

Developmental Readiness, Early Entry Policy, and Preschool Access: Structural Influences on Early Literacy Outcomes in Montana

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Abstract

State-level early education policies shape children's developmental and academic trajectories in ways that extend well beyond kindergarten. Montana permits children to enroll in kindergarten at age four if they turn five on or before September 10 and remains one of the few states without state-funded universal preschool (Cormier, 2025). Developmental science suggests that school readiness is determined not solely by chronological age but by neurological maturation in executive functioning, emotional regulation, and early language acquisition (Banihashem et al., 2021; Demetriou et al., 2020). In a Montana elementary school where 88% of students were not proficient in reading by the end of the 2023–2024 academic year (Cormier, 2025), a quantitative ex post facto analysis ($N = 64$) examined whether age, gender, race, and socioeconomic status were associated with third grade reading achievement. Results indicated no statistically significant relationships between reading scores and age, race, or socioeconomic status; however, gender differences were statistically significant ($p < .001$), with female students outperforming male students (Cormier, 2025). These findings suggest that early literacy disparities in Montana must be interpreted within a structural policy context shaped by early entry age and limited preschool access. Developmentally informed reforms are warranted.

1. Introduction

Early literacy proficiency is a strong predictor of long-term academic success and educational attainment. Students who have not developed foundational reading skills by the end of third grade are more likely to experience persistent academic difficulty, school disengagement, grade retention, and a reduced likelihood of high school completion (Annie E. Casey Foundation, 2021). Because reading supports learning across content areas, literacy achievement during the elementary years remains central to educational policy, accountability, and school-improvement efforts in the United States.

The importance of early literacy has become especially visible in the aftermath of the COVID-19 pandemic. National and international research documented declines in reading achievement following school closures and instructional disruptions, with particular concern for elementary students whose early literacy development was interrupted (Mazrekaj & De Witte, 2023; Moran et al., 2022). Although pandemic-related learning loss remains an important consideration, literacy development is shaped by more than classroom instruction or short-term disruption. Policies governing school-entry age, access to preschool, and opportunities for early learning may influence children's readiness for formal schooling well before they encounter standardized literacy assessments.

Montana provides an important context for examining the intersection of educational policy and literacy achievement. Children may enter kindergarten if they turn five by September 10, giving Montana one of the youngest school-entry ages in the United States (Cormier, 2025). In addition, the absence of state-funded universal preschool means that access to early childhood education depends substantially on local resources, family finances, geography, and program availability. Together, these conditions may contribute to considerable variation in children's developmental readiness and educational experiences at kindergarten entry.

Recent research indicates that developmental readiness is associated with academic achievement and extends well beyond chronological age. Readiness includes cognitive, linguistic, social-emotional, behavioral, and executive-functioning capacities that support successful participation in school (Banihashem et al., 2021; Demetriou et al., 2020). Children who enter school with stronger language, self-regulation, attention, and executive-functioning skills are often better positioned to engage with early academic demands. These capacities reflect both biological maturation and environmental experience, including access to high-quality early education, language-rich environments, and opportunities for social and cognitive development.

Educational policies concerning kindergarten entry age are frequently discussed in terms of enrollment timelines, childcare considerations, or administrative convenience. However, developmental science suggests that these policies carry major implications for children's academic and social-emotional trajectories (Ansari et al., 2021; Samuels, 2022). During early childhood, developmental differences of even a few months may correspond with meaningful differences in executive functioning, language acquisition, emotional regulation, and cognitive maturity. Consequently, policies that determine when children begin formal schooling may influence educational outcomes well beyond kindergarten.

Research shows that younger students in a grade commonly face disadvantages in achievement, behavior, and how teachers perceive them (Scammacca et al., 2020; Samuels, 2022). These effects usually shrink over time but can affect key periods of reading development. Similarly, many studies find that preschool helps vocabulary, phonological awareness, executive functioning, and school readiness (Ansari et al., 2021; Moran et al., 2022). This means school entry age and preschool access are important structural factors in literacy outcomes.

Within this policy context, one rural Montana elementary school reported that approximately 88% of students were not reading proficiently at the end of the 2023–2024 academic year. Although this figure represents a single school rather than a statewide pattern, it raises important questions about literacy achievement in rural settings. The school serves a geographically isolated community in which access to early childhood resources and prekindergarten educational opportunities may vary substantially. This setting therefore provides a useful context for examining literacy achievement in relation to developmental and structural conditions.

The educational context of the participating school is central to interpretation of the study. When literacy difficulties are widespread across a school population, demographic differences may be less readily detectable because academic challenges extend across multiple student groups. Accordingly, this study uses a structural lens to consider how educational policy, access to early learning opportunities, developmental readiness, and broader contextual conditions may shape achievement across the student population (Ansari et al., 2021; Bronfenbrenner & Morris, 2006; Demetriou et al., 2020). This perspective is particularly relevant in Montana, where school-entry requirements and uneven preschool access may influence developmental opportunities before formal schooling begins (Samuels, 2022).

This article therefore examines literacy achievement within a developmental-policy framework. Rather than attributing outcomes to any single factor, the analysis considers the intersection of developmental processes, educational opportunities, instructional experiences, demographic characteristics, and policy conditions.

Drawing on Piaget's constructivist theory, contemporary developmental science, research on relative-age effects, and findings from a quantitative ex post facto study in a rural Montana elementary school, this article examines associations among age, gender, race, socioeconomic status, and reading achievement. The findings are then situated within Montana's broader policy context, particularly kindergarten-entry requirements and preschool access. Integrating developmental theory, empirical findings, and policy analysis allows literacy achievement to be considered not only as an instructional concern but also as a developmental and structural policy issue.

