ISSN: 2584-0231(Online)
International Journal of Multidisciplinary Research in Arts, Science and Technology
Volume 4 | Issue 4 | April 2026
Available online at: https://ijmrast.com
DOI: https://doi.org/10.59828/ijmrast.v4i4.264

Culturally Responsive Pedagogy for Enhancing Secondary School Students' Science Achievement and Emotional Intelligence: An Integrative Review

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ABSTRACT

Culturally Responsive Pedagogy (CRP) is one of current pedagogical approach which help to transform that enhancing equity among children, inclusion at institution and meaningful learning in the classrooms. These integrative reviewees synthesize literature (2000–2025), with emphasis on recent studies (2020–2025), to examine the role of CRP in enhancing secondary school students' science achievement and emotional intelligence (EI). Grounded in constructivist, sociocultural and social-emotional learning (SEL) theories, the review highlights how cultural impact and associate teaching practices improve engagement, conceptual understanding and socio-emotional competencies.

The reviewees findings indicate that CRP enhances science achievement among students in 21st century and also create motivation with the learner and learner identity. This approach is fostering emotional awareness, empathy and interpersonal skills these qualities help to students' holistic development in natural way. However, limited empirical evidence directly links CRP with EI in science education. The study emphasizes the need for further research and outlines implications for classroom practice, teacher education and policy to support holistic development.

Keywords: *Culturally Responsive Pedagogy, Science Achievement, Emotional Intelligence, Secondary Education, Social-Emotional Learning, Integrative Review*

INTRODUCTION

Culturally Responsive Pedagogy (CRP) was introduced by [26]. It is a teaching approach that focus on associated with curriculum, instruction and classroom interactions with the cultural practices, local languages, traditions and identities of learners. In recent research finding show that adolescents of secondary school develop complex cognitive and emotional capacities. The CRP plays important aspect for making science learning class room meaningful, equitable and actively engagement of student's participation. Through the integrating socio-cultural backgrounds into scientific inquiry and collaborative learning for enhances motivation, conceptual understanding and academic achievement by the help of CRP approach [17] [29]. In recent research, Secondary school science learning often becomes abstract and disconnected from students lived experiences and realities. When teachers teach lesson with the connecting culturally familiar examples such as geographical pattern, local river system, local knowledge systems, community issues and everyday news and local information in communities which helps to students demonstrate higher interest and improved achievement in science [9] [1] [33]. The CRP supports this result by eradicating cultural barriers such as social disparities, social inequalities in instruction and promoting inclusive environment participation among diverse student groups. In addition to academic benefits, CRP strengthens emotional intelligence (EI) that help to increase the critical, analytical, problem-solving abilities and 21st century

skills. According to [8], emotionally supportive learning environments develop students' self-awareness, emotional regulation and empathy these are essential for effective teamwork in laboratory activities and inquiry-based science tasks. Another research evidences,[43] emphasize that culturally responsive social-emotional learning promotes belongingness and reduces classroom anxiety, directly contributing to improved academic performance. Within secondary schools where identity formation, peer influence, emotional sensitivity and social interaction are more linkage with CRP with EI-focused make strategies ensures holistic development of children. Culturally responsive story, cooperative learning, reflective thinking and community-linked science and social sciences projects collectively enhance students' confidence, resilience and problem-solving abilities which helps to factors on strongly associated with higher science achievement. After review recent examines research result on how culturally responsive pedagogy enhances secondary school students' science achievement and emotional intelligence that increase offering insights into its theoretical foundations, empirical evidence and implications for science teachers in diverse classroom settings.

RATIONALE OF THE REVIEW

Culturally responsive pedagogy (CRP) is most important pedagogical powerful approach for improving both science achievement and students' emotional well-being. In another point of view there remains a significant low of integrative research explicitly associated CRP with emotional intelligence (EI) in secondary science classrooms. Existing research finding emphasizes that culturally relevant and sustaining pedagogies are essential for making students' identities, particularly in diverse and marginalised students thereby enhancing engagement and academic success [39] [46] Research evidence suggests that CRP is reducing achievement gaps and strengthens scientific identity and develop attitudes toward science among the students. Now emotional outcomes are often overlooked and leaving a critical gap in understanding holistic student development. Parallel research in emotional intelligence consistently indicates its strong association with academic achievement. Studies report show to high positive correlations between EI and academic performance among secondary and higher secondary students. It is indicating that emotional wellbeing of learners exhibits better self-regulation, motivation and collaborative skills [37] [34] [44] These competencies are vital for inquiry-based science learning where teamwork, persistence and problem-solving are essential. The role of CRP helps to mediating mechanism scientific approach between EI and science achievement remains underexplored.

In current studies focus on the integration of social-emotional learning (SEL) with CRP has been identified as a promising pedagogical indication in different level of education. This research indicates that culturally responsive pedagogy and SEL fosters inclusive classroom environments that enhance students' sense of belonging, emotional coordination and academic activities of Indigenous Knowledge Systems (IKS) in STEM (Science, Technology, Engineering, and Mathematics). It is an interdisciplinary approach to learning that integrates Science, Technology, Engineering, and Mathematics, focusing on real-world application, critical thinking and innovation. It became beyond the traditional methods such as "*Sravana"* (Listening/Study), "*Manana"* (Reflection/Contemplation) and "*Nididhyasana"* (Meditation/Internalization) that are encouraging hands-on experimentation, teamwork and problem-solving to prepare students for future. Analysis of the evidences evidence that integrating IKS enhances higher-order thinking and both academic and emotional outcomes. After analysis of these gaps, there is a compelling need for a CRP-centric integrative research review that synthesizes research on CRP, emotional intelligence and Indigenous knowledge. Such a review will provide a comprehensive framework for understanding how culturally responsive and emotionally supportive pedagogies help to enhance secondary school students' science achievement and holistic development in combine manner.

