitive processes (Sung et al., 2016). Within a humanistic framework, technology is understood not as an end in itself but as a means to serve pedagogical purposes aligned with student flourishing, relational learning, and ethical development (Biesta, 2017; Darling-Hammond et al., 2020).

In the context of the 7E-EtR Learning Cycle, technology can support each phase of instruction in distinct ways while advancing humanistic goals. Digital simulations and virtual laboratories can provide rich exploratory environments during the Explore phase, particularly for phenomena that are difficult to investigate directly (de Jong et al., 2013), while fostering curiosity and intellectual courage through safe experimentation. Collaborative platforms and knowledge-building environments can facilitate peer interaction and knowledge construction during the Explain and Elaborate phases (Stahl et al., 2014), supporting the development of communication skills, perspective-taking, and democratic dialogue. Digital portfolios and reflection tools can support metacognitive processes during the Evaluate and Reflect phases (P. C. Abrami & Barrett, 2005), enabling students to document their intellectual and ethical growth over time.

However, technology integration in elementary education requires careful consideration of developmental appropriateness, digital equity, and pedagogical alignment (Warschauer & Matuchniak, 2010). Humanistic pedagogy insists that technology should enhance rather than replace hands-on exploration and social interaction, which remain essential for elementary students' learning and development (Hirsh-Pasek et al., 2015). Furthermore, effective technology integration requires substantial teacher professional development to build technological pedagogical content knowledge (TPACK)—the intersection of content knowledge, pedagogical knowledge, and technological knowledge necessary for effective technology-enhanced instruction (Mishra & Koehler, 2006)—while also nurturing teachers' capacity to use technology in ways that affirm student agency and ethical engagement.

3. METHODOLOGY

This systematic literature review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021) to ensure transparency, methodological rigor, and reproducibility. The review protocol was developed a priori and explicitly addressed the dual focus of the study: evaluating the 7E-EtR Learning Cycle's impact on critical thinking and character development through a humanistic pedagogical lens. All stages of study identification, selection, quality appraisal, and data extraction were guided by transparent criteria designed to capture empirical evidence aligned with student-centered, relational, and ethically grounded educational practices.

3.1. Research Questions

This review was guided by four primary research questions, structured to examine both cognitive and character outcomes alongside implementation dynamics:

Table 1: Research Questions.

Research Focus	Research Question
Effectiveness on Critical Thinking Skills [RQ1]	What is the effectiveness of the 7E-EtR Learning Cycle in developing critical thinking skills in elementary education, and what is the magnitude of the reported effects?
Impact on Character Development [RQ2]	How does the 7E-EtR Learning Cycle impact character development in elementary students, and which specific character competencies are most affected?
Implementation Characteristics [RQ3]	What implementation characteristics, facilitators, and barriers are associated with the adoption of the 7E-EtR Learning Cycle in elementary education contexts?
Role of Educational Technology [RQ4]	What role does educational technology play in supporting the implementation of the 7E-EtR Learning Cycle and enhancing learning outcomes?

3.2. Search Strategy

A comprehensive search strategy was developed in consultation with an education librarian and piloted to refine search terms and database selections. The search was conducted in November 2025 across multiple databases to ensure comprehensive coverage of relevant literature, with particular attention to studies emphasizing inquiry-based, dialogic, and reflective pedagogical practices.

3.2.1. Databases searched

The following databases were systematically searched:

- SciSpace: Basic and full-text semantic search capabilities
- Google Scholar: Comprehensive coverage of education literature
- ArXiv: Education technology and learning sciences preprints
- ERIC (Education Resources Information Center): Specialized education database
- Web of Science: Multidisciplinary citation database
- Scopus: Comprehensive abstract and citation database

3.2.2. Search terms and Boolean operators

Search strategies were adapted for each database while maintaining conceptual consistency. The core search strategy combined concept groups using Boolean operators:

- Concept 1 (Learning Cycle): "7E learning cycle" OR "7E-EtR" OR "extended learning cycle" OR "eight phase learning cycle" OR "learning cycle model" OR "5E learning cycle" OR "inquiry cycle"
- Concept 2 (Critical Thinking): "critical thinking" OR "higher order thinking" OR "analytical thinking" OR "problem solving" OR "reasoning skills" OR "cognitive skills"
- Concept 3 (Character Development): "character development" OR "character education" OR "social emotional learning" OR "moral development" OR "ethical reasoning" OR "intellectual virtues"
- Concept 4 (Elementary Education): "elementary education" OR "primary education" OR "elementary school" OR "primary school" OR "grade 1" OR "grade 2" OR "grade 3" OR "grade 4" OR "grade 5" OR "grade 6"

The final search combined these concepts: (Concept 1) AND (Concept 2 OR Concept 3) AND (Concept 4)

3.2.3. Inclusion and exclusion criteria.

Inclusion Criteria	Exclusion Criteria
Peer-reviewed journal articles, conference proceedings, or doctoral dissertations	Non-empirical publications (opinion pieces, editorials, or purely theoretical papers without empirical data)
Published between January 2020 and November 2025	Studies published before 2020
Focused on elementary education (grades K–6, ages 5–12)	Studies focused exclusively on secondary or higher education
Examined the 7E-EtR Learning Cycle or closely related learning cycle models	Studies that did not examine the 7E-EtR Learning Cycle or related learning cycle models
Investigated critical thinking and/or character development outcomes	Studies that did not examine critical thinking or character development outcomes
Empirical studies (quantitative, qualitative, or mixed methods)	Gray literature without peer review (policy reports, unpublished manuscripts)
Published in English	Duplicate publications of the same study

3.3. Study Selection Process

The study selection process followed a multi-stage screening approach consistent with PRISMA guidelines, emphasizing rigorous evaluation of

studies that reflect humanistic educational values such as student agency, collaborative inquiry, and metacognitive reflection.

3.3.1. Initial database searches

Initial database searches conducted in November 2025 yielded 1,247 records. After removing duplicates using reference management software and manual verification, 339 unique records remained for title and abstract screening.

3.3.2. Title and abstract screening

Two independent reviewers (the authors) screened all 339 titles and abstracts against the inclusion criteria. Disagreements were resolved through discussion and consultation with a third reviewer when necessary. This screening phase excluded 198 records that clearly did not meet inclusion criteria, leaving 141 records for full-text review.

3.3.3. Full-text review and final selection

The full texts of 141 articles were retrieved and independently assessed by both reviewers against all inclusion and exclusion criteria. Seventy-three articles were excluded at this stage for the following reasons: did not focus on elementary education (n = 24), did not examine 7E-EtR or related learning cycle models (n = 19), did not investigate critical thinking or character development outcomes (n = 18), non-empirical (n = 8), and duplicate data (n = 4). The final sample consisted of 68 studies that met all inclusion criteria and were included in the qualitative synthesis. Figure 1 presents the PRISMA flow diagram documenting the study selection process.