To establish the foundation for this developmental-policy perspective, the following literature review examines theoretical and empirical evidence connecting developmental readiness with literacy achievement. Particular attention is given to cognitive development, executive functioning, relative-age effects, preschool access, gender differences in literacy achievement, and the distinctive conditions of rural education. Together, these areas provide the conceptual framework for interpreting the present study within Montana's educational context.

Literature Review and Developmental Readiness Framework

Developmental Readiness and Early Academic Success

Developmental readiness has emerged as one of the most important concepts in contemporary early childhood education. Although school readiness is often discussed in relation to chronological age, developmental scientists increasingly recognize that readiness encompasses a broad constellation of cognitive, linguistic, behavioral, emotional, and social competencies that support successful engagement in formal learning environments (Banihashem et al., 2021; Demetriou et al., 2020). Children enter kindergarten with considerable variability in these developmental domains, and these differences frequently influence academic achievement throughout the elementary years.

Historically, school readiness was conceptualized primarily as a child's preparedness to meet the demands of formal schooling. More recent perspectives emphasize that readiness signifies a dynamic interaction between the child and the instructional environment (Ansari et al., 2021). In this view, readiness is not exclusively a characteristic of the student but also a function of how effectively educational systems accommodate developmental variation among learners. Instructional environments that align with developmental capacities are more likely to promote academic success than those that presume uniform readiness among students of the same chronological age.

Research repeatedly demonstrates that developmental readiness predicts academic achievement across multiple domains, including reading, mathematics, and social-emotional functioning (Demetriou et al., 2020). Children who enter school with stronger readiness skills are more likely to achieve positive educational outcomes, while students who begin school with developmental vulnerabilities often need additional academic and behavioral support. These early differences frequently compound over time, creating achievement gaps that become increasingly difficult to remediate in later grades.

The significance of developmental readiness is especially clear in literacy development. Reading acquisition requires children to integrate multiple cognitive processes simultaneously, including language comprehension, memory, attention, phonological processing, and executive functioning. When

developmental capacities are not sufficiently established, students may struggle to meet academic expectations despite receiving high-quality instruction. Consequently, literacy outcomes cannot be understood solely as measures of instructional effectiveness; they must also be examined in relation to developmental readiness.

Piaget's Constructivist Theory and Developmental Learning

Piaget's constructivist cognitive developmental theory provides a valuable means for understanding developmental readiness and literacy acquisition. Piaget (1964, 1971) proposed that children actively construct knowledge through interaction with their environment rather than passively receiving information. Learning occurs through processes of assimilation and accommodation as children integrate new experiences into existing cognitive structures and modify them when necessary.

According to Piaget, children progress through a series of developmental stages characterized by increasingly sophisticated forms of thinking. During the preoperational stage, which typically occurs between ages two and seven, children develop symbolic thought and language but often have difficulty with logical reasoning and perspective-taking. The transition to the concrete operational stage involves improvements in logical thinking, classification, and problem-solving capacities that support more complex academic learning.

Literacy acquisition depends heavily upon cognitive capacities that develop during these early stages. Reading requires symbolic representation, language comprehension, memory, and the ability to connect abstract symbols with meaning. Piaget's theory suggests that educational instruction is most effective when aligned with children's developmental capacities. When academic expectations exceed developmental readiness, learning may become more difficult and less meaningful.

Contemporary developmental research supports many aspects of Piaget's theory while increasing insight into the factors that influence cognitive development. Researchers now recognize that development is influenced not only by maturation but also by environmental experiences, social interactions, and educational opportunities (Banihashem et al., 2021). Nevertheless, Piaget's central premise, that learning must be understood in relation to developmental readiness—remains highly relevant for educational policy and practice.

Executive Functioning and Literacy Development

Executive functioning has emerged as one of the strongest predictors of early academic success. Executive functioning refers to a set of cognitive processes that enable individuals to regulate behavior, sustain attention, manage emotions, and engage in goal-directed activities (Demetriou et al., 2020). Core components include working memory, inhibitory control, and cognitive flexibility.

Working memory allows students to hold and manipulate information while engaged in academic tasks. In reading, working memory supports comprehension by helping students retain information from earlier portions of a text as they integrate new information. Inhibitory control allows students to resist distractions and sustain focus during learning activities. Cognitive flexibility promotes problem-solving and adaptation to changing instructional demands.

Research consistently demonstrates strong relationships between executive functioning and literacy achievement (Banihashem et al., 2021). Students with stronger executive functioning skills tend to demonstrate greater reading comprehension, vocabulary acquisition, and academic persistence.

Conversely, deficits in executive functioning are often associated with academic difficulties, behavioral concerns, and challenges related to class participation.

Executive functioning develops rapidly during early childhood and continues to mature throughout adolescence. Importantly, these skills are affected by both biological maturation and environmental experiences. High-quality early childhood programs frequently include opportunities for structured play, self-regulation practice, and social interaction that support the development of executive functioning. As a result, educational policies that affect preschool participation and school entry timing may indirectly shape literacy outcomes by influencing executive functioning.

Relative Age Effects and School Entry Policy

One of the most extensively studied topics in developmental readiness is relative age effects. Relative age refers to a student's age relative to peers within the same grade cohort. In schooling systems that use age-based enrollment cutoffs, some students enter school a year older than their classmates, even though they are assigned to the same grade level.

Research consistently indicates that younger students within a cohort often experience disadvantages in academic achievement, behavior management, and social-emotional adjustment (Scammacca et al., 2020; Samuels, 2022). Younger students are more likely to receive special education referrals, exhibit behavioral difficulties, and perform less favorably on standardized assessments during the elementary years.

Several explanations have been proposed for these outcomes. Developmental differences of six to twelve months represent a substantial proportion of a young child's life and may correspond to meaningful differences in cognitive maturity, language development, executive functioning, and emotional regulation. Consequently, younger students may encounter academic expectations before they have developed the readiness necessary to meet them successfully.