NEED FOR AN INTEGRATIVE REVIEW

Recent reviews argue that culturally relevant and sustaining pedagogies (CR-SP) are essential for cantering marginalized students' identities and experiences in science education, particularly in postcolonial and multicultural contexts. Empirical studies show that CRP in secondary science reduces achievement gaps, improves attitudes toward science, and strengthens students' scientific identities, yet few papers measure concomitant emotional outcomes. When simultaneously work in emotional intelligence and CRP indicates that higher EI predicts better academic performance at secondary and higher-secondary levels with moderate-to-strong positive correlations reported across multiple disciplinary settings. These

findings collectively suggest that CRP may be connecting mechanism between emotional competencies and science achievement that promote a link that remains undertheorized and under investigated.

a) **Emotional intelligence and science achievement**

Multiple studies shows that significant positive correlations between emotional intelligence and academic achievement among secondary and higher-secondary students including those in CBSE and state-board systems. For example, a correlation of r=0.56*r*=0.56 between emotional intelligence and academic achievement among secondary school students signals that interventions targeting EI can have tangible pay-offs in classroom performance. Furthermore, recent syntheses emphasize that emotionally intelligent learners exhibit better self-regulation, motivation, and collaborative skills, all of which are critical for inquiry-based science learning.

b) **Underrepresentation of IKS and local knowledge in STEM**

Despite growing advocacy, Indigenous knowledge systems (IKS) remain underrepresented in secondary STEM curricula, even though systematic reviews show that integrating IKS into K-12 STEM improves higher-order thinking skills and contextual problem-solving. Professional-development studies highlight that unless teachers receive explicit training in IKS-integrated STEM [25] [32]. Western epistemologies continue to dominate, reproducing epistemic and achievement inequities. Recent curriculum-design work in Zimbabwean and other high-school contexts demonstrates that local artefacts, practices and ecological knowledge can be productively woven into formal science instruction, deepening conceptual understanding during affirming students' cultural identities

c) **Holistic development and pedagogical synergy**

Scholars of social-emotional learning and CRP prove that effective teaching in culturally diverse settings needs attending simultaneously to students' cognitive, affective and sociocultural needs. Integrative models propose that CRP and SEL are mutually work for development of student when teachers validate students' cultures and emotions wellbeing engagement, belonging and conceptual mastery rise [48]. This is especially focus on in secondary science where inquiry-driven and project-based designs can be structured around local issues, family practices Science, Technology, Engineering, and Mathematics and community-based knowledge thus associated with cultural relevance, emotional support and scientific importances.

SYNTHESIS OF THE REVIEWED LITERATURE

A review of existing literature reveals most of important findings regarding the impact of Culturally Responsive Pedagogy (CRP) on academic achievement, student engagement, and emotional intelligence, while also highlighting gaps in empirical research. Scholars such as [28] [19] provide foundational insights, which are further supported by recent studies (2020–2024).

1. **Positive Relationship with Academic Achievement**

Recent research strongly indicates that a positive relationship between CRP and student's academic achievement on science education. CRP improves performance of students which making learning meaningful and relevant to students' cultural contexts that enhances comprehension and retention capacity of students in academic field. Studies show that when instruction is culturally associated with students demonstrate improved outcomes in science activities and assessments. Recent research in STEM education gives the confirms that culturally responsive teaching enhances understanding and academic performance by integrating student's previous experiences and knowledge with scientific concepts [38] [4].

2. **Enhanced Student Engagement**

Another research findings indicates that CRP significantly enhances student engagement in the learning process when collaborative students' cultural identities into instruction, CRP increases interest, motivation and actively participation. Actively engaged students are more likely to take an active role in classroom activities, group discussions, brain storming activities and inquiry-based learning. Recent studies highlight that culturally responsive classrooms promote higher levels of actively engagement and active participation that are essential for effective learning and [11] [15] [36].

3. **Improved Emotional Intelligence**

Review related literature prove that CRP helps to the development of emotional intelligence by promoting self-awareness, empathy and emotional regulation. Culturally inclusive environments help students to understand their own emotions and balances which appreciate diverse perspectives across institutions that enhances interpersonal skills among students. Research on culturally responsive social-emotional learning indicates that integrating CRP with SEL practices improve emotional competence and social relationship among the students. [31] [52].

4. **Limited Empirical Research on CRP and Emotional Intelligence**

Regardless the growing body of research on CRP and emotional intelligence separately. There is limited empirical research that explicitly examines the combined impact of CRP and EI is special in science education. Most of studies focus either on academic achievement or on social-emotional learning without directly linking the two constructs. This gap show that the need for further empirical investigation to explore how CRP simultaneously influences both academic achievements and emotional intelligence. Addressing this gap would contribute to a more comprehensive understanding of holistic student development and strengthen the theoretical and practical implications of CRP [43] [12].

5. **Lack of teacher training on CRP and Emotional intelligence**

The result of lack of teacher training in Culturally Responsive Pedagogy (CRP) and Emotional Intelligence (EI) reduces the effectiveness of classroom teaching and student's engagements. Many teachers and educators are not properly trained to understand student's cultural backgrounds, practices and emotional needs that can affect student actively engagement and learning outcomes of students. Without proper training and practices on CRP and EI, teachers may struggle to connect lessons with student's real-life experiences and local examples and manage emotions in the classroom. Training programs can help teachers develop these important skills such as How teacher paper contents and lesson according to cultures of learners. Research shows that professional development in CRP and EI improves helps to improve teaching quality and student performance [18] [20]. Therefore, proper training is essential for inclusive and effective education on the ground of CRP and EI.

6. **Lack of knowledge about cultural practices**

Lack of knowledge about student's cultural practices can create problems of effectiveness in teaching and learning process. When teachers are not aware of different traditions languages and values that create difficulties relate lessons to student's learning. This can make students feel misunderstood and less interested in learning and actively engagement. Understanding cultural backgrounds helps teachers build trust and create a more inclusive classroom. Researchers highlight that cultural awareness is important for create effective teaching- learning environments and student success [26]. In another point that improving teacher's knowledge about diverse cultures are necessary for better classroom interaction and meaningful learning among students

7. **Curriculum constraint**

Curriculum constraints can limit the effective and proper implement of Culturally Responsive Pedagogy (CRP) in classrooms. Many school curricula are fixed and focus mainly on completing the syllabus within a limited time. This leaves little room for teachers to include students' cultural experiences and adapt lessons to their needs, interest and capacities. As a result, learning may become lack of effectiveness and engaging for diverse students during teaching learning process. Teachers may also feel pressure to follow textbooks strictly instead of using flexible methods and local resources. Researchers point out that rigid curricula can restrict inclusive teaching practices and reduce actively participation of students [18] [45]. Therefore, more flexible curricula are needed to support diverse learners.

