



# American Journal of Education and Technology (AJET)

ISSN: 2832-9481 (ONLINE)

VOLUME 4 ISSUE 4 (2025)



PUBLISHED BY  
E-PALLI PUBLISHERS, DELAWARE, USA

## Culturally Responsive Social-Emotional Learning in STEM for Underserved Students with Behavioral Challenges

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### Article Information

**Received:** March 12, 2025

**Accepted:** April 17, 2025

**Published:** November 10, 2025

### Keywords

*Behavioural Challenges, Culturally Responsive Education, Social-Emotional Learning, STEM, Underserved Students*

### ABSTRACT

This study examines integrating culturally responsive social-emotional learning in STEM education to enhance the learning for underserved students, particularly students facing behavioural challenges. The key research question that is explored involves seeking out beneficial SEL interventions that are culturally relevant but also challenging for students, and how STEM can be used to augment resilience, success. This review critically examines reliable and credible existing journals and materials on culturally responsive SEL in STEM. Results from the gathered journals and materials formed the dataset for this review. Document analysis technique was utilised, and findings were presented thematically. Findings show that, culturally responsive SEL integrated into STEM education can meet both the emotional and academic needs of underserved students. Culturally relevant SEL can assist these students in the development of the social-emotional competencies to be successful in the classroom, in school, and beyond. Insight drawn from peer-reviewed literatures also reveal that incorporating diverse perspective, building strong relationships, and developing emotional literacy, among others are the key strategies to employ for the implementation of culturally responsive SEL in STEM for underserved students with behavioural challenges. However, one key challenge lies in the fact that teachers will need to be given professional development that provides them with knowledge of students' backgrounds and enables them to incorporate these strategies into an effective SEL in STEM education.

### INTRODUCTION

Almost half of students lose motivation for STEM by the 8th grade, sharply dropping from the interest they previously had in STEM. Challenges to STEM self-efficacy often result from factors like mental health, disability status, gender, and cultural influences (Karalar *et al.*, 2021). Computer science programs, including other relevant areas in STEM, for elementary school students are formal and informal. Equitable pedagogy in formal STEM programs changes STEM attitudes positively through diverse content, high-quality teaching and targeted support (Mouza *et al.*, 2016). Mentorship and community-based type programs have been used to develop skills and increase STEM interest in nontraditional settings with low resources (Disalvo *et al.*, 2009; Kelly *et al.*, 2023). Student engagement requires fostering student-student bonds and exposing diverse identities in STEM key subjects, especially in the case of minority students who have a reputation of being interested, but who struggle for socioeconomic reasons (Cheryan *et al.*, 2015; Mouza *et al.*, 2016). Previous studies on the impact of culturally responsive coding programs, for instance, those targeting minority and girl students, have confirmed integration of integrative content, support, and resources helps increase their inclusion, motivation, and perceived capability in this field (Serrano *et al.*, 2020; Carlana & Fort, 2022). It fosters close and far transfer of developmental skills across different age groups, interest levels and experiences

of learners. It is the combination of interests like gaming, art and geometry into programming principles leading to effective socio-emotional skills such as frustration management, teamwork, organization, receiving feedback, and time handling and cognitive benefits in aspects like creativity, language, computational thinking, metacognition and spatial reasoning (Scherer *et al.*, 2021; Washington *et al.*, 2021; Canbeldek & Isikoglu, 2023). Essentially, Social-Emotional Learning (SEL) by Weissberg *et al.* (2015) refers to a process by which children and adults learn and apply the information, attitudes, and skills that enable them to understand and control emotions, set and achieve goals to be certain, sympathize for others, build and maintain relationships, and make responsible decisions. The field emerged formally some 25 years ago and over the past few years, the evidence accumulated from basic and applied research (Cantor *et al.*, 2018; Jones & Kahn, 2017; NCSEAD, 2019; Osher *et al.*, 2018; Taylor *et al.*, 2017) has prompted practitioners, researchers, and policymakers to advocate for the adoption of such programs for pre-K–12 students in school and out of school settings (Jones *et al.*, 2019). However, such programs have also been subjected to criticism. Recent research (Clark *et al.* 2022) has begun to identify the potentially harmful effects of SEL, in particular, for multiply marginalized students, as more schools have incorporated and tried to embed SEL standards into their curriculum and instruction. Also,

