Equity in CTE & STEM Root Causes and Strategies
SUMMARY TABLE

NAPE

Equity in CTE & STEM Root Causes and Strategies[1] provides an intersectional lens to examine the ways that individual learners are affected by the dynamics within education, careers, and community, offering a wealth of insights into specific and overlapping root causes. The snapshot of current theories and evidence-based strategies provided identifies and addresses the structures, practices, and biases that must shift to promote equity and sustainable change.

We hope this will be a helpful overview and tool to assist with program and institutional improvement initiatives, and to stimulate dialogue within and among institutions and systems delivering CTE and STEM education. This tool can help you identify general recommendations for interventions and the root causes that make interventions necessary.

To access the full resource, visit napequity.org/root

Education

Building diversity in educational settings will bring needed vitality to training and business development in fields requiring CTE and STEM education. Excluding or limiting participation and success of underrepresented students impacts the evolution of professions as well as individuals who might otherwise achieve independence and success. Inflexible and biased educational programming creates workers who will accommodate an inflexible and biased workplace. Although some educators and employers might be initially uncomfortable with inclusion, shifting toward equity in schools and professions increases community building, innovation, and entrepreneurship to meet 21st century challenges.

ROOT CAUSE + THEORY	STRATEGIES
Access to and Participation in CTE/STEM Individual discrimination is only one level where educational limitations exclude underrepresented students. Exclusionary institutional practices and systemic silos cement stereotypes by affecting hiring, partnerships, programming, curriculum, and administrative policies. Honest assessment of these interconnected arenas is necessary to bridge gaps to build equity. Assessing common practices and creating interventions that address all three levels will increase physical, social, community, classroom, school, and district resources for inclusion, participation, performance, and completion.	◆ Assess cultural attitudes, values, strengths, and challenges of your student population and integrate those multicultural perspectives into CTE/STEM curricula and programs to build inclusion and equity ◆ Integrate teaching and learning strategies to value different learning needs and cultural experiences ◆ Hire diverse educators and engage community and professional mentors to build rapport and engagement ◆ Create parallel supplemental programming and equitable work-based learning initiatives, both short and long term to support inclusive curriculum initiatives ◆ Build whole school assessment to evaluate progress and prevent silos in program development and transition
Instructional Strategies Understanding the root cause of exclusion demands that we think of equity as an educational practice, as well as a value. Without opportunities for personal and professional development for teachers and students, narrow parameters for success in CTE/STEM programming and classroom settings will continue to create silos. Equitable accommodations, skill-building, and culturally responsive content can become lost if schools and school systems maintain outmoded standards. Well-intentioned policies to support the Common Core, Perkins V, and other mandates may nonetheless be applied in ways that increase deficit thinking and embed biases despite acknowledging the increasing diversity of student populations.	◆ Use maker space activities to expand curriculum into student-centered and problem-based learning strategies ◆ Integrate Culturally Responsive Teaching (CRT) to increase a sense of belonging for underrepresented students and sustain innovation in the classroom ◆ Schedule ongoing and regular assessment of student responses and attitudes about new curriculum initiatives. Valuing student voices makes a difference. ◆ Build equitable extracurricular engagement for underrepresented students to increase professional and personal development in career paths ◆ Identify funding for partnerships and curriculum development to expand equity innovations into employer and community contexts

Institutional Climate

School/Institution and classroom ecology cannot be equitable without respect for diverse community values in every level of culture. A healthy ecosystem promotes engaged learning, inclusive programs, and diverse curriculum to develop strong academic and social self-concepts for all students. Negative school and classroom climate has a cascading effect on participation, persistence, and completion in CTE/STEM career paths, particularly for underrepresented students. Negative school climate can make effective classroom interventions ineffective, or unsustainable—sabotaging program, curriculum, and individual equity interventions.

- Build inclusion with multi-tiered learning opportunities and whole school initiatives
- Assess intergroup dynamics within programs and across social groups in classrooms and the school
- Support innovation with diverse and collaborative leadership structures at all institutional levels
- Assure long-term improvement for equity by creating a culture of assessment and long-term professional development for all gatekeepers
- Identify silos and roadblocks caused by policy, specifically looking at gaps for underrepresented students with CTE/STEM interests
- When evaluating participation, persistence, and completion, identify representation patterns between classes, programs, and overall school/institution inclusion. Find and compare data to examine intersections of gaps and dominant participation across identities/ populations, identifying both dominant and underrepresented individuals/groups. For example, when looking at equity gaps for women and girls, be intentional about disaggregating those data by race and ethnicity and special population categories.
- Support teachers with equity professional development tied to specific CTE/STEM innovations

Support Networks

The first interventions designed to bridge achievement gaps for marginalized students generally begin by establishing institutional support teams tasked with addressing federal and state mandates. Ironically, these responses, without an equity mindset, can support systemic CTE/STEM exclusion even when legal mandates are technically followed. Underrepresented students often have limited access to academic or professional support networks, leaving them vulnerable to low expectations, bias, staff discomfort with accommodations, and misalignment of goals and student interests. Systemically required accommodations, such as an individualized education plan (IEP) and other processes, can be used to create silos and inflexible certificate programs. They may also support traditional assumptions about ability, focusing on weaknesses rather than strengths and interests.