8. **Superficial integration of culture**

Superficial integration of culture means when teachers include cultural elements only at a surface level such as celebrating festivals with value-based outcome and using examples without deeper understanding of culture and local surrounding. This approach does not fully connect learning with student's real cultural experiences and practices. As a outcome, students may not feel truly represented and more engaged in the classroom. Meaningful

integration requires make bridge between culture with teaching methods, content and classroom interactions. Researchers explain that deep understanding and authentic use of culture improves learning and inclusion [26] [18]. Therefore, teachers need proper training to move beyond surface-level practices and create more meaningful, culturally responsive learning environments.

CONCEPTUALIZING CULTURALLY RESPONSIVE PEDAGOGY

Culturally Responsive Pedagogy (CRP) refers to as a student-centred approach in which teaching concern about real round root level of student's cultural backgrounds, lived experiences, languages, crural practices of cultures and community knowledge. First introduced by [26] and expanded by [18], CRP aims to ensure creates learning opportunities for all students. Particularly those from diverse and marginalized backgrounds. Research presents that CRP enhances not only academic outcomes but also social-emotional and cognitive competencies. CRP promotes cultural competence, academic success and critical consciousness. Cultural competence enables the students to understand, value, and navigate both their home culture and the dominant school culture [26]. Howard (2003) reported that culturally relevant instruction improves students' identity affirmation and fosters pride in their cultural heritage. [18] found that when teachers incorporate culturally familiar examples, narratives, and linguistic practices, students show increased engagement and reduced classroom anxiety. Academic success ensures that all learners achieve at high levels by connecting instruction to their sociocultural realities and cognitive strengths. [2] [26] found that CRP-based classrooms showed significantly higher academic achievement among African American and Latino students. In science education, [2] demonstrated that culturally embedded science tasks improve conceptual understanding and critical inquiry skills. [7] observed that culturally relevant science teaching increases accuracy in scientific reasoning and boosts standardized test scores. Critical consciousness refers to students' ability to analyse social inequities, question dominant narratives, and become agents of change [16] [26] [40] revealed that CRP develops student's mind capacity to critique social injustices and especially those tied to culture, race and power.

In secondary school settings where identity formation, peer influence and emotional sensitivity are high level in our life. The integration of CRP with emotionally responsive teaching strategies offers such holistic approach for student development. Practices such as culturally responsive dialogue, cooperative learning, reflective journaling and community-linked science studies, examples and projects foster confidence, resilience and problem-solving abilities. These competencies have needed for navigating complex scientific concepts and collaborative tasks. In other level, CRP extends beyond mere representation of cultural diversity. It actively incorporates culture into curriculum design, instructional processes and assessment practices. This research analysis admires to examine the theoretical foundations and empirical evidence supporting the role of culturally responsive pedagogy in encouraging secondary school students' science achievement and emotional intelligence with implications for creating inclusive and effective science classrooms in 21st century.

THEORETICAL FRAMEWORK

a) Sociocultural theory (Vygotsky)

CRP agrees with sociocultural theory, which represents that learning happens through social interaction and culture. Students learn by building knowledge from meaningful cultural experience. Theoretical Framework: Sociocultural Theory and Culturally Responsive Pedagogy (CRP) [49]. Sociocultural theory was developed by Lev Vygotsky. He pointed that learning is fundamentally a social and culturally process which helps to develop critical thinking with the child. According to this perspective, knowledge is constructed through social interaction among culture and community people that promote engagement with others within a cultural context [49]. The theory emphasizes that cultural environment plays a vital and transitional role in shaping child thinking process which promote inculcate cultural values, traditions, beliefs and cultural practices of their social surroundings. Learning occurs through interaction with more knowledgeable person such as teachers and peers who provide better knowledge and support within what Vygotsky termed the Zone of Proximal Development (ZPD). Furthermore, language and cultural tools act as mediators of thinking, enabling learners to develop higher-order cognitive skills [49] [50]. From this site students cannot learn along because he/she is social animal rather, their cultural backgrounds and social experiences significantly influence how they construct and interpret knowledge.

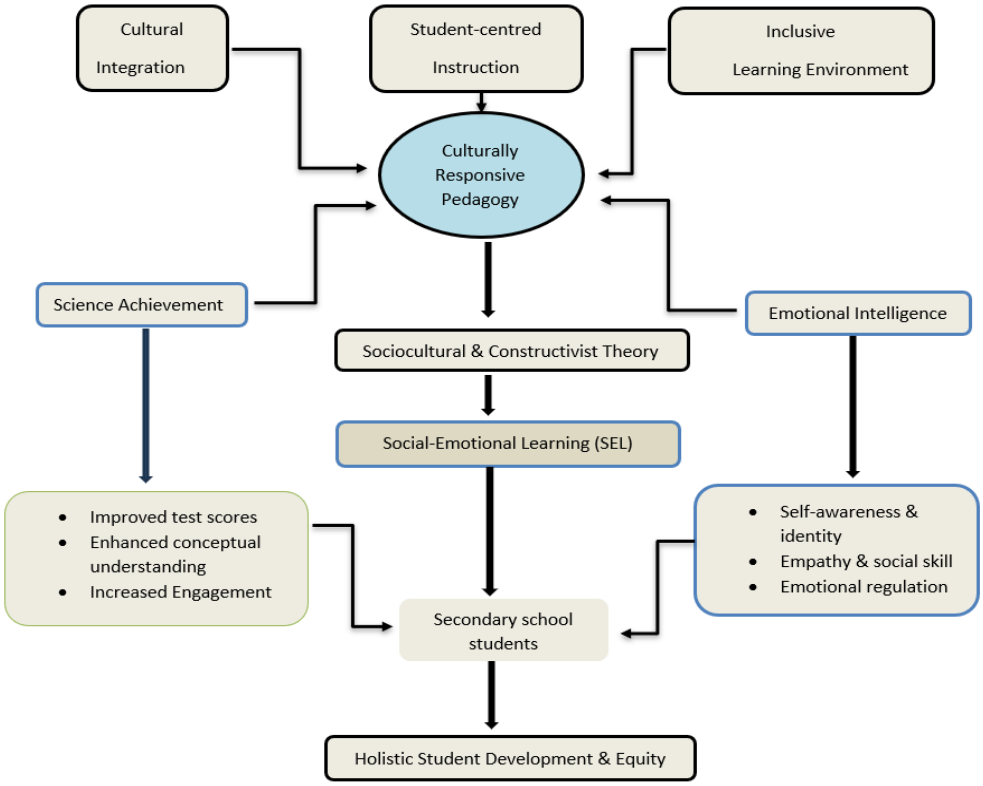

Fig. 1: Conceptual Model of Culturally Responsive Pedagogy Influencing Science Achievement and Emotional Intelligence.