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authors have observed that the SEL standards reproduce the hegemonic and normative one that the practice of civility has been elevated over the controversies necessary to pursue equity and justice (Camangian & Cariaga, 2021; Clark *et al.*, 2022). Additionally, by ignoring such issues of racism, ableism, and other intersecting oppressions, SEL reinforces inequalities with standards that normalize the ways of the dominant ones (western Eurocentric standards, patriarchal norms) and signifies and points out students who contradict 'the norm' as deviant. According to Simmons (2021), SEL programs that don't address racism and racial trauma are also a hallmark of "white supremacy with a hug." Racism and racial trauma do not get addressed in this kind of SEL program. By doing so, they do not become truly transformative in tackling the oppressions felt while living in a racist and disabled society. Therefore, for SEL to be equitable for all students, a new orientation to and approach considering SEL is required.

Underserved students, specifically students from minority and low-income status, suffer multiple barriers to academic success such as behavioural challenges as well as limited availability of high-quality educational resources. As well, social-emotional learning (SEL) is coming to be seen as a critical means of supporting these students' academic, and emotional growth. Applied with culturally responsive teaching strategies, SEL can build an inclusive learning climate wherein the culture from which students come is reflected, as well as the personal experiences of the students. Using a culturally responsive SEL in STEM education is the focus of this research investigation of how this may benefit underserved students, including students experiencing behavioural challenges and how STEM education could successfully deliver both academic and personal development.

Culturally responsive teaching means learning, understanding and relating to a student's background, beliefs, values, home culture, etc. to aid in teaching. It is a way of affirming students' cultural identities and using students' lived experiences to stimulate learning and a sense of self (Lessonbee, 2022). Responsive teaching is a crucial part of SEL because educators who have meaningful knowledge, skills, and competencies about students' cultures and identities can teach SEL based on students' cultures and identities. In actuality, cultural responsiveness makes certain that students receive all the good that can come from SEL (Lessonbee, 2022). The literature readily contains notions of culturally responsive (Gay, 2000), culturally relevant (Ladson-Billings, 2014), and culturally sustaining teaching (Alim & Paris, 2017). From the consensus, there is no culture-informed content and instructional processes that represent the best science of learning and development which can guarantee cultural well-being, identity, and a safe learning environment which in turn will afford enough freedom for academic, social and emotional learning (Cantor *et al.*, 2018; Darling-Hammond, 2017; Hammond & Jackson, 2015; Immordino-Yang *et al.*, 2018).

Social-emotional learning (SEL) cannot be overestimated in addressing the needs of underserved students, in particular students who have behavioural exclusions. While SEL frameworks have great potential for creating meaningful, impact experiences in STEM fields, when coupled with culturally responsive teaching, offering instructor support can provide some needed additional support in building them. Therefore, it is important to have culturally responsive approaches to SEL to reduce behavioural issues; promote inclusion; and improve academic performance in STEM disciplines, which are currently marked by the underrepresentation of marginalized groups (Yeh *et al.*, 2022).

Culturally responsive teaching recognizes and honours students' cultural backgrounds, experiences, and identities and applies this to teaching in their practices and curriculum development (Gay, 2018). Culturally responsive SEL programs are well beyond standard SEL frameworks and acknowledge where the students are living and learning, making SEL more relevant and effective. Particularly helpful for underserved students, this approach seeks to encourage engagement, develop trust, and eclipse bias, discrimination and exclusion among students who may encounter such biases (Ladson-Billings, 2014). Culturally Responsive Teaching (CRT) is a concept that advocates recognizing, respecting and incorporating students' culture(s) into the learning process (Gay, 2018). This approach combined with SEL will improve students' awareness of themselves and others, social-emotional skills and regulation. This review takes up the task of understanding and supporting students with behavioural challenges through the framework of culturally responsive SEL in the context of STEM education.

Culturally responsive SEL is important in STEM education, where marginalized students are underrepresented, because it means that these students see themselves in the STEM curriculum, STEM role models, and classroom activities among other things. There is a greater interest and persistence in STEM fields because students from marginalized communities have to overcome more challenges (Sithole *et al.*, 2017). Some evidence has been reported for the effect of culturally grounded SEL programs on risk reduction (Hecht & Shin, 2015; Metzger *et al.*, 2013).