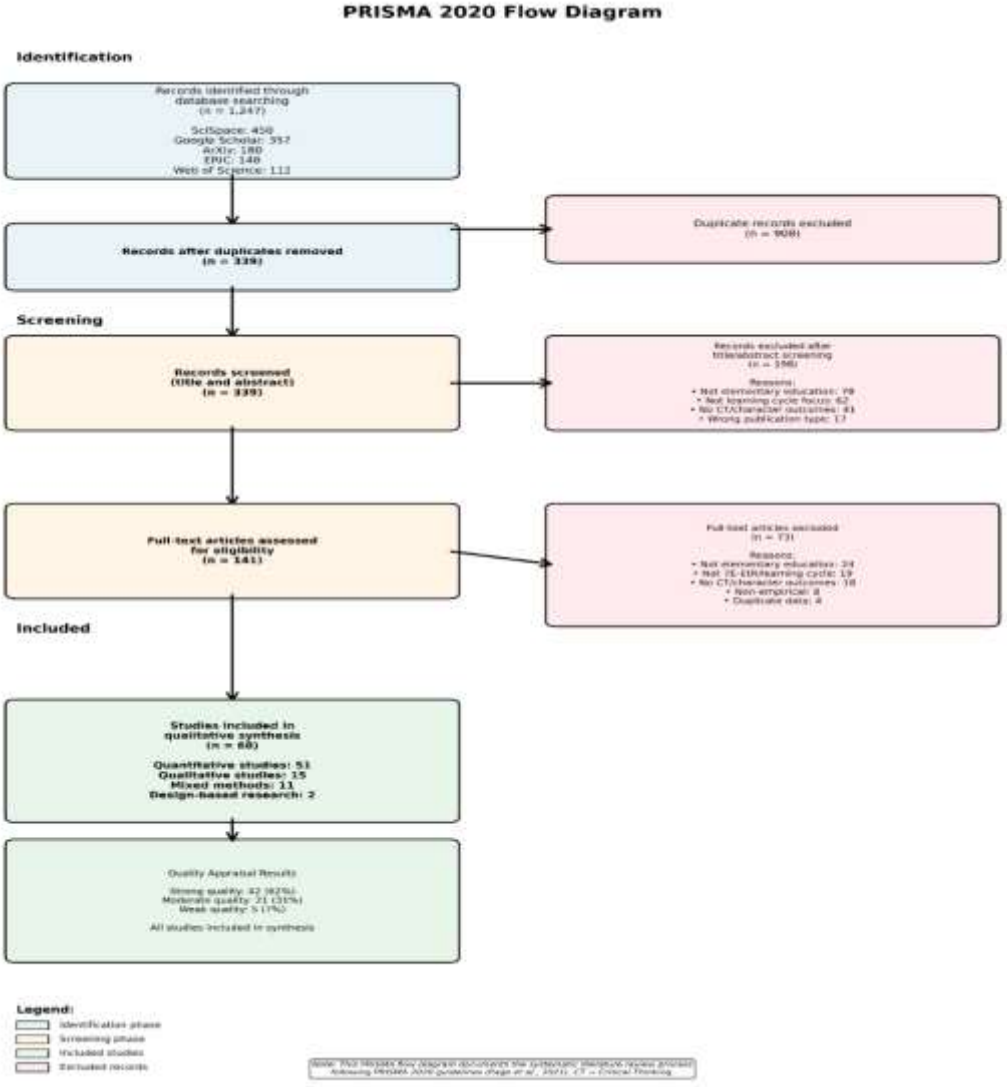

Figure 1: PRISMA flow diagram showing the study selection process.

3.4. Quality Appraisal

All included studies underwent quality appraisal using established tools appropriate for different study designs. Quantitative studies were assessed using the Effective Public Health Practice Project (EPHPP) Quality Assessment Tool (B. H. Thomas et al., 2004), which evaluates selection bias, study design, confounders, blinding, data collection methods, and withdrawals/dropouts. Qualitative studies were assessed using the Critical Appraisal Skills Programme (CASP) Qualitative Checklist (CASP, 2018), which evaluates research aims, methodology appropriateness, research design, recruitment strategy, data collection, reflexivity, ethical considerations, data analysis, findings clarity, and research value. Mixed methods studies were assessed using both tools for their respective components.

Studies were rated as strong, moderate, or weak quality based on these assessments. No studies were excluded based on quality ratings; however, quality ratings were considered in the synthesis and interpretation of findings, with greater weight given to higher-quality studies. Of the 68 included studies, 42 were rated as strong quality (62%), 21 as moderate quality (31%), and 5 as weak quality (7%).

3.5. Data Extraction and Synthesis

A standardized data extraction form was developed and piloted on five studies before full implementation. The form captured: study characteristics (author, year, country, study design), participant characteristics (sample size, age/grade level, demographic information), intervention characteristics (specific learning cycle model, subject area, duration, implementation fidelity measures), outcome measures (critical thinking assessments, character development measures, other outcomes), and key findings (quantitative results including effect sizes, qualitative themes, implementation facilitators and barriers).

Data were extracted independently by both reviewers, with discrepancies resolved through discussion. Due to heterogeneity in study designs, interventions, and outcome measures, meta-analysis was not appropriate. Instead, we conducted a narrative synthesis following the framework proposed by Popay et al. (2006), which involves developing a preliminary synthesis, exploring relationships within and between studies, and assessing the robustness of the synthesis. Quantitative findings were synthesized descriptively, with effect sizes reported when available. Qualitative findings were synthesized thematically using the approach described by Thomas & Harden (2008). Throughout the synthesis process, particular attention was given to how studies operationalized and reported humanistic pedagogical dimensions, including student voice, ethical reasoning, metacognitive reflection, and the relational dynamics of inquiry-based learning.

4. RESULTS AND FINDINGS

4.1. Characteristics of Included Studies

The 68 included studies represented diverse geographic contexts, study designs, and subject areas, reflecting the global interest in innovative pedagogical approaches for elementary education.