b) Constructivist Learning Theory

Constructivism expresses that the learners actively build their own knowledge. CRP makes learning more meaningful by relating science to students' cultural experiences. Constructivist learning theory helps to that learners actively engaged and construct their own knowledge through the interactions with their social and culturally environments rather than passively receiving information from the surrounding. The famous psychologist Jean Piaget emphasized that cognitive development occurred with the help of learners assimilate and accommodate new knowledge into existing building block ideas of mind [41]. Another psychologist Jerome Bruner highlighted actively engagements promote new ideas which helps to discovery new learning [10]. Within this framework, learning became effective and meaningful when is associated with child's prior knowledge and real-life experiences. Culturally Responsive Pedagogy (CRP) concern with principles of constructivism connection between academic content, such as science, cultural backgrounds of students and lived experiences of surround finds. By integrating cultural context into instruction, CRP enables learners to construct knowledge in ways that are relevant and meaningful to their social realities [18] [26].

c) Culturally Relevant Pedagogy (Ladson-Billings)

The culturally responsive pedagogy CRP consists with three pillars: Academic success, cultural competence, sociopolitical consciousness. Culturally Relevant Pedagogy (CRP) was developed by Gloria Ladson-Billings. its framework that gives importance the use of student's cultural backgrounds, real live experiences and identities as meaningful and effective for learning. [26] conceptualized this concept around three interconnected pillars such as academic success, cultural competence and sociopolitical consciousness. Academic success means aim to all students can achieve high academic standards with qualitative manner when instructional lesion is meaningful and quittable supportive. Cultural competence means enabling students to maintain their own cultural practices and identity while also developing an understanding and respect for other cultures equally. Sociopolitical consciousness means learners to critically analysis social disparities, disseminations in different grounds and develop the skills to overcome injustice and social disparities in society. Interrelated these three dimensions ensure that teaching not only promotes academic achievement but also promotes cultural awareness and critical thinking which helps to making education more equitable and inclusive way that is relevant to diverse learners [26] [27].

d) Social-Emotional Learning (SEL) Framework

SEL helps students to know themselves, manage their emotion and connect with others. Different research shows that SEL improved both emotional and academic outcomes. When CRP is added with SEL, it strengthens emotional intelligence by linking the emotions to student's cultural experience which are meaningful [51].

OBJECTIVES OF THE STUDY

1. To assess the role of culturally responsive pedagogy (CRP) in enhancing science achievement among secondary school students
2. To interpret the impact of CRP on emotional intelligence among secondary school students
3. To explore different theoretical frameworks which support CRP in science education

RESEARCH QUESTIONS

1. How does CRP help in enhancing science achievement among secondary school students?
2. What is impact of CRP in fostering emotional intelligence among secondary school students?
3. How different theoretical frameworks (constructivism, socio-cultural theory and socio- emotional learning (SEL) support CRP in science education?

METHODOLOGY

This study has taken an integrative review approaches and synthesizing theoretical and rational literature from books, peer-reviewed journals and recent studies (2000–2024). This research specially focusses on Scopus-indexed research journal and high-impact research articles analysis that focusing on CRP, science education, student's achievement rate on related to CRP and emotional intelligence.

RESULTS AND DISCUSSION

a) Research point of views on CRP in Science Education

Science education often shows dominant cultural views, which can make diverse learners feel marginalized. CRP in Science helps to connect the scientific concepts with local and cultural contexts and encourage question based on students' real-life experiences which helps to appreciate and validate indigenous and community knowledge systems. After analysis of the original work of Gloria Ladson-Billings, Geneva Gay and several scholars have contributed relevant ground on culturally responsive approaches in science education. In recent research evidence of James A. Banks highlighted multicultural education means the integrating diverse cultural perspectives into formal curriculum setting which helps to students learn more effectively when curriculum, context and examples given by teacher to reflects their cultural identities. Similarly, [13] focus on the relevance of rational and evidence-based education helps to students from different backgrounds actively engage and deeply analysis when they see themselves represented in scientific practices and discourse. In the ground of indigenous knowledge, Glen S. Aikenhead highlighted that science education is connecting bridge between Western science with indigenous ways of knowing that allowing students to navigate multidisciplinary knowledge systems in academic carrier [1]. Likewise, [7] focus that community-based and indigenous knowledge promotes real ground understanding and makes science learning more relevant and meaningful for students. According to other researches, [9] focuses on the role of language and discourse in science classrooms highlighted that recognizing student's linguistic and cultural practices can improve actively participation and vibrant engagement. These perspectives collectively promotes that culturally responsive science education can associated scientific concepts with students lived experiences that encourage inquiry grounded in real-life contexts with critical thinking and recognized diverse knowledge systems. Such approaches promote academic achievement and promote inclusion, identity development with equity in science learning according students' area, culture and background. Different studies indicate that culturally based science teaching boosts both engagement and better understanding.

RQ1: *How does CRP help in enhancing science achievement among secondary school students?*

1. **Impact on Science Achievement**

   Impact on Science Achievement helps to increase Academic Performance: Recent Research data (2020–2024) and Recent empirical results (2020–2024) represents strong evidence that Culturally Responsive Pedagogy (CRP) significantly enhances science achievement and academic competency among youth. Contemporary research study pointed out that CRP promote cognitive, affective and psychomotor improvement with actively engagements during participation which helps to identity development and equity in science learning environments. In other research filed, recent research in education highlighted that culturally responsive teaching capable Indian educators to integrate cultural knowledge with scientific and rational path which promote improving understanding and performance [38].