A meta-analysis by Scammacca et al. (2020) found consistent evidence of relative age effects in reading achievement across multiple educational contexts. Although the scale of these effects often decreases over time, early academic experiences may influence students' confidence, motivation, and perceptions of academic competence. These outcomes suggest that school-entry policies warrant close consideration from developmental and educational perspectives.

Preschool Access and School Readiness

Preschool participation represents a further vital component influencing developmental readiness. High-quality preschool programs provide opportunities for language enrichment, social interaction, executive functioning development, and early literacy skill acquisition before children enter formal schooling.

Research regularly demonstrates positive relationships between preschool participation and academic achievement (Ansari et al., 2021; Moran et al., 2022). Children who attend high-quality preschool programs often demonstrate stronger vocabulary, phonological awareness, letter recognition, and social-emotional competence than peers without similar experiences. These advantages often contribute to easier transitions into kindergarten and stronger academic performance during the primary grades.

The benefits of preschool participation may be particularly important for children residing in economically disadvantaged or geographically isolated communities. Preschool programs can provide

access to instructional activities and developmental support that may not otherwise be available. Consequently, disparities in preschool access may contribute to differences in school readiness and academic achievement.

Montana's absence of universal preschool creates substantial variability in access to early learning opportunities. Rural communities regularly face additional challenges related to transportation, staffing, funding, and program availability. As a result, children may enter kindergarten with dramatically diverse levels of educational preparation. These structural differences emphasize the importance of examining preschool access as a policy variable that may influence literacy outcomes.

Gender Differences in Literacy Achievement

Gender differences in literacy achievement have been documented consistently across school contexts. National and international studies routinely find that girls outperform boys in reading achievement, often beginning during the elementary years, and persisting throughout formal schooling (Delaney & Devereux, 2021).

Several developmental factors could contribute to these patterns. Research suggests that girls often demonstrate earlier development in language acquisition, self-regulation, and executive functioning. These developmental advantages may support literacy acquisition through promoting attention, persistence, and engagement with reading-related activities.

Educational environments may similarly contribute to gender differences. Early literacy instruction frequently emphasizes sustained attention, behavioral compliance, and language-based tasks that correspond closely with developmental strengths commonly observed among girls during early childhood. However, researchers caution against interpreting gender differences as fixed or biologically predetermined. Instead, literacy achievement shows interactions among developmental timing, environmental effects, instructional practices, and educational expectations (Clark et al., 2023).

Understanding gender differences is particularly important within the context of literacy achievement because these disparities usually develop early and persist over time. Educational interventions that acknowledge developmental variability while sustaining high expectations may help reduce achievement gaps and support success for all learners.

Rural Education and the Montana Context

Academic results must also be understood within the wider contexts in which students live and learn. Rural schools frequently encounter difficulties distinct from those in urban and suburban settings. Geographic isolation, limited access to services, staffing shortages, transportation barriers, and funding limitations may shape educational opportunities and student outcomes.

Montana's rural character makes these issues particularly relevant. Many communities are located considerable distances from educational and healthcare resources, including early childhood programs. Families may encounter barriers to accessing preschool services, specialized interventions, and developmental support that are more readily available in urban settings.

At the same time, rural communities commonly possess strengths that support student development, including strong community relationships, family involvement, and close connections among schools and local stakeholders. Understanding literacy achievement within Montana, therefore, requires consideration of both the problems and assets associated with rural educational contexts.

Taken together, the literature indicates that literacy achievement reflects interactions among developmental readiness, school-entry policy, preschool access, executive functioning, demographic characteristics, and educational context (Ansari et al., 2021; Banihashem et al., 2021; Demetriou et al., 2020). In settings where literacy challenges are widespread, however, demographic differences may be less visible because broader conditions affect students across groups. This possibility is especially relevant to the present study, in which overall reading proficiency was exceptionally low. A structural lens therefore provides a useful framework for examining how individual characteristics operate within the educational and policy systems that shape children's development (Bronfenbrenner & Morris, 2006; Piaget, 1964, 1971).

Guided by this developmental and structural framework, the study examined whether age, gender, race, and socioeconomic status were associated with third-grade reading achievement in a rural Montana elementary school. The methodology described below defines the study's scope and provides the basis for interpreting its findings without extending conclusions beyond the variables that were directly measured.

2. Methodology and Study Design

Research Design

This study employed a quantitative ex post facto design to examine associations among age, gender, race, socioeconomic status, and third-grade reading achievement within a rural Montana elementary school. Ex post facto designs are appropriate for investigating naturally occurring characteristics that cannot be ethically or practically manipulated (Creswell & Creswell, 2018). Because the variables of interest already existed in school records, this design allowed the study to examine patterns in literacy achievement without assigning participants to conditions.

The study focused on demographic factors commonly associated with academic achievement within a school context characterized by widespread literacy challenges. Developmental readiness theory and Montana's educational policy context informed interpretation of the results, particularly with respect to kindergarten-entry requirements and access to preschool.

Because ex post facto research identifies associations rather than causal effects, the findings should not be interpreted as demonstrating that any demographic or structural factor caused the observed reading outcomes. Instead, the design provides a descriptive and inferential examination of naturally occurring patterns within one educational setting and a basis for considering how those patterns correspond with the broader developmental and policy literature.

Research Questions

The study was guided by the following research questions:

1. Is there a statistically significant relationship between age and third grade reading achievement among students attending a rural Montana elementary school?
2. Is there a statistically significant relationship between gender and third grade reading achievement among students attending a rural Montana elementary school?
3. Is there a statistically significant relationship between race and third grade reading achievement among students attending a rural Montana elementary school?
4. Is there a statistically significant relationship between socioeconomic status and third grade reading achievement among students attending a rural Montana elementary school?