Though there are numerous advantages of SEL in education, including STEM, reports suggest that SEL should be integrated properly. The implementation of SEL effectively in STEM has made it difficult to find the best way to do this positively for the students (Kaspar & Massey, 2022). The effectiveness of SEL implementation in STEM, particularly among underserved students with behavioural challenges, is determined by some key factors. One of the major factors to consider to effectively integrate SEL in STEM for underserved students is the execution of Culturally-Responsive Pedagogy (CRP). Efficient integration of SEL in STEM, influenced by CRP, will enhance the development of underserved students with behavioural challenges.

## LITERATURE REVIEW

### Emotional and Behavioural Disabilities (EBD)

Emotional and Behavioural Disabilities (EBD) is one of the behavioural challenges facing underserved students. Research on the disproportionality of multiple marginalized students with or at risk for emotional and behavioural disabilities (EBD, also known as emotional disturbance) in special education remains the focus (Sullivan, 2017). In the United States majority of children identified as EBD are school-age children of minoritized backgrounds (Office of Special Education Programs [OSEP], 2021). Through research spanning over years exploring racially, ethnically, and linguistically diverse (RELD) special education populations, it has been found that Black and Latinx students are more likely to be identified with or at risk for EBD than White students even when taking into consideration race, culture, language, disability, and poverty (Harper & Ferguson, 2017; OSEP, 2021; Sullivan, 2017). From the long and broad history of inequitable practices and policies from all these factors in the public education system coming into existence, one can expect adverse education and behaviour outcomes (DeMatthews, 2019; Artiles, 2013). Such practices and policies marginalize, exclude and prevent students with emotional and behavioural disabilities from equitable learning opportunities as they are often ignored or feel isolated.

However, discriminatory practices within the school environment in which RELD students are at risk or identified as “with EBD” have been conditioned, and have made educational spaces a barrier to their social and emotional development (U.S. Department of Education, 2021). While marginalized students with emotional or behavioural challenges from a RELD background typically require equitable provision of resources and services for social and emotional success, they may not receive the same type of support because of implicit biases. Implicit bias, according to several researchers (McIntosh *et al.*, 2014; Migliarini & Annamma, 2020; Triplett *et al.*, 2014), refers to unconscious, stereotyped perceptions of ability resulting in a disparate practice that over-represents minoritized students in special education. Nevertheless, given the above, it is recommended that children with, or at risk of, EBD are studied in inclusive and equitable environments that encourage social-emotional growth and development, regardless of their race or ability. (U.S. Department of Education, 2021)

### The Effects of Students with or At-risk for EBD in Schools

We have seen a significant increase in the diversity of urban schools, yet the minoritized students are overrepresented in them (U.S. Government Accountability Office, 2022). Urban schools are the largest kind of schools across the U.S. and serve the largest populations of students out of disadvantaged, and historically marginalized groups (from disabled and racial minority backgrounds). While this may be the case, they are often subject to several inequities in

the educational environment that negatively affect their social and emotional well-being (lack of high-quality teachers; Great Lakes Equity Center, 2020). For instance, the study by Burke, and colleagues (2011) showed that students in urban communities with four or more adverse childhood experiences are thirty-two times more likely to experience behaviour and learning difficulties in school, which may be often connected with high rates of suspension, grade retention, disproportionate special education placement, and school dropout (Bal *et al.*, 2017; Harper, 2017). Further, such a clash of cultural dissonance between the school and home confines (Han, 2022) is fueled and continued by the systemic barriers confronted by multiple marginalised students.

### Social-Emotional Learning (SEL): Its Role in Student Development

Social and emotional development support is one of the key factors to improve a student’s academics. A good way to support student social and emotional growth is to practice Social-Emotional Learning [SEL] (CASEL, 2023). SEL is a learning procedure superior to conventional scholastic training and gives fundamental life aptitudes to students that limit accomplishment in their scholastic interests and future contracts. CASEL (2023) states that the main purpose of SEL is to create a better understanding of emotions, one’s awareness, sympathy, and the mindful ability of decision-making to improve one’s interpersonal skills. Executing SEL programs through instructive training has the potential to have beneficial and snared effects on the accomplishment of the student’s instruction, companionship, mental well-being, and extensive improvement (Weissberg, 2019).