2. **Improved Academic Performance & Increased Engagement and Motivation**

   A systematic review found that CRP has appositive effect on learning and performance across the contexts on better conceptual understanding, achieve higher test scores and increased participation in field of education to scientific areas. [38]. CRP helps make science meaningful. Students become more interested when their culture is included in the curriculum or learning and better motivate themselves. Recent research highlighted that culturally responsive teaching fosters positive mindset toward learning and improves willingness to invest effort in academic tasks among leaners [18][26].

3. **Bridging Achievement Gaps**

   CRP assist to increase equality among different background children and established quality relation between home and school which helps to reducing disparities in our society. In current empirical research data in science education [30] shows that culturally responsive teaching improves student empowerment, self-efficacy and academic identity which are directly associated with performance in science classrooms. Recently a systematic review by [12] analysing multiple research studies reported that CRP significantly enhances academic achievement, student engagement, and participation by adapting instruction to learners' cultural backgrounds with real life experiences.

RQ2*: What is impact of CRP in fostering emotional intelligence among secondary school students?*

Recent research (2020–2024) pointed that Culturally Responsive Pedagogy (CRP) plays a important role in promoting student's Emotional Intelligence (EI) particularly through its integration with social-emotional learning (SEL). These studies show that when teaching practices are culturally responsive which help to foster emotional awareness, empathy and interpersonal skills by associated with emotional development and students' cultural identities and lived experiences for batter understanding. A recent study on culturally responsive social-emotional learning emphasizes that integrating CRP with SEL frameworks significantly improves student's emotional development and sense of belonging that helps to promote social competence [52]. Similarly, research by [31]. This study focusses on that culturally responsive SEL practices support emotional growth through the providing opportunities for students that helps to student express their feelings in culturally meaningful ways and develop cooperation qualities toward dynamic perspectives of communities. In other sites of research emerging research on culturally responsive SEL practices suggest that such approaches enhance self-awareness, emotional regulation and social interaction skills, particularly among marginalized learners [3].

1. **Development of Self-Awareness and Identity**

   Researcher like [6] prove that culturally responsive science teaching supports students in developing a science identity, enabling them to see themselves as capable participants in scientific practices. Similarly, the research on culturally responsive social-emotional learning highlights that integrating student's cultural identities into instruction enhances self-awareness, emotional regulation and interpersonal understanding [31].

2. **Empathy and Social Skill**

   Today classroom is full up diversities and includes different cultures, backgrounds which help to encourage respects to all diverse qualities of all students and better relationships among themselves. From an analytical perspective, CRP enhances empathy by exposing students to multiple cultural perspectives and encouraging them to appreciate differences in beliefs, values and experiences. Classroom practices such as group discussions, collaborative learning

and culturally relevant examples help students develop the ability to see situations from others viewpoints. This process strengthens emotional understanding and helps to reduces biasness and stereotypes in our society. Research also suggests that culturally responsive classrooms promote a holistic perspective taking and emotional sensitivity which empathy [43].

3. **Emotional Engagement in Learning**

   When the teaching learning process culturally relevant where students show more emotional involvement. Recent studies (2020–2024) further emphasize that culturally responsive and socially inclusive teaching practices significantly improve students' emotional engagement. For instance, research shows that when students feel their identities are recognized and valued, they develop stronger emotional connections to learning tasks, leading to higher levels of engagement and academic success [52].

4. **Integration with SEL Outcomes**

   SEL supports emotional regulation, relationships, and academic performance. CRP makes this stronger by connecting emotional learning to students' cultural experiences. According to Geneva Gay, culturally responsive teaching enhances students' emotional and social development by creating inclusive environments that validate diverse cultural perspectives [18]. Similarly, Gloria Ladson-Billings emphasizes that education should support not only academic success but also cultural competence and critical consciousness, which align closely with SEL outcomes [26].

RQ3: *How different theoretical frameworks (constructivism, socio-cultural theory and socio- emotional learning (SEL) support CRP in science education?*

Culturally Responsive Pedagogy (CRP) is theoretically grounded in constructivism, sociocultural theory, and social-emotional learning (SEL), which collectively enhance its effectiveness in diverse classrooms. Constructivism, advanced by Jean Piaget and Jerome Bruner, posits that learners actively construct knowledge based on prior experiences. CRP aligns with this perspective by valuing students' cultural knowledge and experiences as foundational to learning [19][26]. This approach fosters meaningful engagement and deeper conceptual understanding in science education. At the same time Sociocultural theory, proposed by Lev Vygotsky, emphasizes the role of social interaction, language, and cultural context in cognitive development. CRP integrates these principles through collaborative learning, dialogue, and culturally relevant practices that connect scientific concepts to students lived realities [49][35]. This supports participation, identity development, and knowledge co-construction [4]. Further the Social-Emotional Learning (SEL**)**, associated with frameworks developed by CASEL, highlights competencies such as self-awareness, empathy, and relationship skills. CRP incorporates SEL by fostering inclusive and emotionally supportive environments where students feel respected and valued [14][23]. This integration enhances motivation, reduces anxiety, and promotes emotional intelligence [24]. Therefore, these frameworks provide a comprehensive foundation for CRP, ensuring cognitively engaging, socially meaningful, and emotionally supportive learning experiences that promote both academic achievement and holistic development.

SYNTHESIS OF FINDINGS

A review of recent studies (2020–2025) reveals consistent and meaningful trends regarding the impact of Culturally Responsive Pedagogy (CRP) on secondary school students' science achievement and emotional intelligence (EI). First, a strong positive relationship between CRP and science achievement is widely reported. Studies indicate that culturally relevant teaching practices enhance conceptual understanding and academic performance by connecting scientific knowledge with student's lived experiences [18][28][11]. Second, there is significant improvement in student engagement and motivation. CRP fosters active participation, interest, and identity development in science learning, particularly among diverse learners [4][21]. Third, emerging evidence links CRP with emotional intelligence, suggesting that inclusive and culturally affirming classrooms promote empathy, self-awareness, and interpersonal skills [14][24]. However, despite these promising findings, there is a limited number of direct empirical studies integrating CRP and EI within science education contexts, indicating a critical research gap [15][11]. Overall, the synthesis suggests that CRP contributes significantly to both cognitive (achievement) and affective (EI) domains, though further empirical validation is needed.