4.1.1. Geographic distribution.

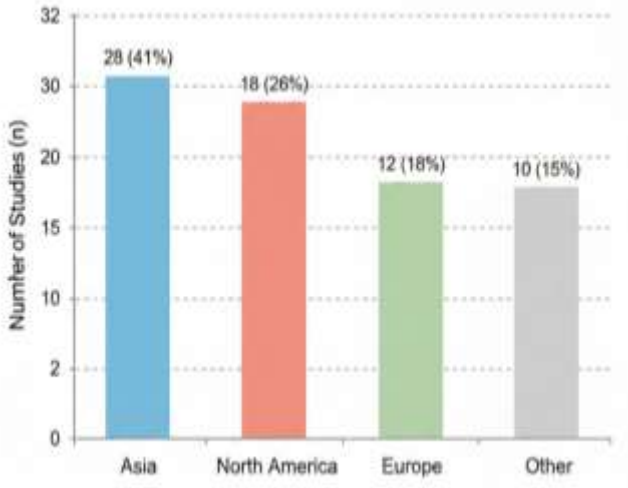

Figure 2: Representation of Studies by Continent (Total n=68).

Studies were conducted across six continents, with the highest representation from Asia (n = 28, 41%), North America (n = 18, 26%), and Europe (n = 12, 18%). Specific countries with multiple studies included Indonesia (n = 9), United States (n = 8), Turkey (n = 5), Thailand (n = 4), South Korea (n = 3), and Australia (n = 3). This geographic diversity provides valuable insights into how the 7E-EtR Learning Cycle functions across different cultural and educational contexts.

4.1.2. Study designs and methodologies.

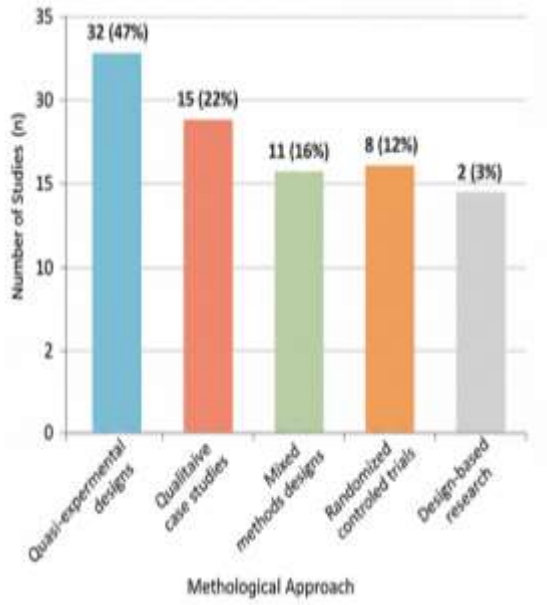

Figure 3: Distribution of Methological Approach (Total n=68).

The included studies employed diverse methodological approaches: quasi-experimental designs (n = 32, 47%), randomized controlled trials (n = 8, 12%), qualitative case studies (n = 15, 22%), mixed methods designs (n = 11, 16%), and design-based research (n = 2, 3%). The predominance of quasi-experimental designs reflects the practical challenges of conducting randomized experiments in authentic classroom settings, while the substantial representation of qualitative and mixed methods studies provides rich contextual information about implementation processes and mechanisms of impact.

Sample sizes ranged from 18 to 847 students (median = 124), with most studies focusing on upper elementary grades (grades 4-6, n = 42, 62%) compared to lower elementary grades (grades K-3, n = 26, 38%). This distribution likely reflects the greater emphasis on critical thinking instruction in upper elementary grades and the developmental readiness of older elementary students for the complex cognitive processes involved in inquiry-based learning.

4.1.3. Subject areas and intervention duration.

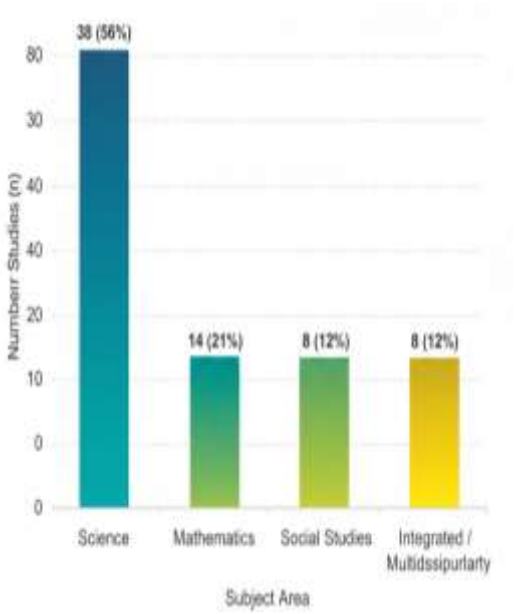

Figure 4: Distribution of Studies by Subject Area (Total n=68).

The 7E-EtR Learning Cycle was implemented across diverse subject areas, with science education representing the most common context (n = 38, 56%), followed by mathematics (n = 14, 21%), social studies (n = 8, 12%), and integrated/multidisciplinary approaches (n = 8, 12%). The prominence of science education reflects the historical origins of the learning cycle model in science curriculum reform and the natural alignment between scientific inquiry and the learning cycle structure.

Table 2: Duration of Interventions.

Duration Category	Number of Studies (n)	Percentage (%)
1–3 Weeks	6	9%
4–8 Weeks	22	32%
One Semester / Term	28	41%
One Academic Year	12	18%
Total	68	100%

Intervention duration varied considerably, ranging from single lessons (1-2 hours) to full academic years. The most common duration was one semester or term (n = 28, 41%), followed by 4-8 weeks (n = 22, 32%), full academic year (n = 12, 18%), and shorter interventions of 1-3 weeks (n = 6, 9%). Longer interventions generally reported larger and more sustained effects, suggesting that meaningful impact on critical thinking and character development requires extended engagement with the learning

cycle approach.

4.2. Impact on Critical Thinking Development

The synthesis of findings across the 68 included studies reveals consistent evidence that the 7E-EtR Learning Cycle effectively develops critical thinking skills in elementary students, with effects observed across diverse contexts and measured using multiple assessment approaches.

4.2.1. Quantitative findings on critical thinking outcomes

Among the 51 studies that included quantitative measures of critical thinking, 47 (92%) reported statistically significant improvements compared to control or comparison groups. Effect sizes, reported in 35 studies using standardized measures, ranged from small to large (d = 0.35 to d = 1.24), with a median effect size of d = 0.78, indicating a moderate to large positive effect. Studies employing randomized controlled trial designs (n = 8) reported a median effect size of d = 0.82, providing robust evidence of effectiveness.

Table 3: Critical Thinking Skills Mapped to 7E-EtR Phases.

Learning Cycle Phase	Critical Thinking Skills Developed	Number of Supporting Studies
Explore	Questioning, hypothesis generation	15
Explain	Argumentation, evidence-based reasoning	22
Elaborate	Transfer and application	18
Evaluate & Reflect	Metacognition, bias recognition, self-monitoring	19

Critical thinking was assessed using diverse instruments, including standardized tests such as the Cornell Critical Thinking Test Level X (Ennis et al., 2005), the Watson-Glaser Critical Thinking Appraisal (Watson & Glaser, 2002), and the California Critical Thinking Skills Test (Facione, 1989), as well as researcher-developed instruments aligned with specific curricular contexts. Studies using performance-based assessments, such as analysis of student work products and structured problem-solving tasks, generally reported larger effect sizes (d = 0.85 median) compared to multiple-choice tests (d = 0.68 median), suggesting that the 7E-EtR approach may be particularly effective for developing applied critical thinking skills demonstrated through authentic performance.