These questions were developed to explore whether demographic characteristics frequently discussed in educational research were associated with literacy achievement within a rural Montana context.

Setting and Context

The study was conducted at a rural elementary school in a geographically isolated Montana community. Although the school's identity remains confidential to protect participant anonymity, the site reflects characteristics common to many rural schools throughout the state. These characteristics include limited access to early childhood educational services, geographic barriers to educational resources, and substantial variation in educational opportunities prior to kindergarten entry.

The school was selected due to concerns about literacy achievement. At the conclusion of the 2023–2024 academic year, approximately 88% of students failed to meet the district- and state-established reading proficiency benchmarks. While this figure reflects a localized educational context rather than a statewide trend, it raises important questions regarding developmental readiness, educational opportunity, and structural factors influencing literacy achievement.

The school's rural context is particularly important because rural educational environments often face challenges in staffing, transportation, resource allocation, and access to early intervention services. Additionally, families residing in rural communities may have fewer opportunities to access preschool programs, developmental screenings, and specialized educational supports before kindergarten entry. These contextual factors provide an important backdrop for interpreting the study's findings.

Participants

The sample consisted of 64 third-grade students enrolled in the participating elementary school. Third grade was selected because it represents an important period in literacy development, commonly described as a transition from "learning to read" toward "reading to learn" (Annie E. Casey Foundation, 2021). Literacy performance at this stage has been associated with later academic outcomes, making the grade level relevant to the study's focus.

The participant group represented the entire third-grade cohort within the school. Because all available students meeting the inclusion criteria were included in the analysis, the study utilized a census sampling approach rather than a random sampling procedure. This approach allowed for examination of literacy achievement across the entire grade level while minimizing sampling bias within the school context.

Demographic variables included age, gender, race, and socioeconomic status. Age was grouped into three-month intervals to examine potential relative-age effects within the grade cohort. Gender was categorized according to school records. Race was examined using categories maintained within the district's student information system. Socioeconomic status was operationalized through eligibility for free or reduced-price lunch, a commonly used proxy measure in educational research.

Data Sources and Measures

Reading Achievement

Reading achievement served as the dependent variable and was measured using Northwest Evaluation Association (NWEA) reading assessments. NWEA assessments are widely used standardized measures designed to evaluate student growth and achievement across multiple academic domains. The

assessment provides nationally normed scores and is commonly used for instructional planning, progress monitoring, and accountability.

NWEA scores provided a standardized, continuous measure of reading achievement across participants and were suitable for the statistical analyses used in the study. Their use also reduced variability that might arise from relying on teacher-developed measures.

Independent Variables

Four independent variables were examined:

- **Age:** Student age was categorized into 3-month intervals based on birthdate information available in school records. This categorization allowed for examination of potential relative-age effects among students within the same grade cohort.
- **Gender:** Gender was recorded according to student demographic information maintained by the school district.
- **Race:** Race categories were derived from demographic information contained within student records.
- **Socioeconomic Status:** Socioeconomic status was measured using eligibility for free or reduced-price lunch. Although this measure does not capture the full complexity of socioeconomic conditions, it is widely used in educational research as an indicator of economic disadvantage.

Data Collection Procedures

Data were obtained through existing educational records maintained by the school district. Student identifying information was removed prior to analysis to protect confidentiality. The study utilized archival educational data and did not require direct interaction with students.

All procedures were conducted in accordance with institutional and ethical guidelines governing educational research. Appropriate permissions were obtained for the use of student achievement and demographic data. Data were stored securely, and all analyses were conducted using de-identified records to ensure participant privacy.

Data Analysis

Statistical analyses examined associations between the four demographic variables and reading achievement. Descriptive statistics were first used to summarize participant characteristics and achievement outcomes, followed by inferential analyses to evaluate whether reading performance differed across demographic groups.

The alpha level was set at .05 for all inferential analyses. Statistical significance was evaluated using $p < .05$ as the decision criterion. Because the sample was small, statistical findings were interpreted cautiously and in relation to the study's design, sample characteristics, and broader literature.

The sample size limited statistical power and may have reduced the study's ability to detect modest subgroup differences. Accordingly, both statistically significant and nonsignificant results were interpreted as context-specific findings rather than evidence of broad population-level effects.

Methodological Considerations and Limitations

Several methodological considerations informed the interpretation of the findings. First, because the study involved a single school, external validity is limited. Findings should not be generalized to Montana schools without additional research involving larger, more diverse samples.

Second, the study examined a context characterized by widespread literacy challenges. When a substantial proportion of students perform below proficiency benchmarks, variability in achievement may be reduced, potentially making subgroup differences more difficult to detect statistically.

Third, the study focused on demographic variables and did not examine potentially important contextual influences such as instructional quality, attendance patterns, preschool participation history, intervention services, teacher experience, or family engagement. These factors contribute to literacy outcomes and warrant consideration in future research.

Despite these limitations, the study provides context-specific evidence about literacy achievement in a rural educational setting and contributes to discussion of developmental readiness, educational equity, and early childhood policy. These methodological boundaries are important to the interpretation of the findings presented in the following section.

With these methodological considerations in mind, the findings are interpreted cautiously and within the specific context of the participating school. The discussion distinguishes between relationships observed in the data and broader developmental or structural explanations drawn from the literature.

3. Findings and Discussion

Overview of Findings

The study examined associations among age, gender, race, socioeconomic status, and third-grade reading achievement in a rural Montana elementary school. Gender was the only variable significantly associated with reading achievement, with female students outperforming male students. No statistically significant associations were identified for age, race, or socioeconomic status.