Table 1. Synthesis of Key Findings (2020–2025)

Supporting Studies

Theme	Key findings	References
CRP and Science Achievement	Strong positive impact on academic performance and conceptual understanding through culturally relevant content among students	[18] [28] [11]
Engagement and motivation	Increased participation, interest, creativities and student identity in science learning	[4] [21]
CRP and Emotional Intelligence	Growth in empathy, self-awareness and interpersonal skills on the result of inclusive environments	[14] [24]
Integration of CRP for EI and Science achievement	Emerging recognition of CRP's role in fostering both cognitive and affective and psychomotor skill outcome of students.	[23 [21]
Contrasting findings		
CRP and Science Achievement	No significant gains when CRP is poorly implemented and lacks teacher training	[11] [15]
Engagement and motivation	Engagement improvements may be short-term and inconsistent across contexts	[21]
CRP and Emotional Intelligence	Lack of direct empirical measurement of EI outcomes that claims often inferred	[24]
Integration of CRP for EI & Science achievement	Effectiveness depends heavily on teacher competence, resources and contextual adaptation	[19] [4]
Neutral & Mixed Findings		
CRP and Science Achievement	Moderate or context-dependent impact by varies by subject and implementation fidelity	[15] [11]
Engagement and motivation	Some improvements observed, but not always statistically significant	[4]
CRP and Emotional Intelligence	Emerging but indirect relationship that requires further empirical validation	[14] [23]
Integration of CRP for EI and Science achievement	Fragmented evidence and most studies examine CRP and EI separately	[4] [11]

1. Critical synthesis of Arguments and Counterarguments

The present review highlights Culturally Responsive Pedagogy (CRP) as a powerful pedagogical approach which helps to enhancing secondary school student's science achievement and emotional intelligence (EI). A key argument emerging from the literature reviews are that CRP significantly improves academic outcomes by connecting scientific knowledge with student's cultural experiences. Grounded in constructivist and sociocultural perspectives the CRP promotes deeper conceptual understanding, engagement and identity formation in science learning among

students [19][28]. Another research perspectives by integrating principles of social-emotional learning (SEL). The CRP fosters emotional awareness, empathy and interpersonal skills which helps to contributing for holistic development children [14] [24]. After analysis of various research finding, the researcher find out the several counterarguments challenge the consistency and generalizability of these findings but critics argue that the effectiveness of CRP is highly dependent on the quality of implementation, teacher competence and teacher's practical knowledge about the cultural practices on real ground level. Superficial and tokenistic incorporation of cultural elements can have no significant academic gains [11] at the same time CRP is often linked with improved emotional outcomes. The research about CRP is limited direct empirical evidence linking CRP with emotional intelligence, particularly within science education contexts [15]. Another critical concern is the variability of outcomes across different educational settings on CRP. Some studies report moderate and mixed effects that suggesting the CRP may not uniformly benefit all student groups and another subject area. This indicates the need for context-specific adaptations and rigorous evaluation.

SUGGESTIONS AND IMPLICATIONS

Culturally Responsive Pedagogy (CRP) is providing important directions for improving teaching, curriculum and educational policy.

1. **For teachers**

   The CRP highlighted the integration of student's cultural backgrounds into classroom strategies. Teachers should use local cultural and resources as examples and inquiry-based learning to make science more meaningful and more rational. It is also encouraging inclusive classroom dialogue which is help to both teacher and students for creating inclusive classroom with equitable way of learning. Research by Gloria [26] pointed that culturally relevant teaching improves actively engagement of students and academic success. Similarly, Geneva [18] highlights that connecting instruction with real and everyday life of students and experiences that enhances understanding and participation batter.

2. **For curriculum developers**

   The CRP suggests designing science curricula that reflect diverse cultural backgrounds and cultural practices such as include indigenous ideas and local knowledge systems in concert mode. This approach helps students visualized the relevance of science in their daily lives and cultural practices. Many research proved that inclusive curricula promote equity and reduce educational disparities among diverse learners in educational setting.

3. **For policy makers**

   The CRP vital need for strong institutional support through teacher training programs such pre-services, in-services, cultural oriented training and inclusive educational policies that assist effective implementation in educational institution and also enhance effective professional development can equip teachers with the skills to implement CRP in classrooms. Studies by [47] highlighted that teacher preparation is most importance for culturally responsive teaching. In addition, that policies and policy maker should be conscious about cultural pedagogy benefits and advancements for learners that promote cultural inclusion and equity can create supportive environments for diverse learners. Overall, CRP serves as a powerful approach to improve academic achievement, emotional development, and educational equity in science education.

2. CHALLENGES IN IMPLEMENTING CRP: RESEARCH-BASED ANALYSIS

1. **Lack of Teacher Training**

   Recent research studies highlights that inadequate professional training is a major barrier to make effective CRP implementation in teaching-learning process. [38] found that many teachers have lack practical knowledge and skills to integrate cultural practices and resources into science teaching. Without structured training of teachers often feel like on traditional methods, limiting student engagement and culturally meaningful learning and retention of students. Similarly, [47] highlighted on his study that teacher preparation programs must focus on cultural competence to support diverse learners which help to create fully inclusive classroom with any types of discrimination on the ground of physical, social and intellectual.

2. **Curriculum Rigidity**

   Rigid and standardized curricula restrict the teacher's creativity and innovative ideas. Curriculum should flexibility to adapt content according to student's cultural contexts with associating the classroom syllabus which helpful for batter understanding what are exactly in the concept of knowledge in text book. Research shows that fixed syllabi and exam-oriented systems discourage innovation and culturally responsive practices among students. Different researcher found that curriculum reform is necessary to ensure inclusivity and relevance for culturally diverse students time to time according to needs and potentialities of student.

3. **Limited Cultural Awareness**

   In another study highlighted that teachers have lack of knowledge about student's cultural practices that effects the implementation of effective and productive classroom, and student's achievements of science areas. Other hand when educators are unaware of cultural diversity, they may fail to connect learning with student's real-life experiences and feelings. Researcher like [18] highlights that cultural awareness is essential for creating meaningful and engaging inclusive learning environments.