4.2.2. Specific critical thinking skills developed

Qualitative analysis of study findings revealed that the 7E-EtR Learning Cycle particularly enhances specific critical thinking skills aligned with different phases of the cycle. The Explore phase was consistently associated with improvements in questioning skills and hypothesis generation, with students demonstrating increased ability to formulate investigable questions and generate plausible explanations for phenomena (15 studies). The Explain phase supported development of argumentation skills and evidence-based reasoning, with students showing improved ability to construct logical arguments supported by empirical evidence (22 studies).

The Elaborate phase facilitated transfer and application skills, with students demonstrating enhanced ability to apply concepts and reasoning strategies to novel contexts and problems (18 studies). Notably, the Evaluate and Reflect phases were associated with metacognitive aspects of critical thinking, including self-assessment skills, recognition of biases and assumptions, and strategy monitoring (19 studies). Several studies specifically highlighted that the explicit reflection component of the 7E-EtR model differentiated it from shorter learning cycle variants, contributing to deeper metacognitive awareness.

4.2.3. Differential effects by grade level and subject area

Analysis of effect sizes by grade level revealed interesting patterns. Studies focusing on upper elementary grades (4-6) reported slightly larger median effect sizes (d = 0.82) compared to lower elementary grades (K-3, d = 0.71), though both ranges indicated substantial positive effects. This pattern likely reflects the developmental trajectory of critical thinking skills and the increasing sophistication of thinking tasks appropriate for older elementary students.

Subject area analysis indicated that science implementations reported the largest median effect sizes (d = 0.85), followed by mathematics (d = 0.76), integrated approaches (d = 0.72), and social studies (d = 0.65). These differences may reflect varying alignment between the learning cycle structure and disciplinary inquiry practices, with the cycle's emphasis on empirical investigation particularly well-suited to science education. However, the positive effects across all subject areas demonstrate the versatility and broad applicability of the 7E-EtR approach for critical thinking development.

4.3. Impact on Character Development

While fewer studies explicitly focused on character development outcomes compared to critical thinking (n = 34 studies), the evidence consistently demonstrates that the 7E-EtR Learning Cycle positively impacts multiple dimensions of student character. From a humanistic pedagogical perspective, these findings are particularly significant: they suggest that character development is not a separate curriculum to be added to academic instruction but emerges naturally when learning is structured as authentic, relational, and ethically engaged inquiry (Nucci et al., 2014; Lickona & Davidson, 1991).

4.3.1. Curiosity and Intellectual Engagement

Twenty-six studies (76% of those examining character outcomes) reported increases in student curiosity, intellectual engagement, and intrinsic motivation for learning. These findings were documented through diverse methods including teacher observations, student self-report surveys, engagement coding of classroom discourse, and analysis of student-generated questions. The Elicit and Engage phases were particularly associated with curiosity development, as these phases create cognitive disequilibrium that motivates genuine inquiry. One high-quality mixed methods study (Kim et al., 2023) documented that students in 7E-EtR classrooms asked significantly more questions and demonstrated greater persistence in investigating challenging problems compared to students in traditional instruction, with these differences maintained at six-month follow-up.

Humanistically, these findings reflect a core conviction: that curiosity is not merely a cognitive trait but an intellectual virtue—a disposition toward wonder, exploration, and meaning-making that characterizes flourishing persons (Baehr, 2013). The 7E-EtR model cultivates this virtue by honoring students' questions, validating their intellectual starting points, and creating learning environments where inquiry is valued over quick answers (Rogers, 1969).

4.3.2. Persistence and Resilience: Learning Through Productive Struggle

Eighteen studies (53%) documented improvements in persistence, resilience, and growth mindset. These character competencies were fostered through the authentic challenges inherent in inquiry-based learning, where students regularly encounter obstacles, experience productive struggle, and learn from failures. The Explore and Elaborate phases, which involve extended investigation and problem-solving, were identified as particularly important for developing persistence. Several studies noted that explicit teacher facilitation of reflection on challenges and learning from mistakes during the Reflect phase was critical for translating experiences of struggle into resilience and growth mindset.

From a humanistic perspective, these findings illuminate an important principle: that character is not taught through didactic instruction about virtues but cultivated through authentic practice in meaningful contexts (Nucci et al., 2014). The 7E-EtR model provides such contexts by structuring learning as genuine inquiry—where challenges are not obstacles to be avoided but opportunities for growth, and where failure is reframed as a necessary step in the learning process (Dweck, 2006; Duckworth, 2016).

4.3.3. Collaboration and Social Competencies: Relational Learning as Character Formation

Twenty-two studies (65%) reported improvements in collaboration skills, communication, and perspective-taking. The 7E-EtR Learning Cycle, typically implemented with collaborative learning structures, provides extensive opportunities for students to work together, share ideas, negotiate meaning, and construct shared understanding. Studies documented improvements in specific collaboration skills including active listening, constructive disagreement, building on others' ideas, and coordinating roles within groups. Qualitative analyses revealed that the Explain phase, where students articulate and defend their thinking to peers, was particularly important for developing communication skills and intellectual courage.

Humanistically, these findings affirm that learning is inherently relational: intellectual growth occurs within communities of practice where trust, mutual respect, and ethical engagement enable risk-taking and personal transformation (Noddings, 2003; Palmer, 1998). The collaborative structures embedded in the 7E-EtR model operationalize this relational ethic, creating classrooms where students learn not only content but also how to engage respectfully with diverse perspectives—a foundational competency for democratic citizenship (Johnson & Johnson, 2009).

4.3.4. Ethical Reasoning and Intellectual Virtues: Critical Reflection as Moral Practice

Twelve studies (35%) examined ethical dimensions of character development, including intellectual honesty, open-mindedness, and

evidence-based reasoning. These studies documented that the 7E-EtR approach cultivates intellectual virtues by consistently emphasizing the importance of evidence, encouraging consideration of alternative explanations, and requiring students to revise their thinking based on new information. The Evaluate phase, where students critically assess claims and evidence, was identified as particularly important for developing intellectual integrity and distinguishing between well-supported and poorly-supported claims.