The nonsignificant findings for race and socioeconomic status differ from national research documenting persistent achievement disparities across both variables (Clark et al., 2023; Kyere et al., 2023; National Center for Education Statistics, 2021). These results should not be interpreted as evidence that such disparities are absent in Montana. Rather, they may reflect the characteristics of this particular sample, the study's limited statistical power, or contextual conditions within the participating school.

Interpretation of these results therefore requires attention to sample size, school context, and the limits of the variables measured. The developmental-policy framework used in this article provides one way to situate the findings within a broader body of research without attributing the observed outcomes to unmeasured structural factors.

Importantly, the absence of statistically significant findings for age, race, and socioeconomic status does not establish that these factors are unrelated to literacy development. It indicates only that statistically significant associations were not detected in this sample. Broader structural conditions remain relevant as contextual considerations and should be examined directly in future research.

Interpreting the Non-Significant Age Findings

One of the study's notable findings was the absence of a statistically significant association between age and reading achievement. This result differs from research documenting relative-age effects in academic achievement, behavioral outcomes, and school readiness (Samuels, 2022; Scammacca et al., 2020). Across educational systems, younger students within grade cohorts have sometimes demonstrated disadvantages in academic performance and school adjustment, particularly during the primary grades (Scammacca et al., 2020).

The present finding should not be interpreted as evidence that developmental readiness or relative age is unimportant. Instead, it indicates that an age-related difference was not detected within this sample and warrants consideration of several methodological and developmental explanations.

First, the sample size limited statistical power, making modest relative-age effects more difficult to detect. A nonsignificant result in a sample of 64 students therefore cannot establish the absence of an age effect in the broader population.

Second, the participating school was characterized by widespread literacy difficulty, with approximately 88% of students not meeting reading-proficiency benchmarks. This restricted educational context may have reduced observable differences among age groups, although the present study did not directly test that explanation.

Third, chronological age is only one component of developmental readiness. Children of similar ages may differ in executive functioning, language development, self-regulation, social-emotional competence, and prior educational experience (Banihashem et al., 2021; Demetriou et al., 2020). Age therefore provides an incomplete measure of the developmental capacities that may influence literacy achievement.

Rather than contradicting the relative-age literature, the finding underscores the need for research that measures developmental readiness more directly and examines age alongside preschool participation, early learning experiences, and educational context.

For policy and practice, the finding cautions against treating chronological age as a complete indicator of readiness. Age remains administratively important, but developmental readiness encompasses a broader set of capacities and experiences that may be relevant to children's success at school entry.

Understanding the Gender Differences

The most significant finding of the study involved gender differences in literacy achievement. Female students demonstrated significantly higher reading achievement than male students, a finding consistent with extensive national and international research (Delaney & Devereux, 2021).

Gender differences in literacy achievement have been documented across numerous educational contexts and age groups. Research consistently indicates that girls outperform boys in reading proficiency, reading engagement, and language-related academic tasks. These differences often emerge during the early elementary years and may persist throughout formal schooling.

Developmental science provides several explanations for these patterns. Girls frequently demonstrate earlier development in language acquisition, expressive communication, executive functioning, and self-regulation. These developmental advantages may facilitate literacy acquisition because reading instruction relies heavily upon sustained attention, behavioral regulation, vocabulary development, and language comprehension.

Executive functioning may be particularly relevant because literacy instruction requires sustained attention, impulse regulation, persistence, and organization of information. Developmental differences in these capacities may contribute to variation in how students engage with reading instruction during the initial stages of literacy acquisition.

However, these findings should not be interpreted as evidence of fixed differences in ability. Rather, they reflect interactions among developmental timing, educational expectations, instructional practices, and environmental influences. Many boys become successful readers and demonstrate strong

literacy achievement when instructional approaches align with their developmental needs and learning preferences.

The findings highlight the importance of developmentally responsive instruction. Educational systems should consider how instructional practices may interact with developmental variability and should seek to provide learning environments that support all students while maintaining high expectations.

Race, Socioeconomic Status, and Structural Conditions

The absence of statistically significant relationships involving race and socioeconomic status also warrants careful consideration. National data consistently demonstrate achievement disparities associated with both race and socioeconomic background (National Center for Education Statistics, 2021). Consequently, the findings of the present study should not be interpreted as contradicting the broader literature.

Several factors may have contributed to these nonsignificant results, including limited statistical power and the demographic composition of the sample. The participating school's widespread literacy difficulties also provide important context; however, because the study did not directly test structural explanations, these possibilities should be treated as hypotheses for future investigation rather than conclusions from the present data.

The findings therefore support the value of situating demographic results within a broader structural context while maintaining a clear distinction between measured variables and contextual interpretation. Preschool access, school-entry policy, educational resources, rural service availability, and post-pandemic disruption are plausible influences identified in the literature, but their effects were not directly measured in this study.

This perspective aligns with ecological approaches to educational research, which emphasize the interaction between individual characteristics and environmental conditions. Educational outcomes emerge not only from student characteristics but also from the systems and contexts within which students develop.

Developmental Readiness as a Policy Issue

A central argument of this manuscript is that literacy achievement warrants consideration as both an instructional and a developmental-policy issue. The present findings do not demonstrate that particular policies caused the observed outcomes; rather, they provide a context for considering how the study's patterns correspond with developmental research and Montana's educational environment.

Developmental readiness is shaped by experiences that occur long before children enter kindergarten. Access to preschool, opportunities for language development, early literacy experiences, social-emotional learning opportunities, and family support systems all contribute to readiness. Educational policies influence many of these factors by determining when children enter school and what opportunities are available prior to enrollment.

Montana's policy environment is relevant because it combines a comparatively young kindergarten-entry cutoff with limited access to universal preschool. These conditions may contribute to variability in readiness among children entering kindergarten, although the present study did not measure preschool participation or readiness directly. Developmental research nevertheless supports examining readiness alongside chronological age when evaluating early childhood policies and programs.