The SEL offers advantages through a variety of different consequences. It leads more towards better academic achievement, which in turn promotes enhanced self-regulation and goal-setting functions (Sahranavard *et al.*, 2018) and time management and focus study habits. SEL’s development of positive interpersonal interactions and conflict resolution skills helps to establish a harmonious and cohesive educational setting. This will allow the students to cut the silly skills to skillfully navigate an intricate emotion and circumstances (Trigueros *et al.*, 2020). Adult training brings up an environment for full kid advancement including passionate well-being, social aptitudes and scholastic achievements (CASEL, 2023) joining guardians, by their commitment to overseeing the kids or the families of kids, tight in time proficient improvement opens doors for teachers and approaching SEL in the educational modules. Growing basic qualities, for example, versatility, adaptability, energetic well-being, and so forth in young students assist with getting them on the offing track to learn the essentials that will make them thrive in the continuously evolving society (CASEL, 2023).

Through the mixture of SEL into the instructional modules, the blending of exhaustive proficient improvement openings for instructors, and the dynamic

individuals of guardians, training offers an open ecosystem with which the extensive improvement of kids, remembering their enthusiastic welfare, social aptitudes and scholastic execution was accomplished (CASEL, 2023). That means SEL helps guide the development of such properties as versatility, adaptability and enthusiastic well-being in students, and the ability to thrive in an ever-changing society (CASEL, 2023). The results of the studies show the positive influence and effectiveness of the implementation of SEL in the school setting (Corcoran *et al.*, 2018; Sandilos *et al.*, 2022; Schiepe-Tiska *et al.*, 2021). Such programs implemented for SEL not only help the students but also the teachers; it ensures better student-teacher relationships, reduced stress, improved classroom management and positive behaviour (Schonert-Reichl, 2016). We find however that statistics demonstrate the wide consequence of the negative impact on a high number of students' emotional skills after the pandemic as a result of school closings and the need for SEL implementation in the classroom setting (Schwartz *et al.*, 2022). Another need was also reported by educators as a school-wide SEL program to help the students in terms of enhancing social-emotional skills and the student's overall outcome (Hamilton *et al.*, 2019).

Essentially, some studies have examined the role of SEL in STEM education, while others have investigated the combination of culturally responsiveness and STEM education (Sahranavard *et al.*, 2018; Corcoran *et al.*, 2018; Trigueros *et al.*, 2020; Sandilos *et al.*, 2022; Schiepe-Tiska *et al.*, 2021). However, there is paucity of studies on the integration of culturally responsive SEL in STEM for underserved students with behavioural challenges. Also, limited studies exist that examine how teachers make culturally responsive SEL strategies work in their STEM instruction about behaviorally challenged students (CASEL, 2023). There is lack of cohesive models that relate SEL, STEM, culture, and behavior. Hence, this study.

## MATERIALS AND METHODS

This review utilises existing and credible journals and materials on culturally responsive social-emotional learning in STEM for underserved students with behavioural challenges. Irrespective of the year of publication, relevant articles, journals and other useful materials formed the dataset for the review. Some of the used databases included Scopus, Science Direct, Google Scholar, ResearchGate, IEEE, and the following keywords were used to search for journals and materials (culturally responsive social-emotional learning, STEM, STEM for underserved students, behavioural challenges). Document analysis was employed and findings were presented thematically.

## RESULTS AND DISCUSSION

### Culturally Responsive Teaching (CRT) and Its Impact on Underserved Students

Culturally responsive teaching (CRT) refers to an educational way of teaching in which the teacher

recognizes that the student's cultural background, experiences and values can be incorporated into the learning (Ladson-Billings, 1995). Research has demonstrated that it enhances students' engagement and learning outcomes for students with diverse backgrounds because it allows students to link new knowledge with their preexisting cultural framework (Gay, 2010). CRT serves as a tool which helps validate a student's identity and affords a way for important academic experiences to occur for underserved students (Banks, 2015).

### Social-Emotional Learning (SEL) and Behavioral Challenges

The goal of SEL programs is to build students' emotional intelligence and self-regulation as well as students' interpersonal skills, which lead to both academic and personal success (Durlak *et al.*, 2011). Often unregulated in terms of their emotions, and lacking relationships with peers and with school, students with behavioural challenges make poor progress in school. The challenges associated with addressing such issues can be addressed through implementing SEL strategies such as promoting self-awareness, empathy, and positive behaviour (Jones *et al.*, 2017).

### STEM Education for Underserved Students

STEM education, the concept of combining Science, Technology, Engineering and Mathematics can pull in some underserved students and open up the pathway to a future career. Nevertheless, numerous barriers exclude a large number of students from underprivileged backgrounds from STEM fields such as lack of representation and cultural dissonance in the curriculum (Chavous *et al.*, 2003). One way to bridge the gap between culturally responsive practices and STEM teaching is to infuse culturally relevant practices in STEM teaching to create more access and interest in STEM for these students (Gay, 2018).