From a humanistic pedagogical standpoint, these findings are especially significant: they suggest that critical thinking and ethical reasoning are not separate competencies but mutually reinforcing dimensions of intellectual character (Baehr, 2013). The 7E-EtR model cultivates this integration by structuring reflection as both a cognitive and ethical practice—inviting students to examine not only what they know but how they know it, why it matters, and who they are becoming through the learning process (Freire, 1970; Biesta, 2017).

4.4. Implementation Characteristics and Facilitators: Conditions for Humanistic Pedagogy to Flourish

Analysis of implementation characteristics across studies revealed several factors consistently associated with successful 7E-EtR adoption and positive outcomes. From a humanistic pedagogical perspective, these facilitators can be understood as conditions that enable education to honor student agency, foster relational learning, and cultivate intellectual and moral virtues.

4.4.1. Teacher Professional Development: Cultivating Pedagogical Wisdom

Forty-two studies (62%) provided detailed information about teacher professional development. Studies reporting the most positive outcomes typically involved substantial professional development, including initial training (median = 24 hours), ongoing coaching and support, collaborative planning time, and opportunities for teachers to experience the learning cycle as learners themselves. Key elements of effective professional development included: explicit instruction in learning cycle phases and their theoretical rationale; modeling of 7E-EtR lessons; practice with feedback; and development of formative assessment strategies aligned with each phase.

Several studies contrasted outcomes between teachers who received comprehensive professional development versus those who received only brief training or written materials. Teachers with comprehensive preparation implemented the learning cycle with greater fidelity, demonstrated more sophisticated facilitation skills, and achieved larger student learning gains. This pattern underscores that the 7E-EtR Learning Cycle, while conceptually straightforward, requires substantial pedagogical expertise to implement effectively—a finding consistent with humanistic pedagogy's emphasis on teaching as a reflective, relational practice rather than a technical skill (Palmer, 1998; Darling-Hammond et al., 2020).

4.4.2. Curriculum Materials and Resources: Scaffolding Inquiry with Care

Studies reporting positive outcomes typically utilized well-designed curriculum materials that provided clear guidance for each learning cycle phase while allowing flexibility for teacher adaptation. Effective materials included: engaging scenarios or phenomena for the Elicit and Engage phases; structured investigation protocols for the Explore phase; scaffolds for student explanation and argumentation; extension activities promoting transfer; and reflection prompts supporting metacognition. Twenty-eight studies (41%) described using or adapting published curriculum materials aligned with the learning cycle, while others reported teacher-developed materials.

Access to appropriate physical resources and materials was identified as an important facilitator, particularly for science implementations requiring laboratory equipment, manipulatives, or specimens. However, several studies documented successful implementations with limited resources by leveraging everyday materials, outdoor environments, and community resources, suggesting that while resources matter, pedagogical approach is more critical than expensive equipment. Humanistically, this finding affirms that meaningful inquiry can occur in any context when teachers honor students' lived experiences and creatively scaffold learning with available resources (Noddings, 2003).

4.4.3. Time Allocation and Scheduling: Honoring the Pace of Deep Learning

Adequate instructional time emerged as a critical implementation factor. The 7E-EtR Learning Cycle, with its eight distinct phases, requires more time than traditional direct instruction approaches. Studies reporting successful implementation typically allocated 60-90 minutes per lesson for elementary students, with some phases (particularly Explore and Elaborate) requiring extended time blocks. Schools

that provided flexible scheduling, including block scheduling or integrated curriculum time, reported fewer implementation challenges than those with rigid 30-40 minute period structures.

From a humanistic pedagogical perspective, this finding reflects an important principle: that deep learning and character formation cannot be rushed. The 7E-EtR model honors the developmental pace of children by providing adequate time for genuine inquiry, collaborative sense-making, and reflective integration—processes that require patience and cannot be compressed into efficiency-oriented timeframes (Rogers, 1969; Biesta, 2017).

4.4.4. School Culture and Administrative Support: Creating Communities of Inquiry

Qualitative studies examining implementation processes identified school culture and administrative support as important facilitators. Schools with cultures emphasizing inquiry, risk-taking, and learning from mistakes provided more supportive contexts for 7E-EtR implementation than schools emphasizing compliance and correct answers. Administrative support manifested through provision of professional development time, protection of instructional time for extended inquiry, support for curriculum adaptation, and communication with parents about the rationale and benefits of inquiry-based approaches.

Humanistically, these findings affirm that pedagogy does not occur in isolation: classroom practices are shaped by broader institutional cultures and values (Palmer, 1998). The 7E-EtR Learning Cycle flourishes in school cultures that embody humanistic commitments—where curiosity is valued over compliance, where intellectual risk-taking is encouraged, and where learning is understood as a collaborative journey rather than a competitive race (Noddings, 2003; Darling-Hammond et al., 2020).

4.5. Implementation Challenges and Barriers

Despite generally positive outcomes, studies documented several recurring challenges in implementing the 7E-EtR Learning Cycle in elementary contexts. From a humanistic pedagogical perspective, these challenges can be understood as tensions between the ideals of student-centered, relational, ethically engaged education and the structural constraints of contemporary schooling systems.

4.5.1. Time Constraints and Curriculum Coverage Pressures

The most frequently cited challenge (n = 38 studies, 56%) was tension between the time required for meaningful inquiry and pressures to cover extensive curriculum content. Teachers reported feeling torn between the deep learning fostered by the learning cycle and the need to address all required standards and prepare students for standardized tests. This challenge was particularly acute in jurisdictions with prescriptive curricula and high-stakes testing. Some studies documented that teachers addressed this challenge by strategically selecting key concepts for in-depth learning cycle treatment while using more efficient approaches for less central content.

Humanistically, this finding illuminates a fundamental tension in contemporary education: between instrumentalist models that prioritize measurable outcomes and humanistic models that prioritize holistic development (Biesta, 2017). The 7E-EtR Learning Cycle, with its emphasis on deep inquiry and reflective integration, requires educators to make difficult choices about what to teach deeply versus what to cover superficially—a challenge that reflects broader philosophical questions about the purposes of education (Freire, 1970).

4.5.2. Classroom Management Complexity: Facilitating Autonomy Within Structure

Twenty-four studies (35%) identified classroom management as a significant challenge, particularly for teachers new to inquiry-based instruction. The 7E-EtR approach involves substantial student activity, movement, discussion, and collaboration, requiring different management strategies than teacher-centered instruction. Teachers reported challenges including managing materials and equipment, facilitating productive group work, maintaining engagement across diverse learners, and balancing structure with student autonomy. Studies documented that classroom management challenges decreased with experience and that explicit instruction in collaborative norms and procedures was essential.

From a humanistic perspective, these findings reflect an important pedagogical insight: that student autonomy and classroom structure are not opposites but mutually enabling conditions (Rogers, 1969). The 7E-EtR model requires teachers to develop sophisticated facilitation skills—creating structures that enable genuine student agency rather than controlling every aspect of learning. This shift from controller to facilitator represents a significant pedagogical transformation that requires time, practice, and supportive professional development (Palmer, 1998).