Accordingly, the policy discussion that follows draws on the study's findings together with the broader developmental literature. Recommendations are presented as directions for consideration and further evaluation rather than as causal conclusions from this single-site study.

Findings Within the Rural Montana Context

The study's rural context provides additional insight into the findings. Rural communities often experience unique educational challenges, including limited access to early childhood programs, geographic barriers to services, staffing shortages, and resource constraints. These factors may influence developmental readiness and literacy achievement in ways that differ from urban and suburban settings.

At the same time, rural communities frequently possess important strengths, including close relationships among schools, families, and community members. Understanding literacy achievement within Montana requires recognition of both the challenges and assets associated with rural educational contexts.

The findings suggest that literacy achievement within rural communities should be examined through a comprehensive framework that considers developmental, instructional, environmental, and policy influences simultaneously. Such an approach provides a more nuanced understanding of educational outcomes and may support more effective policy development.

4. Summary of Findings

Taken together, the findings add context-specific evidence to literature on developmental readiness and literacy achievement. The significant gender difference is consistent with prior research, whereas the nonsignificant findings for age, race, and socioeconomic status require cautious interpretation because of the small, single-site sample and the school's unusually low overall proficiency.

More broadly, the findings illustrate the value of interpreting literacy outcomes within the interaction of developmental processes, educational opportunities, demographic characteristics, and policy context. This perspective provides a foundation for considering policy implications while preserving the distinction between the variables measured in the study and broader structural factors identified in the literature.

The findings shift the discussion from observed statistical relationships to the broader question of how educational systems might respond to developmental variability and differences in early opportunity. Because the study cannot establish that school-entry policy, preschool access, or other structural factors caused the outcomes observed, the following recommendations are grounded in the combined evidence of the present study and the broader developmental literature.

Policy Implications and Recommendations

The study's findings have implications for educational policy, early childhood programming, and literacy reform in Montana when considered alongside the broader developmental literature. Literacy achievement is often discussed primarily in relation to curriculum and instruction; however, developmental readiness and access to early learning opportunities also warrant consideration. Because the present study did not directly measure preschool participation, readiness, or the effects of school-entry policy, the recommendations below should be understood as evidence-informed policy considerations rather than causal conclusions from the study.

Within this developmental-policy framework, policymakers can consider how children's developmental capacities, early educational experiences, and structural opportunities interact before formal literacy instruction begins. The following recommendations connect the study's context with established developmental and early childhood research.

Reconsidering Kindergarten Entry Policies

One of the most significant policy implications of this study concerns Montana's kindergarten entry requirements. Montana currently permits kindergarten enrollment for children who turn five years old on or before September 10, resulting in one of the youngest kindergarten entry ages in the United States. As a result, some children begin formal schooling shortly after their fifth birthday, while classmates may be a full year older. During early childhood, developmental differences of this magnitude can correspond to substantial variation in executive functioning, language development, emotional regulation, attentional control, and social competence (Banihashem et al., 2021; Demetriou et al., 2020).

Age was not a statistically significant predictor of reading achievement in the present sample. This result differs from research documenting relative-age effects on achievement and school adjustment (Samuels, 2022; Scammacca et al., 2020), but it should not be interpreted as evidence that developmental readiness is unrelated to literacy outcomes. Instead, it highlights the limits of chronological age as a stand-alone measure of readiness.

The participating school's widespread literacy difficulties provide an important context for interpreting the age finding, but the study did not test whether structural conditions suppressed age-related differences. Accordingly, explanations involving preschool access, early learning opportunities, or prekindergarten educational conditions remain plausible hypotheses derived from the literature rather than findings of this analysis (Ansari et al., 2021; Moran et al., 2022).

This interpretation aligns with contemporary developmental science, which emphasizes that readiness encompasses far more than age. Executive functioning, language development, self-regulation, social-emotional competence, and early educational experiences all contribute to a child's preparedness for formal schooling (Banihashem et al., 2021; Demetriou et al., 2020). Research has consistently demonstrated that children who enter school with stronger executive functioning and language skills are more likely to experience academic success during the elementary years (Ansari et al., 2021; Piaget, 1964). Two children of the same age may enter kindergarten with dramatically diverse levels of readiness depending on their developmental histories and access to early learning opportunities.

Consequently, reconsideration of kindergarten-entry policy should be grounded in broader developmental evidence rather than in the nonsignificant age result alone. Policymakers may wish to examine approaches that combine age-based criteria with parent consultation, developmentally appropriate readiness information, and transitional options where feasible (Samuels, 2022). Such approaches would recognize developmental variability while preserving equitable access to schooling.

Expanding Universal Preschool Access

A major policy consideration emerging from the developmental literature is expanded access to high-quality preschool across Montana. Research associates preschool participation with stronger language development, phonological awareness, executive functioning, social-emotional competence, and school readiness (Ansari et al., 2021; Moran et al., 2022). Because preschool participation was not

measured in the present study, these benefits should be understood as evidence from the broader literature rather than as effects demonstrated by this sample.

Montana remains one of the few states without universal state-funded preschool. Consequently, access to early childhood educational opportunities varies depending upon geography, family income, local resources, and program availability. In many rural communities, preschool options are limited or unavailable, creating disparities in educational opportunities before children enter kindergarten.

Expanded preschool access can be considered not only as an early childhood initiative but also as a potential literacy and educational-equity strategy. By supporting developmental readiness before kindergarten, high-quality programs may reduce later needs for remediation and strengthen children's capacity to benefit from early literacy instruction.

Evidence cited in this manuscript supports positive educational outcomes associated with high-quality early childhood education. For Montana, the policy question is therefore not simply whether preschool matters, but how access can be expanded equitably and evaluated rigorously across diverse communities.