### Culturally Responsive SEL in STEM

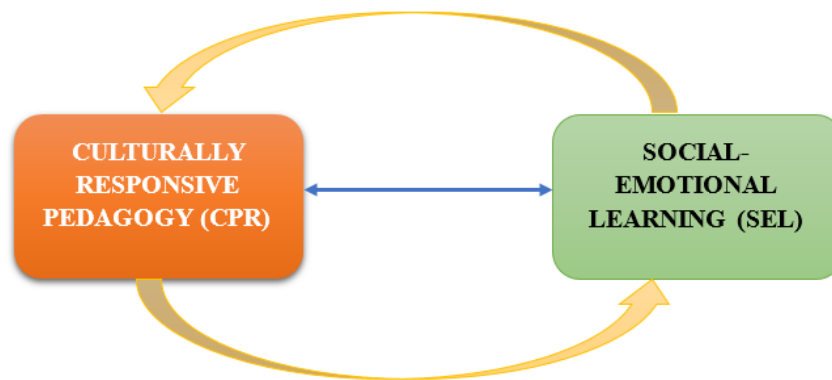
Although much less researched, evidence suggests that cultural responsiveness, SEL, and STEM should be combined to meet students' emotional needs while simultaneously arousing students' interest and achievement in STEM subjects. Embedding SEL in culturally relevant ways into STEM instruction will enhance educators' support of students' social-emotional development and academic success (National Research Council, 2015) In the following section, we reviewed and analyzed KLA, curriculum, and best practices for embedding SEL into STEM instruction resulting in Social Emotional Links in STEM instruction for all students.

### Culturally-Responsive Pedagogy (CPR) Framework

Culturally responsive pedagogy (CRP) is founded with an asset-based framework in acknowledging that the "cultural heritages, experiences, perspectives, and contributions of different ethnic groups of colour" will be included in

innovative and purposeful intellectually rigorous teaching and learning opportunities (Gay, 2021). With this in mind, educators ought to take for granted that students have relevant prior knowledge that can be used to strongly support their learning experiences. So, educators need to know their students on a personal level. Sleeter (2012) suggests that CRP is a “political endeavour.” Therefore, educators should not dehistoricize learning from its social-political environment. Gay also contends that the infusion of curriculum into CRP is more than simply the infusion of curriculum content since CRP considers that the context, the learner, and the content must be viewed together. These entities are necessarily similar to elements of online learning theory, and no educator can promote the achievement and well-being of the youth of

colour, particularly in online settings, without attending to them as inseparable. Other characteristics of CRP such as “[caring], cultural affirmation, socio-emotional well-being, interpersonal relations, and political efficacy, of individuals and systems (Gay, 2021). The use of CRP may lead students to be more involved in the learning process (Sleeter, 2012) when the application is suitable. Culturally Responsive Social-Emotional Learning (CRSEL) Framework Essentially, the interaction effects of cultural responsiveness and SEL in STEM for underserved students, particularly, those with behavioural challenges, cannot be overlooked (Figure 1). These combinations will create a positive ripple effect on the overall growth and development of these students.



**Figure 1:** Culturally Responsive Social-Emotional Learning (CRSEL) Framework

Consequently, integrating SEL within a Culturally Responsive Pedagogy (CRP) is indeed very important for the creation of educational environments that are representative of students from diverse backgrounds and experiences. Ladson-Billings (1995) corroborates that CRP emphasizes the significance of offering the cultural identities of learners acknowledgement and respect in recognising that features of the learners’ cultural identities affect and affect how they learn. If SEL is integrated with CRP, it will make sure students are provided with cultural sensitivity so SEL are integrated into emotional and social growth integration.

SEL becomes a tool to promote understanding between different cultures and break their biases in a culturally responsive and inclusive learning environment. The students can learn to commend on and be receptive to difference, and value all for each other. Consequently, it assists in the disruption of systemic sociological barriers that might have been sustaining disparities based on race, ethnicity, socioeconomic status, or a variety of other factors.