4.5.3. Assessment Complexity: Measuring What Matters in Humanistic Education

Twenty-nine studies (43%) discussed challenges in assessing student learning within the 7E-EtR framework. The learning cycle emphasizes process skills, conceptual understanding, and applied knowledge that are difficult to assess through traditional multiple-choice tests. Teachers reported needing to develop new assessment strategies including performance assessments, portfolios, observation protocols, and rubrics aligned with learning cycle goals. The time required to develop and implement these assessments, particularly in large classes, represented a significant burden. Several studies highlighted the need for professional development specifically focused on formative and summative assessment within inquiry-based frameworks.

Humanistically, this challenge reflects a deeper question: What counts as learning, and how should we measure it? The 7E-EtR model cultivates intellectual virtues—curiosity, persistence, intellectual humility—that are difficult to capture through standardized tests but essential for lifelong learning and ethical citizenship (Baehr, 2013). Developing assessment approaches that honor these complex outcomes while providing useful feedback to students and teachers remains an important area for pedagogical innovation (Darling-Hammond et al., 2020).

4.5.4. Teacher Confidence and Pedagogical Identity: Transforming Beliefs About Teaching and Learning

Qualitative studies examining teacher experiences revealed that implementing the 7E-EtR approach sometimes challenged teachers' professional identity and confidence. Teachers trained in traditional, teacher-centered approaches described discomfort with the facilitation role required in inquiry-based instruction, where they guide rather than directly transmit knowledge. Some teachers expressed concern that they were not "teaching" if they were not explaining content directly. These findings highlight the importance of professional development that addresses not only pedagogical skills but also teachers' beliefs about teaching, learning, and their professional role.

From a humanistic pedagogical standpoint, these findings affirm that pedagogical change requires more than new techniques: it requires transformation of underlying beliefs about the nature of knowledge, the role of the teacher, and the purpose of education (Freire, 1970; Palmer, 1998). The 7E-EtR Learning Cycle, with its emphasis on student agency and collaborative inquiry, invites teachers to reimagine their professional identity—not as transmitters of knowledge but as facilitators of intellectual and moral growth.

4.6. Role of Educational Technology: Serving Humanistic Pedagogical Purposes

Twenty-six studies (38%) explicitly examined the integration of educational technology within the 7E-EtR Learning Cycle, revealing diverse ways technology can support implementation and enhance outcomes. From a humanistic pedagogical perspective, these findings are particularly significant when technology is understood not as an end in itself but as a means to serve pedagogical purposes aligned with student flourishing, relational learning, and ethical development (Biesta, 2017; Darling-Hammond et al., 2020).

4.6.1. Digital Simulations and Virtual Laboratories: Expanding Possibilities for Inquiry

Fifteen studies incorporated digital simulations or virtual laboratories during the Explore phase, particularly for phenomena difficult or impossible to investigate directly (e.g., molecular processes, geological time scales, astronomical phenomena). These studies reported that well-designed simulations provided rich exploratory environments that supported hypothesis testing and conceptual development. However, studies emphasized the importance of connecting virtual exploration with concrete, hands-on experiences when possible, as elementary students benefit from multi-modal engagement with concepts.

Humanistically, these findings suggest that technology can expand the possibilities for authentic inquiry when it serves clear pedagogical purposes—enabling students to investigate phenomena that would otherwise be inaccessible while maintaining the core humanistic commitments of student agency and experiential learning (de Jong et al., 2013). The key is ensuring that technology enhances rather than replaces the relational, hands-on dimensions of learning that remain essential for elementary students' development (Hirsh-Pasek et al., 2015).

4.6.2. Collaborative Platforms and Knowledge-Building Tools: Extending Dialogic Learning

Twelve studies utilized collaborative platforms (e.g., Google Workspace, Microsoft Teams, specialized knowledge-building environments) to

support peer interaction and knowledge construction. These tools facilitated sharing of ideas, collaborative document creation, and asynchronous discussion, extending learning beyond the physical classroom. Studies documented that collaborative platforms were particularly valuable during the Explain and Elaborate phases, supporting students in articulating their thinking and building on peers' ideas. However, effective use required explicit instruction in online collaboration norms and strategies.

From a humanistic perspective, these findings affirm that learning is inherently dialogic: intellectual growth occurs through engagement with diverse perspectives and collaborative meaning-making (Vygotsky et al., 1978; Stahl et al., 2014). Technology can extend these dialogic possibilities when it is used to foster genuine collaboration rather than isolated consumption—a distinction that reflects humanistic pedagogy's emphasis on education as relational practice (Noddings, 2003).

4.6.3. Digital Portfolios and Reflection Tools: Supporting Metacognitive Growth

Eight studies incorporated digital portfolios or specialized reflection tools to support the Evaluate and Reflect phases. These technologies enabled students to document their learning processes, collect evidence of growth, and engage in structured reflection on their thinking and learning strategies. Studies reported that digital portfolios enhanced metacognitive awareness and provided valuable formative assessment information for teachers. Multimedia capabilities allowed students to represent their learning through diverse modalities (text, images, video, audio), supporting diverse learners.

Humanistically, these findings are especially significant: they suggest that technology can support the metacognitive and ethical dimensions of learning when it is designed to facilitate reflection rather than merely record performance (P. C. Abrami & Barrett, 2005). The 7E-EtR model's explicit emphasis on reflection aligns well with digital portfolio approaches that invite students to examine their intellectual and moral growth over time—a practice consistent with humanistic pedagogy's conviction that education should cultivate self-aware, ethically engaged persons (Baehr, 2013; Biesta, 2017).

4.6.4. Considerations for Effective Technology Integration: Equity, Access, and Pedagogical Alignment

Across studies, several factors emerged as important for effective technology integration within the 7E-EtR framework. Technology was most beneficial when it served clear pedagogical purposes aligned with specific learning cycle phases rather than being used for its own sake. Elementary students required explicit instruction and scaffolding for technology use, and technical difficulties could derail lessons when adequate technical support was unavailable. Studies emphasized the importance of ensuring equitable access to technology and addressing digital divides that could exacerbate educational inequalities.

From a humanistic pedagogical standpoint, these findings affirm a core principle: that technology should serve human ends rather than determine them (Biesta, 2017). Effective technology integration requires careful attention to developmental appropriateness, digital equity, and pedagogical alignment—ensuring that technological tools enhance rather than undermine the relational, ethical, and intellectual commitments that define humanistic education (Warschauer & Matuchniak, 2010; Darling-Hammond et al., 2020).