4. **Superficial Implementation**

   The CRP is often implemented at a surface level due to lack of teacher ready to teach this type approaching real classroom situation. This "tokenistic" approach limits its impact on both academic achievement and emotional development of students.in the context of culturally relevant pedagogy [26] focus that CRP requires deep pedagogical change but not just the inclusion of cultural symbols or examples. Research reflect that teachers often lack integrated pedagogical knowledge for CRP implementation.

CONCLUSION

Culturally responsive pedagogy is an effective approach that, strengthens both academic and development of emotional intelligence especially at the secondary level. CRP makes learning more meaningful and fairer by bridging cultural gaps in education. Future study should examine CRP and its effect on emotional intelligence among secondary school sciences students. The traditional classroom perceived science education is based on objectivity of facts and phenomenon quite isolated from culture and lived experiences. CRP works as a catalyst to bridge the gaps between student's lived experiences and sciences learning. This review suggested. This review revealed that CRP has positive effect on sciences achievement and emotional intelligence of secondary school sciences students. Different research study also highlighted that culturally relevant content fosters academic performance, conceptual understanding, engagement, empathy, self-awareness and inter-personal skills among the secondary school students. These findings aligned with the research findings of [26] [18] both emphasis the role of culture a meaning full learning and holistic development. Whoever other contrasting findings suggest that the effectiveness of CRP is not uniform when poorly implemented or lack trained teacher, curricular rigidness and short-term gains. Moreover, other studies highlighted the effectiveness of CRP is highly context- dependent and varying across different learning groups, resources as well as teacher competence. Though CRP has strong potential to enhances cognitive, affective and psychomotor outcome at the same time no studies were are under taken by any researcher with the variables like CRP in enhancing academic achievement and emotional intelligences among the secondary school students. So future researcher may consider this by integrating longitudinal, cross-sectional, sequential exploratory and other suitable research methodology and designs.

Conflicts of interest

No conflicts of interest declared by all authors.

REFERENCES

[1]. Aikenhead, G. S. (2006). *Science education for everyday life: Evidence-based practice*. Teachers College Press.

[2]. Aikenhead, G. S., & Michell, H. (2011). *Bridging cultures: Indigenous and scientific ways of knowing nature*. Pearson.

[3]. Albritton, T., et al. (2024). Culturally responsive social-emotional learning practices. *Education Sciences*.

[4]. Aronson, B., & Laughter, J. (2016). The theory and practice of culturally relevant education: A synthesis of research across content areas. *Review of Educational Research,86*(1),163–206. https://doi.org/10.3102/0034654315582066

[5]. Aronson, B., & Laughter, J. (2016). *The theory and practice of culturally relevant education: A synthesis of research across content areas*. *Review of Educational Research, 86*(1), 163–206. https://doi.org/10.3102/0034654315582066

[6]. Avraamidou, L. (2020). Science identity as a landscape of becoming: Rethinking recognition and emotions through an intersectionality lens. *Cultural Studies of Science Education, 15*, 323–345. https://doi.org/10.1007/s11422-019-09954-7

[7]. Bang, M., & Medin, D. (2010). Cultural processes in science education: Supporting the navigation of multiple epistemologies. *Science Education, 94*(6), 1008–1026. https://doi.org/10.1002/sce.20392

[8]. Brackett, M. A., & Rivers, S. E. (2014). Transforming students' lives with social and emotional learning. In R. Pekrun & L. Linnenbrink-Garcia (Eds.), *International handbook of emotions in education* (pp. 368–388). Routledge.

[9]. Brown, B. A. (2017). *Science in the city: Culturally relevant STEM education*. Teachers College Press.

[10]. Bruner, J. S. (1961). The act of discovery. *Harvard Educational Review, 31*(1), 21–32.

[11]. Byrd, C. M. (2016). Does culturally relevant teaching work? An examination from student perspectives. *SAGE Open, 6*(3), 1–10. https://doi.org/10.1177/2158244016660744

[12]. Caingcoy, M. E. (2023). *Culturally responsive pedagogy: A systematic overview*. Diversitas Journal,8(4), 3203–3212. https://doi.org/10.48017/dj.v8i4.2780

[13]. Carlone, H. B., & Johnson, A. (2007). Understanding the science experiences of successful women of color. *Journal of Research in Science Teaching, 44*(8), 1187–1218. https://doi.org/10.1002/tea.20237

[14]. CASEL. (2020). *What is social and emotional learning?* Collaborative for Academic, Social,and Emotional Learning. https://casel.org/what-is-sel/

[15]. Dee, T. S., & Penner, E. K. (2017). The causal effects of cultural relevance: Evidence from an ethnic studies curriculum. *American Educational Research Journal, 54*(1), 127–166. https://doi.org/10.3102/0002831216677002

[16]. Freire, P. (2000). *Pedagogy of the oppressed* (30th anniversary ed.). Continuum.

[17]. Gay, G. (2002). *Culturally responsive teaching: Theory, research, and practice*. Teachers College Press.

[18]. Gay, G. (2010). *Culturally responsive teaching: Theory, research, and practice* (2nd ed.). Teachers College Press.

[19]. Gay, G. (2018). *Culturally responsive teaching: Theory, research, and practice* (3rded.). Teachers College Press.

[20]. Goleman, D. (1995). *Emotional intelligence: Why it can matter more than IQ*. New York,NY: Bantam Books.

[21]. Hammond, Z. (2020). *Culturally responsive teaching and the brain: Promoting authentic engagement and rigor among culturally and linguistically diverse students*.

[22]. Howard, T. C. (2003). Culturally relevant pedagogy: Ingredients for critical teacher reflection. *Theory Into Practice, 42*(3), 195–202. https://doi.org/10.1207/s15430421tip4203_5

[23]. Immordino-Yang, M. H., & Damasio, A. (2007). We feel, therefore we learn: The relevance of affective and social neuroscience to education. *Mind, Brain, and Education,1*(1),3–10. https://doi.org/10.1111/j.1751-228X.2007.00004.x

[24]. Jennings, P. A., & Greenberg, M. T. (2009). The prosocial classroom: Teacher social and emotional competence in relation to student and classroom outcomes. *Review of Educational Research, 79*(1), 491–525. https://doi.org/10.3102/0034654308325693

[25]. Kalsi, A. K., & Dhillon, S. S. (2025). From traditional to contemporary: Integrating Indigenous knowledge systems into STEM education to enhance higher order thinking skills. *International Journal of Advanced Academic Studies, 7*(4), 77–83. https://doi.org/10.33545/27068919.2025.v7.i4b.1427

[26]. Ladson-Billings, G. (1995). Toward a theory of culturally relevant pedagogy. *American Educational Research Journal, 32*(3), 465–491. https://doi.org/10.3102/00028312032003465

[27]. Ladson-Billings, G. (2009). *The dreamkeepers: Successful teachers of African American children* (2nd ed.). Jossey-Bass.