The fact that SEL within a CRP context does more than just meet the current needs of the students exposes them to be active agents of the global society (McCallops *et al.*, 2019). Complete with building effective communication, conflict resolution, and cooperation skills – the skills

that SEL helps develop – a world in which people are becoming more and more interconnected and diverse will prove unmanageable by those who do not learn such skills. Educators who enable these skills help grow generations that aren’t only authority-wise, but socially mindful and profoundly locally associated with creating good social change (Baker, 2024). As a result, the integration of SEL in educational settings, particularly rooted in the values of Culturally Responsive Pedagogy, is powerfully reinforcing educational and societal outcomes when we design SEL in culturally responsive pedagogy. Besides equipping individuals with emotional intelligence to be able to deal with challenges, SEL also enables people to be able to identify and question the unjust and inequitable systems so that a more just, equitable, and inclusive society can be created.

### **Culturally Responsive-Sustaining Pedagogy and Social-Emotional Learning**

Culturally Responsive-Sustaining Pedagogy (CRSP) and Social Emotional Learning (SEL) are the two educational approaches mainly used together to better rates of positive learning outcomes in classrooms with different populations. CRSP represents a practice that sees and accepts the students’ cultural positions and gives instructive that are culturally appropriate (Gay, 2002b), while SEL is

a practice related to students in their emotional, social, and cognitive development (Gay, 2010; Paris & Alim, 2014). CRSP is founded on two theories (that is culturally relevant pedagogy and culturally sustaining pedagogy) that construes education through a strand of education that acknowledges the various cultures of students to try and develop instruction that is based on their specialized backgrounds (Paris & Alim, 2014). Culturally relevant pedagogy is founded on the assumption that we understand the student's cultural background and want to create a culture where every student is responsive to that background. Additionally, culturally sustaining pedagogy builds on the ideas of culturally relevant pedagogy by specifying that educational practices should also preserve the cultural and linguistic competence of students while providing access to the social capital markers of the dominant culture (Paris, 2021). The culturally responsive sustaining approaches are combined when we believe that students will learn more effectively when the ways that students' cultures inform learning and identity are known, affirmed, and incorporated into the class context. For example, if teachers can acknowledge the singular and multiple identities of the students they teach, they can build interactions in a welcoming and supportive classroom that allows students to share their experiences in and out of the classroom stemming from their singular identities, their cultural identity, feelings and values.

Katz *et al.* (2020) describes SEL as a process of developing skills such as self-awareness, self-management, social awareness and responsible decision-making to enhance students' social, emotional and cognitive growth. This is also a key skill for them to be successful in the classroom and life. As mentioned, SEL also focuses on the development of positive student relationships and a positive classroom climate. CRSP's relationship with SEL is explicitly based on the thinking that students need to be in an environment in which they feel cared for, culturally responsive sustaining and their social and emotional needs are met so that they can be successful. The combination of CRSP and SEL can allow students to experience higher levels of academic performance and engagement, as well as better social-emotional well-being (McCallops *et al.*, 2019). Besides, students who have CRSP and SEL experiences are more likely to be motivated and engaged in their learning.

### **Culturally Responsive Teaching and SEL**

Culturally responsive teaching rests on the underlying idea that all the students bring useful information and experiences that are based on what they have learned from their cultural background. For instance, educators use these perspectives to integrate into classroom practices that are then put in place and the students are then recognized and validated (Ladson-Billings, 1995). This approach is necessary in a diverse classroom, especially for students who might have cultural misunderstandings or marginalization in traditional school settings.

Social-emotional learning is the process of helping

students learn to recognize, understand, and manage emotions and to set and achieve positive goals, show empathy for others, build positive relationships and make responsible decisions (Collaborative for Academic, Social, and Emotional Learning [CASEL], 2020). For students with behavioural problems, SEL is particularly helpful since it can foster the skills of emotional and social regulation.

### **The Intersection of Culturally Responsive SEL and STEM Education**

STEM education doesn't just need rational knowledge but calls upon the ability to work as a team, speak, and come up with solutions with emotional stamina. Students with behavioural problems may find themselves in STEM environments to be uncomfortable because they can't control their impulses, tolerate frustration, and buddy up. Implementing culturally responsive SEL practices can help those challenges by giving students the skills to tolerate and tolerate their emotions, as well as honour their cultural identification.

To exemplify, in terms of culturally responsive SEL, sample strategies might include using culturally responsive materials in STEM lessons; and making sure that students can see themselves in the curriculum. Promoting group work that fosters collaboration and empathy also gives them practice with social-emotional skills in a meaningful context. Teachers can embed SEL practices into STEM education to make learning environments more inclusive places and those with behavioral challenges can thrive.