For Montana, expansion efforts should be designed with rural realities in mind. Traditional preschool models may not be feasible in all communities due to geographic isolation, transportation barriers, and staffing shortages. Policymakers may therefore need to consider innovative delivery models, including regional preschool cooperatives, community partnerships, hybrid programming, and mobile early childhood services.

Promoting Developmentally Responsive Literacy Instruction

The significant gender difference identified in this study reinforces the importance of developmentally responsive literacy instruction. Female students outperformed male students in the sample, consistent with prior research (Delaney & Devereux, 2021). This difference should not be interpreted as a fixed difference in ability; rather, it highlights the need to consider developmental variability in how students engage with literacy instruction.

Developmentally responsive instruction recognizes that children develop at different rates and enter classrooms with diverse strengths and needs. Rather than expecting uniform developmental readiness, developmentally responsive approaches adapt instructional strategies to support a broad range of learners while maintaining rigorous academic expectations.

For literacy instruction, this may include incorporating movement-based learning opportunities, interactive literacy activities, differentiated instruction, self-regulation support, and opportunities for student choice and engagement. Such approaches may be particularly beneficial for students who demonstrate developmental characteristics associated with later maturation of executive functioning and attentional control.

Importantly, developmentally responsive instruction should not be confused with reduced expectations. On the contrary, these approaches seek to maximize learning by aligning instructional practices with developmental science. Students benefit when educational environments provide both appropriate support and appropriately challenging academic expectations.

Professional development initiatives focused on developmental readiness, executive functioning, and literacy development may help educators better understand and respond to developmental variability within classrooms. Such efforts could improve educational outcomes while reducing disparities among student groups.

Strengthening Early Identification and Intervention Systems

The developmental framework also supports strengthening early identification and intervention systems. Developmental differences can emerge before formal academic difficulties become established; therefore, early screening may help schools identify areas in which children would benefit from additional support.

Developmental screenings conducted during preschool and kindergarten can provide valuable information regarding language development, executive functioning, social-emotional competence, and school readiness. These assessments should not be used to exclude children from educational opportunities, but rather to identify areas where additional support may be beneficial.

Multi-tiered systems of support (MTSS) provide one promising framework for addressing developmental and academic needs. Through universal screening, targeted interventions, and ongoing progress monitoring, schools can provide increasingly intensive support to students demonstrating risk factors for academic difficulties.

Early intervention efforts are particularly important because literacy challenges often become more difficult to address as students' progress through school. By identifying developmental and academic concerns early, educational systems may improve outcomes while reducing the need for more intensive interventions later.

Rethinking Educational Accountability

The study also raises questions about how educational accountability is interpreted in settings with widespread literacy difficulty. Proficiency benchmarks provide important information, but they may not fully represent student growth or the developmental and contextual conditions that shape achievement.

In schools where large proportions of students perform below proficiency benchmarks, growth measures may provide a more accurate representation of educational progress. Growth-based accountability systems recognize that learning occurs incrementally and that meaningful progress may occur even when students have not yet reached proficiency standards.

Developmentally informed accountability systems would acknowledge that students enter school with varying levels of readiness and educational preparation. Such systems would evaluate both achievement and growth while considering contextual factors that influence educational outcomes.

For Montana, accountability reforms that incorporate developmental science may provide policymakers and educators with more meaningful information regarding student learning. These approaches would encourage continuous improvement while recognizing the complexity of educational achievement.

Building a Developmentally Informed Educational System

Taken together, the study and literature support consideration of a more developmentally informed approach to educational policymaking. Such an approach would use developmental science to inform, rather than replace, rigorous instructional practice and academic expectations.

A developmentally informed system would recognize that literacy achievement begins long before formal reading instruction. It would emphasize early learning opportunities, support developmental readiness, acknowledge learners' variability, and provide appropriate interventions when needed. Such a system would view educational success not simply as a product of instruction but as the result of

coordinated efforts spanning early childhood, elementary education, family engagement, and public policy.

No single policy or instructional initiative can address the range of developmental and educational factors discussed in this manuscript. A more comprehensive approach would coordinate early childhood opportunities, developmentally responsive instruction, early intervention, family engagement, and policy evaluation. For Montana, this framework offers a direction for policy development that should be tested through continued research rather than assumed from a single-site study.

These policy considerations also identify questions that the present study was not designed to answer. In particular, relationships among preschool participation, developmental readiness, school-entry timing, instructional practices, and later literacy achievement require more direct empirical examination.

Future Research Directions

The present investigation contributes context-specific evidence about literacy achievement in one rural Montana school, but it also identifies questions that require more direct study. Future research should examine developmental readiness, educational policy, and literacy outcomes using designs capable of testing the structural explanations considered in this manuscript (Banihashem et al., 2021; Demetriou et al., 2020).

First, future studies should include larger, multi-site samples representing diverse geographic, demographic, and educational contexts across Montana. The current study was conducted within a school characterized by widespread literacy challenges, with approximately 88% of students not meeting reading proficiency benchmarks. While this context provides important insight into literacy achievement in a highly challenging educational environment, it may also have reduced the likelihood of detecting subgroup differences by age, race, and socioeconomic status. Research conducted in schools demonstrating higher overall literacy achievement may help determine whether these variables emerge more clearly when achievement is more widely distributed across the student population. Such investigations would contribute to a more nuanced understanding of how demographic and developmental factors interact across varying educational contexts (Clark et al., 2023; Kyere et al., 2023).