[28]. Ladson-Billings, G. (2021). *Culturally relevant pedagogy: Asking a different question*. Teachers College Press.

[29]. Lee, O. (2003). Equity for linguistically and culturally diverse students in science education: A research agenda. *Teachers College Record, 105*(3), 465–489. https://doi.org/10.1177/016146810310500306

[30]. Lestari, F., Hadriana, H., Mahdum, M., Hermandra, H., & Putra, Z. H. (2025). Culturally Responsive Pedagogy in Inclusive Education: A Systematic Review of Global Practices (2019–2024).PPSDP International Journal of Education, 4(2), 1427–1440. https://doi.org/10.59175/pijed.v4i2.856

[31]. Mahfouz, J., Steed, E. A., & Shapland, D. (2023). Culturally responsive social emotional learning: Perspectives of early childhood teachers. *Early Childhood Education Journal, 53*(2), 405–412. https://doi.org/10.1007/s10643-023-01599-0

[32]. Matindike, F., & Ramdhany, V. (2025). Incorporating indigenous knowledge perspectives in integrated STEM education: a systematic review. *Research in Science & Technological Education*, *43*(3), 1022–1042. https://doi.org/10.1080/02635143.2024.2413675

[33]. Michell, H. (2011). *Working with Aboriginal knowledge in science classrooms*. *Australian Journal of Indigenous Education, 40*, 21–27. https://doi.org/10.1017/9781108868419

[34]. Mohanty, A., & Mishra, S. (2025). Emotional intelligence and academic achievement among students at the higher secondary level. *International Journal of Educational Research, 12*(3), 45–58.

[35]. Moll, L. C., Amanti, C., Neff, D., & Gonzalez, N. (1992). Funds of knowledge for teaching: Using a qualitative approach to connect homes and classrooms. *Theory Into Practice,31*(2),132–141. https://doi.org/10.1080/00405849209543534

[36]. Morrison, K. A., Robbins, H. H., & Rose, D. G. (2008). Operationalizing culturally relevant pedagogy: A synthesis of classroom-based research. *Equity & Excellence in Education,41*(4),433–452. https://doi.org/10.1080/10665680802400006

[37]. Nieto-Carracedo, A., Gómez-Iñiguez, C., Tamayo, L. A., & Igartua, J. (2024). Emotional Intelligence and Academic Achievement Relationship: Emotional Well-being, Motivation, and Learning Strategies as Mediating Factors. *Psicología Educativa,30*(2),67 - 74. https://doi.org/10.5093/psed2024a7

[38]. Ogodo, J. A. (2024). *Culturally responsive pedagogical knowledge: An integrative teacher knowledge base for diversified STEM classrooms*. *Education Sciences,14*(2),124. https://doi.org/10.3390/educsci14020124

[39]. Paris, D. (2012). Culturally sustaining pedagogy: A needed change in stance, terminology, and practice. *Educational Researcher, 41*(3), 93–97. https://doi.org/10.3102/0013189X12441244

[40]. Paris, D., & Alim, H. S. (2017). *Culturally sustaining pedagogies: Teaching and learning for justice in a changing world*. Teachers College Press.

[41]. Piaget, J. (1970). *Science of education and the psychology of the child*. Orion Press.

[42]. Sachdeva, N., & Hewitt, J. (2025). *Teaching for more equitable outcomes*. *The Science of Learning*. https://scienceoflearning.substack.com/p/teaching-for-more-equitable-outcomes

[43]. Sivakalai, S., & Nalinilatha, R. (2017). Emotional intelligence and academic achievement: A study among higher secondary students. *Educational Research and Reviews, 12*(8), 412–418.

[44]. Sleeter, C. E. (2011). The academic and social value of ethnic studies: A research review. *National Education Association Research Department*.

[45]. Smith, T., Avraamidou, L., & Adams, J. D. (2022). Culturally relevant/responsive and sustaining pedagogies in science education: Theoretical perspectives and curriculum implications. *Cultural Studies of Science Education, 17*, 637–660. https://doi.org/10.1007/s11422-021-10082-4

[46]. Villegas, A. M., & Lucas, T. (2002). *Educating culturally responsive teachers: A coherent approach*. State University of New York Press.

[47]. Villegas-Reimers, E., & Cressey, J. M. (2019). *Integrating social-emotional learning and culturally responsive teaching in teacher education preparation programs: The Massachusetts experience so far*. *Teacher Education Quarterly, 46*(4), 150–168.

[48]. VYGOTSKY, L. S. (1978). *Mind in Society: Development of Higher Psychological Processes* (M. Cole, V. Jolm-Steiner, S. Scribner, & E. Souberman, Eds.). Harvard University Press. https://doi.org/10.2307/j.ctvjf9vz4

[49]. Wertsch, J. V. (1985). *Vygotsky and the social formation of mind*. Harvard University Press.

[50]. Yeh, E., Sharma, R., Jaiswal-Oliver, M., & Wan, G. (2021). Culturally Responsive Social Emotional Learning for International Students: Professional Development for Higher Education. *Journal of International Students*, *12*(1), 19-41.

[51]. Zhou, L., & Hassan, H. C. (2024). Role of culturally relevant instruction in enhancing social-emotional learning for marginalised students. *Conhecimento & Diversidade,16*(44),450–469. https://doi.org/10.18316/rcd.v16i44.12267

Cite this Article:

Kunar, J., & Behera, P. (2026). Culturally responsive pedagogy for enhancing secondary school students' science achievement and emotional intelligence: An integrative review. *International Journal of Multidisciplinary Research in Arts, Science and Technology (IJMRAST), 4(4), 81–95.*

***Journal URL**: https://ijmrast.com/* ***DOI:** https://doi.org/10.59828/ijmrast.v4i4.264*