4.7. Discussion

This systematic literature review synthesized evidence from 68 empirical studies examining the 7E-EtR Learning Cycle as an innovative methodology for developing critical thinking skills and character competencies in elementary education. The findings provide robust support for the effectiveness of this approach while illuminating implementation considerations essential for successful adoption. Viewed through the lens of humanistic pedagogy, these results transcend mere instructional efficacy; they reveal how structured inquiry, when grounded in relationality, student agency, and ethical reflection, can operationalize education as a practice of human flourishing (Noddings, 2003; Biesta, 2017).

4.7.1. Synthesis of Evidence on Effectiveness: Cognitive and Character Integration

The evidence demonstrates that the 7E-EtR Learning Cycle consistently produces significant improvements in critical thinking skills, with median effect sizes ($d = 0.78$) indicating substantial educational impact. These effects are comparable to or exceed those reported in meta-analyses of other inquiry-based approaches (Furtak et al., 2012) and critical thinking interventions (P. C. Abrami et al., 2015), suggesting that the learning cycle represents a particularly effective framework for cognitive development. The consistency of positive findings across diverse geographic contexts, subject areas, and

grade levels supports the robustness and generalizability of these effects.

The impact on character development, while examined in fewer studies, is equally noteworthy. The finding that the 7E-EtR approach fosters curiosity, persistence, collaboration, and intellectual virtues addresses a critical need in contemporary education: pedagogical approaches that simultaneously develop cognitive and character competencies. From a humanistic pedagogical standpoint, this dual impact is not coincidental but structurally embedded: when students engage in authentic inquiry, navigate productive struggle, and reflect metacognitively, they simultaneously exercise intellectual virtues (Baehr, 2013) and moral dispositions (Nucci et al., 2014). This challenges the false dichotomy between academic rigor and character education, demonstrating instead that excellence in reasoning and ethical growth are mutually reinforcing dimensions of holistic student development (M. W. Berkowitz et al., n.d.; Lickona & Davidson, n.d.).

4.7.2. Mechanisms of Impact: How Humanistic Pedagogy Operates in the 7E-EtR Cycle

The synthesis reveals several mechanisms through which the 7E-EtR Learning Cycle produces its effects. When interpreted through humanistic pedagogy, these mechanisms illuminate why and how the model cultivates both intellectual and moral capacities:

First, the structured sequence of phases provides a coherent framework that mirrors the humanistic rhythm of learning: encounter, dialogue, integration, and reflection. This structure ensures that students engage in the full range of cognitive processes necessary for deep learning while simultaneously experiencing learning as a meaningful, purposeful journey rather than a series of disconnected tasks (Rogers, 1969).

Second, the emphasis on student agency and active knowledge creation operationalizes the humanistic principle of epistemic respect. The Explore phase positions students as investigators generating their own questions and evidence, fostering ownership of learning and intrinsic motivation. This shift from passive reception to active construction aligns with Freire's (1970) critique of the "banking model" of education and affirms learners as co-creators of knowledge within democratic learning communities.

Third, the explicit incorporation of metacognitive reflection through the Evaluate and Reflect phases promotes self-regulated learning and metacognitive awareness—capacities that distinguish expert from novice learners (B. J. Zimmerman & Schunk, 2011). Humanistically, this reflection is not merely cognitive but ethical: it invites students to examine the values, assumptions, and power dynamics that shape knowledge claims, thereby cultivating intellectual humility, open-mindedness, and responsible citizenship (Biesta, 2017; Baehr, 2013). This may explain why the 7E-EtR model produces larger effects than shorter learning cycle variants that lack explicit reflection phases.

Fourth, the collaborative nature of learning cycle implementation provides extensive opportunities for peer interaction, dialogue, and co-construction of knowledge. These social dimensions support both cognitive development (through cognitive conflict, explanation, and argumentation) and character development (through practice of collaboration, communication, and perspective-taking). Humanistic pedagogy frames this relational dimension as foundational: learning occurs within communities of care where trust, mutual respect, and ethical engagement enable intellectual risk-taking and personal transformation (Noddings, 2003; Palmer, 1998).

4.8. Implications for Practice: Enacting Humanistic Ideals in Elementary Classrooms

The findings have several important implications for elementary educators, administrators, and policymakers seeking to implement innovative, effective pedagogical approaches. These implications extend beyond technical implementation to address the cultural, ethical, and relational conditions necessary for humanistic pedagogy to flourish.

4.8.1. Professional Development as Pedagogical Transformation

The evidence clearly indicates that successful 7E-EtR implementation requires substantial, ongoing professional development that goes beyond brief workshops or written materials. Effective professional development should include extended initial training (minimum 20-30 hours), opportunities for teachers to experience the learning cycle as learners, practice implementing lessons with feedback, collaborative planning time, and ongoing support addressing implementation challenges. Humanistically, this underscores that teaching is not a technical skill but a reflective, relational practice (Palmer, 1998). Professional development must therefore address not only pedagogical strategies but also teachers' underlying beliefs about knowledge, authority, and the purpose of education, supporting

their transformation from transmitters of content to facilitators of intellectual and moral growth.

4.8.2. Curriculum and Resources as Scaffolds for Meaningful Inquiry

Schools and districts should invest in high-quality curriculum materials aligned with the learning cycle framework while providing teachers with flexibility to adapt materials to local contexts and student needs. Curriculum materials should include explicit guidance for each learning cycle phase, formative assessment strategies, differentiation suggestions, and extension activities. While specialized equipment can enhance implementation, the evidence suggests that creative use of everyday materials and community resources can support effective implementation even with limited budgets. This aligns with humanistic pedagogy's conviction that meaningful inquiry honors students' lived experiences and can occur in any context when teachers scaffold learning with care and intentionality (Noddings, 2003).

4.8.3. Structural and Cultural Supports for Humanistic Learning

Administrative leaders should consider structural changes that facilitate 7E-EtR implementation, including flexible scheduling that allows extended time blocks for inquiry, integrated curriculum approaches that reduce fragmentation, and protection of instructional time from interruptions. Crucially, school cultures must shift from compliance-based models to inquiry-centered communities that emphasize intellectual risk-taking, learning from mistakes, and ethical dialogue. Humanistic pedagogy cannot thrive in environments that prioritize standardized compliance over student voice; it requires institutional cultures that value curiosity over conformity and view learning as a collaborative journey rather than a competitive race (Darling-Hammond et al., 2020; Biesta, 2017).