Second, longitudinal research following students from preschool through the elementary grades would provide valuable insight into how developmental readiness influences literacy trajectories over time. Existing research suggests that relative age effects and readiness differences may change as children progress through school (Samuels, 2022; Scammacca et al., 2020). Longitudinal studies could help determine whether developmental differences observed at school entry persist, diminish, or interact with later educational experiences. Such research would be particularly valuable in Montana, where kindergarten entry policies and preschool access vary across communities. Longitudinal investigations could also help identify critical intervention points where educational support may have the greatest impact on literacy development (Ansari et al., 2021).

Third, future studies should directly examine the relationship between preschool participation and literacy outcomes within Montana. Because the current study did not include data regarding preschool enrollment, it was not possible to determine how access to early childhood education may have influenced developmental readiness and reading achievement. Research comparing students with varying preschool experiences could provide important evidence on the potential impact of expanded preschool access on literacy outcomes, particularly in rural communities where early childhood programming may be limited (Ansari et al., 2021; Moran et al., 2022). Such research would be especially relevant given Montana's

continued lack of universal state-funded preschool and the documented benefits of high-quality early childhood education for language development, executive functioning, and school readiness (Ansari et al., 2021).

Fourth, mixed-methods research would provide a richer understanding of the mechanisms underlying the quantitative findings reported in this study. While quantitative analyses identify patterns and relationships, they do not fully explain why those patterns emerge (Creswell & Creswell, 2018). Combining achievement data with interviews, focus groups, and observational data could help researchers better understand how developmental readiness, educational experiences, and policy conditions influence literacy development.

Qualitative investigations may be especially valuable in exploring the lived experiences of students, families, and educators. For example, interviews with parents of younger kindergarten entrants could provide insight into how families make school-entry decisions and perceive their children's readiness for formal schooling. Similarly, qualitative studies involving educators could explore how teachers observe and respond to developmental variability within early elementary classrooms. Research examining the experiences of families facing barriers to preschool access could further illuminate how geography, transportation, cost, and program availability influence educational opportunity within rural Montana communities (Ansari et al., 2021; Moran et al., 2022). These perspectives would help contextualize quantitative findings and provide a deeper understanding of how structural educational policies are experienced by those most directly affected.

Finally, future research should explore how instructional practices interact with developmental readiness to influence literacy achievement. The present study focused primarily on demographic variables and educational outcomes; however, instructional approaches may play a vital role in moderating developmental differences. Investigating how developmentally responsive teaching practices affect literacy achievement among students with varying levels of readiness may provide valuable guidance for educators and policymakers seeking to improve educational outcomes (Demetriou et al., 2020; Piaget, 1964). Research examining classroom practices that support executive functioning, language development, and self-regulation may be particularly beneficial given the strong connections between these developmental domains and literacy achievement (Banihashem et al., 2021).

Together, these directions would allow future research to test the mechanisms that the present study can only identify as contextual possibilities. Larger samples, longitudinal designs, direct measures of preschool participation and readiness, mixed methods, and closer examination of classroom practice could clarify how developmental opportunities and educational policy relate to literacy outcomes (Ansari et al., 2021; Demetriou et al., 2020).

Although additional research is necessary to clarify these relationships, the present study contributes to a broader understanding of literacy achievement by locating reading outcomes within the developmental and structural conditions that surround formal instruction. The conclusion synthesizes the study's empirical contribution while maintaining the distinction between observed findings and broader policy interpretation.

5. Conclusion

Early literacy achievement is strongly associated with long-term educational success, yet reading outcomes are shaped by more than classroom instruction alone (Annie E. Casey Foundation, 2021). This study examined associations among age, gender, race, socioeconomic status, and third-grade reading

achievement within a rural Montana elementary school and situated those findings within a broader discussion of developmental readiness, kindergarten-entry policy, and preschool access.

Gender was the only variable significantly associated with reading achievement in the sample, with female students outperforming male students. No statistically significant associations were identified for age, race, or socioeconomic status. These findings require cautious interpretation because the study involved a small sample from a single school, but the gender result is consistent with prior research documenting differences in literacy achievement (Clark et al., 2023; Delaney & Devereux, 2021).

The manuscript's primary contribution is the integration of these empirical findings with a developmental-policy perspective. Children enter school with differing developmental capacities and educational experiences, and the broader literature indicates that language exposure, executive functioning, self-regulation, and access to early learning opportunities are relevant to school readiness (Ansari et al., 2021; Banihashem et al., 2021). The present study does not establish the effects of these factors, but it demonstrates the importance of considering literacy findings within the systems and contexts in which children develop.

Montana provides a particularly relevant setting for this discussion because of its kindergarten-entry cutoff and limited universal preschool access. Although the study does not establish causal relationships between these policies and literacy achievement, developmental science and prior research justify further investigation of how school-entry conditions and early childhood opportunities relate to later academic outcomes (Ansari et al., 2021; Samuels, 2022; Scammacca et al., 2020).

Several limitations should be acknowledged. The study involved a small sample drawn from a single rural elementary school and did not examine factors such as preschool participation, attendance, instructional quality, or family engagement. Future research should include larger, multi-site investigations and longitudinal designs that more directly examine the relationships among developmental readiness, educational policy, and literacy achievement (Creswell & Creswell, 2018).

Despite these limitations, the findings and literature identify several areas for policy consideration, including preschool access, developmentally responsive instruction, early intervention, and growth-oriented approaches to accountability (Ansari et al., 2021; Moran et al., 2022). These recommendations should be evaluated through additional research rather than treated as effects demonstrated by the present study.

Understanding literacy through a developmental-policy framework broadens the focus from remediation after difficulties emerge to the developmental opportunities and educational conditions that precede formal reading instruction. Aligning policy, early childhood programming, and classroom practice with developmental research may strengthen the foundation for future literacy improvement in Montana while also creating a clearer agenda for continued empirical study (Demetriou et al., 2020; Piaget, 1964, 1971).

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