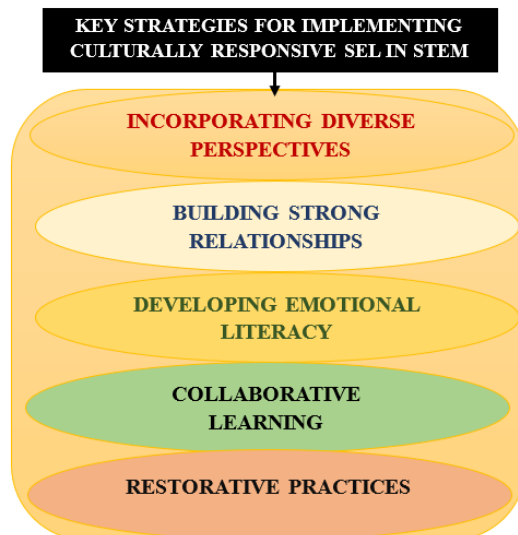
### **Tackling Behavioural Challenges in STEM Classrooms**

Many times, frustrations, lack of engagement and managing emotions in high-pressure situations in STEM classrooms lead to behavioural challenges. These challenges can be particularly cause for hurdles to overcome for students whose cultural experiences are a disconnect from what is being learned in the curriculum (Samuel, 2018). Such a classroom culture that values emotional display and the possession of tools for dealing with stress and frustration is what is culturally responsive SEL.

SEL instruction research has shown not only that students who receive that instruction do better behaviorally, achieve better academically, and have better social skills (Durlak *et al.*, 2011), but also that SEL instruction has caused reduced behavioural problems among other students in the classroom. With culturally responsive SEL practices integrated within the various educator models, through sensations of empathy, self-regulation, and problem-solving, students can learn and thrive in STEM fields.

### **Key Strategies for Implementing Culturally Responsive SEL in STEM**

The following are the recommended key strategies to employ for the implementation of culturally responsive SEL in STEM for students, including underserved students with behavioural challenges (Figure 2).



**Figure 2:** Key Strategies for Implementing Culturally Responsive SEL in STEM

**Incorporating Diverse Perspectives**

Use diversity in STEM content and activities. One example is to include scientists, engineers and mathematicians of different cultures in the curriculum (Macalalag *et al.*, 2022).

**Building Strong Relationships**

Trust and strong relationships with students can be built by recognising the cultural background of students and incorporating their experiences in classroom discussions and problem-solving tasks (Thevenot, 2022).

**Developing Emotional Literacy**

Introduce students to label their emotions. Tools like emotion wheels or journals can be used to get students to think about how they feel about dealing with a STEM challenge (Zins, 2004).

**Collaborative Learning**

Help promote STEM tasks that require teamwork and group problem-solving. Not only does this help to build out STEM-related skills but it also supports social-emotional skill development including empathy, communication and conflict resolution (Andersen *et al.*, 2022).

**Restorative Practices**

González (2012) proposes that we wean ourselves off punitive disciplinary practices and apply restorative practices in the response to behavioural issues that are both constructive and inclusive, rather than punitive. This makes it accountable and helps students manage uncomfortable situations.

**The Role of Various Stakeholders in Culturally Responsive SEL**

The effective implementation of culturally responsive

SEL in STEM requires the active involvement of multiple stakeholders, including educators, families, communities, and policymakers. Each group plays a unique role in creating an environment that supports the academic, emotional, and behavioural needs of underserved students.

**Families and Communities Role in Supporting Culturally Responsive SEL**

Communities and families have a crucial role in assisting underprivileged students’ intellectual, social, and emotional growth. Their participation in culturally sensitive SEL might improve students’ performance in several ways:

- Cultural Knowledge and Values: Families offer valuable information on the cultural origins of their children, which helps teachers better understand their emotional and behavioural needs. Teachers may guarantee that SEL programs are courteous and culturally appropriate by working with families (Epstein, 2018).
- Supportive Home Environments: Families are crucial in helping to strengthen SEL skills in the home. By setting an example of positive behaviour, promoting emotional expression, and fostering an atmosphere of open communication, parents can aid in the development of social-emotional skills (Epstein, 2018).
- Community-Based Development: Incorporating the larger community into STEM education may give students practical connections that support their academic and social development. Businesses, cultural groups, and community organisations may offer resources, chances for kids to interact with STEM outside of the classroom, and mentorship (Ozokwere & Ifeoma, 2024).