4.8.4. Technology Integration as Relational and Reflective Enhancement

When integrating educational technology, schools should ensure that technology serves clear pedagogical purposes aligned with specific learning cycle phases. Technology integration should be accompanied by professional development building teachers' technological pedagogical content knowledge and by technical support addressing infrastructure needs. Schools must also address digital equity issues to ensure that technology integration does not exacerbate educational inequalities. Humanistically, technology should enhance rather than replace human connection, hands-on exploration, and ethical reflection (Biesta, 2017; Hirsh-Pasek et al., 2015). When aligned with pedagogical intentions, digital tools can extend dialogic possibilities, support metacognitive documentation, and democratize access to inquiry—serving human ends rather than determining them.

4.9. Limitations and Future Research Directions: Expanding the Humanistic Research Agenda

While this review provides robust evidence for the effectiveness of the 7E-EtR Learning Cycle, several limitations should be acknowledged, each pointing toward a future research agenda aligned with humanistic pedagogical priorities:

First, the predominance of quasi-experimental designs and the limited number of randomized controlled trials constrain causal inferences. More rigorous experimental studies are needed, particularly studies examining long-term effects and mechanisms of impact. Humanistically, future research should move beyond short-term outcome metrics to track the development of intellectual virtues and ethical dispositions over time, recognizing that character formation and critical reasoning mature gradually through sustained practice (Baehr, 2013; Dweck, 2006).

Second, the heterogeneity in outcome measures, particularly for character development, limits direct comparisons across studies and prevented meta-analytic synthesis. Development of validated, standardized measures of character competencies in elementary contexts would strengthen future research. Importantly, such measures must capture the qualitative dimensions of intellectual virtue—curiosity, humility, courage, integrity—rather than reducing character to behavioral checklists or compliance indicators (Nucci et al., 2014).

Third, most included studies focused on short to medium-term outcomes (one semester to one year), with limited evidence on long-term retention and transfer of skills. Longitudinal studies examining whether critical thinking and character competencies developed through the 7E-EtR approach persist and transfer to new contexts would provide valuable insights into education's lifelong impact.

Fourth, the review identified limited research on implementation with diverse learner populations, including students with disabilities, English language learners, and students from economically disadvantaged backgrounds. Research explicitly examining how the 7E-EtR approach can be

differentiated and adapted to support diverse learners is an important priority. Humanistic pedagogy demands that inquiry-based models be culturally responsive and inclusive, ensuring that all students experience epistemic respect and opportunities for intellectual and moral growth.

Fifth, while the review identified technology integration as a promising area, the rapid pace of technological change means that specific technologies examined in included studies may already be outdated. Ongoing research examining emerging technologies (e.g., artificial intelligence, augmented/virtual reality) within the learning cycle framework is needed, with careful attention to how these tools support or undermine relational, ethical, and metacognitive learning.

Finally, most included studies were conducted by researchers invested in demonstrating the effectiveness of the approach, raising potential publication bias concerns. Independent replication studies conducted by neutral researchers would strengthen confidence in findings and advance scholarly dialogue about the conditions under which humanistic pedagogies thrive.

4.10. Contribution to Innovative Pedagogy Literature: Advancing a Humanistic Paradigm

This review makes several important contributions to the literature on innovative pedagogical methodologies in elementary education. First, it provides the most comprehensive synthesis to date of evidence on the 7E-EtR Learning Cycle's impact on critical thinking and character development, establishing an empirical foundation for this approach. Second, by examining both cognitive and character outcomes, the review demonstrates that these dimensions of learning are mutually reinforcing rather than competing, supporting integrated approaches to holistic student development aligned with humanistic educational philosophy.

Third, the review's attention to implementation characteristics, facilitators, and barriers provides practical guidance for practitioners while highlighting the complexity of translating pedagogical innovations from research to practice. Fourth, by synthesizing evidence across diverse geographic contexts, the review illuminates both universal principles and context-specific considerations in implementing inquiry-based approaches, affirming that humanistic pedagogy is not culturally bound but adaptable to diverse educational ecosystems when implemented with relational intentionality.

Finally, this review bridges empirical evidence with philosophical foundations, positioning the 7E-EtR Learning Cycle not merely as an instructional technique but as a vehicle for humanistic pedagogy in practice. In doing so, it aligns with Scientific Culture's mission to advance interdisciplinary scholarship that connects educational innovation with broader questions of human development, ethical citizenship, and cultural flourishing. By identifying important gaps in the evidence base, the review establishes priorities for future research that can deepen our understanding of how pedagogical approaches can honor the dignity, agency, and holistic potential of every learner.

5. CONCLUSION

This systematic literature review synthesizes evidence from 68 empirical studies to demonstrate that the 7E-EtR Learning Cycle is a highly effective pedagogical framework for simultaneously cultivating critical thinking and character competencies in elementary education. Grounded in constructivist and humanistic principles, the cycle's structured sequence—particularly its explicit integration of metacognitive reflection—operationalizes education as a practice of holistic human development. The consistent positive effects across diverse geographic contexts and subject areas affirm that when inquiry is designed to honor student agency, foster dialogic collaboration, and encourage ethical reflection, cognitive excellence and moral growth emerge as mutually reinforcing outcomes rather than competing educational priorities.

The findings carry significant implications for contemporary educational practice and policy. From a humanistic pedagogical standpoint, the 7E-EtR model challenges instrumentalist approaches by positioning classrooms as communities of inquiry where intellectual virtues—curiosity, persistence, intellectual humility, and ethical reasoning—are cultivated through authentic, relational practice. Successful implementation, however, requires more than procedural fidelity; it demands substantial teacher professional development, flexible scheduling, supportive school cultures, and thoughtful technology integration that serves pedagogical rather than purely instrumental ends (Darling-Hammond et al., 2020). When these conditions are met, the learning cycle becomes a vehicle for enacting humanistic ideals: validating students' lived experiences, scaffolding their capacity for critical self-reflection, and nurturing their development as autonomous, ethically engaged

learners.

While this review establishes a robust empirical foundation for the 7E-EtR approach, several limitations warrant attention. The predominance of short-to-medium-term studies, heterogeneity in character assessment tools, and limited research on diverse learner populations highlight the need for longitudinal, culturally responsive, and methodologically rigorous investigations. Future scholarship should prioritize developing validated measures of intellectual and moral virtues, examining long-term impacts on civic and ethical development, and exploring how emerging educational technologies can deepen—rather than displace—the relational and reflective dimensions of humanistic pedagogy. Ultimately, as elementary educators navigate the complexities of 21st-century schooling, the 7E-EtR Learning Cycle offers a theoretically coherent, empirically validated, and philosophically grounded pathway for fostering both critical reflection and character formation. By aligning instructional design with the inherent dignity and holistic potential of every child, this model advances a vision of education that is not only effective but profoundly human.

Conflict of Interest: Any other information presented at the end of the paper must be treated as normal, separate sections and numbered. Use Heading 1 in the styles gallery for these sections.

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