**The Role of Researchers and Academics**

Through studies that examine the effects of SEL on marginalised students, especially in STEM contexts,

researchers and academics help to build culturally sensitive SEL practices. Among their responsibilities are:

- **Developing Evidence-Based Strategies:** Scholars assist in the identification and development of evidence-based strategies that incorporate cultural sensitivity and SEL in STEM education. Their research offers insightful information on successful tactics and treatments (Durlak *et al.*, 2011).

- **Assessing SEL Initiatives:** Researchers may assess how well culturally responsive SEL programs work and offer information that aids educators and decision-makers in honing and enhancing their methods. Their study aids in the ongoing enhancement of teaching strategies (Legette *et al.*, 2021).

### **Educators' Role in Implementing Culturally Responsive SEL**

The creation of inclusive learning environments is being spearheaded by educators. They play a variety of roles in incorporating culturally sensitive SEL into STEM education:

- **Inclusive curriculum Development:** Educators have to create and implement a STEM curriculum that takes into account the cultural backgrounds, interests, and experiences of their pupils. Teachers may improve students' engagement and sense of connection to the subject matter by implementing community-based initiatives, diverse role models, and STEM examples that are culturally relevant (Cobian *et al.*, 2024).

- **Creating Powerful Connections:** For students who struggle with behaviour, good teacher-student connections are essential. In the classroom, teachers should promote empathy, trust, and respect for one another. Individualised attention, attentive listening, and fostering an inclusive and diverse classroom atmosphere can all help achieve this (Zins & Elias, 2007).

- **Development of Social-Emotional Skills:** SEL skills must be taught and modelled by teachers. Supporting emotional control, conflict resolution, and communication skills may be one way to aid underprivileged children with behavioural issues. These abilities might help reduce problematic behaviours in STEM classrooms (Zins & Elias, 2007).

- **Culturally Responsive Behaviour Management:** To handle misbehaviours in a way that takes into account the cultural background of their pupils, educators must employ culturally responsive behavioural interventions. While preserving students' dignity, strategies like restorative practices or culturally appropriate behavioural supports can encourage constructive behaviour (Noltmeyer *et al.*, 2018).

### **Policymakers' Role in Creating Supportive Educational Environments**

Local, state, and federal policymakers have the authority to establish the prerequisites for the execution of SEL initiatives that are culturally sensitive. Among their responsibilities are:

- **Providing Funding and Resources:** To guarantee that schools have the resources they need to provide inclusive learning environments, policymakers should allot funds to assist educators' professional development in SEL and culturally responsive teaching (Darling-Hammond *et al.*, 2017).

- **Developing Inclusive Policies:** It is essential to implement policies that support inclusion and diversity in education. Lawmakers may implement measures that support culturally responsive curricular frameworks, stimulate the hiring of diverse teachers, and guarantee that SEL is included in the curriculum (Akintayo *et al.*, 2024).

Policymakers' role is crucial in tackling the systemic disparities that underprivileged students encounter. They can help reduce the obstacles that disproportionately impact students with behavioural issues by promoting equitable educational opportunities, such as access to mental health services and high-quality STEM education (Munoz & Weissman, 2020).

### **CONCLUSION**

This review investigates the role of integrating culturally responsive SEL in STEM students, particularly, underserved students with behavioural challenges. Findings indicate that culturally responsive teaching enhances students' engagement and learning outcomes, and also builds their emotional intelligence and interpersonal skills needed to succeed in STEM subjects and beyond. In addition, incorporating diverse perspective, building strong relationships, inculcating collaborative learning, developing emotional literacy, and integrating restorative practices, are the key strategies to employ for the implementation of culturally responsive SEL in STEM for underserved students with behavioural challenges. However, further research is needed to reveal an understanding of these effects. These approaches could be studied in terms of their future effectiveness in various classroom environments and their lasting effects on underserved students in STEM education. Studies on the long-term effects of these interventions on student outcomes in both the academic and behavioural domains should be continued in the future.

### **Recommendations**

Key stakeholders such as families, educators and policy makers, have a grave role to play. Families need to provide supportive home environments for their children and encourage cultural knowledge and values. Educators have to create and implement a STEM curriculum that takes into account the cultural backgrounds, interests, and experiences of their students. The professional development of educators on culturally responsive teaching and SEL practices and their sustained implementation must be taken very seriously. Policymakers at all levels need to provide funds, resources, and developing inclusive policies, to advance the integration of culturally responsive SEL in STEM

education that will meet the needs of all students.

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