- Teach and assess creative and practical inclusive strategies through professional development for CTE/STEM gatekeepers
- Increase technology literacy and more effective networks for all stakeholders
- Reduce bias and increase cultural responsiveness in recruitment and coaching materials
- Increase collaborative partnerships within and outside the school specifically for students from underrepresented groups in CTE/STEM
- Measure progress with formal and informal assessment tools to gather interdisciplinary information

Career

Inequities in CTE/STEM career paths begin early in educational settings, with patterns of exclusion paralleled in extracurricular activities, work-based learning (WBL), internships, and employment opportunities. These are embedded in multiple professional contexts for training, certification, and advancement. As cultural practices shift to value increasing diversity in the workforce, educators and employers need to consider the root causes that increase resistance to change.

ROOT CAUSE + THEORY	STRATEGIES
Challenges of Culture Change in CTE/ STEM Fields Access, participation, and retention in CTE/STEM workplaces depend as much on the culture of a field/organization as on the skills and resilience of the career seeker. Terms such as "empowerment," "inclusion," and "diversity" are defined differently depending on the context, and marginalized employees are often faced with the choice to assimilate or leave. In the sometimes contested and evolving organizational and social frameworks that make applied equity practices challenging, employers and educators alike should create a "safe space" for participation of all workers. This shift means mindfully shaping opportunities for underrepresented employees to engage authentically, feel valued, and contribute in unique ways to the field.	• Design school/employer professional partnerships in CTE/STEM curriculum and training programs to support cultural shifts toward equity. Do not rely only on participation of students from underrepresented as a solution. Inclusion requires institutions to make climate and cultural shifts that ideally enables individuals from underrepresented groups to be their whole and authentic selves at work. • Be attentive to cultural differences in needs for work-life balance in training and workplace contexts • Use current and comparative statistics to ground equity initiatives in contemporary conditions when working with employees, counselors, mentors, parents, and other stakeholders • Include students from underrepresented groups in work-based learning (WBL) and supported employment opportunities • Integrate equity-building psychological supports in organizational change initiatives to make them both sustainable and economically innovative

Training, Recruitment, and Placement

Effective recruitment and hiring practices depend on connections and strategies supported by multiple stakeholders from early career exploration through certification and placement. Access is not only a matter of including diverse candidates who fit unexamined dominant norms; it is about establishing ways of assessing students and career seekers as whole candidates, and creating pathways that recognize multiple qualifications and contributions.

- ◆ Include underrepresented career seekers into career networks to increase opportunities, awareness and exposure.
- ◆ Partner with colleges and universities that have innovative programs for advanced CTE/STEM students underrepresented in their fields of interest
- ◆ Evaluate expectations, certificate requirements and job descriptions to create diverse entry level and customizable employment positions
- ◆ Use whole person, strengths-based career assessment tools to support marginalized career seekers and help them build customized jobs and career pathways.

Role Models and Mentors

Although workplace diversity has significantly increased in the 21st century, workplace cultures change more slowly. This creates challenges for underrepresented workers as they weather discrimination and tensions that might limit their advancement or cause them to leave CTE/STEM careers. Although mentoring programs are valuable tools for retention and advancement, without equity strategies for gradual, practical institutional change, workplace bias remains a deterrent. In any school or employment context, regardless of the percentage of students or workers traditionally underrepresented in CTE/STEM fields, effective role models for marginalized populations are often absent or inadequate.

- ◆ Strategically match mentors and their mentees by attending to similarities in background, experience, and skills needed for support
- ◆ Train mentors so that they respect diverse identities as individual, cultural, and intersectional
- ◆ Support all career training and employment transitions for marginalized career seekers with diverse role models and appropriate policies to engage difference with respect
- ◆ Use diverse assessment tools and ongoing assessment to track programs and individual progress regularly during programming to track ongoing challenges and measure effectiveness of strategies

Individual

Institutions and systems are historically biased, and the assumptions and stereotypes that define a dominant idea of the norm are generally reinforced by the gatekeepers of advancement. These norms are not the skill standards for careers or literacy, but they nonetheless limit the participation of people who are perceived as outsider groups in CTE/STEM career paths. Stereotypes are both imposed and internalized, through interconnected root causes that underestimate or stigmatize marginalized individuals and their cultural groups.

ROOT CAUSE + THEORY	STRATEGIES

Intersecting Identities

Individual experiences of our identities are varied and layered, but dominant cultural biases oversimplify and underrepresent the complexity of cultures and their contexts. These simplifications support institutionalized systems of power, privilege, and oppression. They shape the assumptions of educators in CTE/STEM programs and the experiences of any marginalized students in these programs, both consciously and unconsciously. Everyone has intersecting social identities that uniquely prepare them for their chosen career paths, but imposed stereotypes can be internalized as part of limiting beliefs and are often experienced as roadblocks or exclusions.

- ◆ Use asset-based individual assessments to support equitable advancement
- ◆ In curriculum development, include diverse and nontraditional case studies
- ◆ Identify overlapping vulnerabilities in all students and intervene to build strengths
- ◆ Integrate role models that mirror successful diversity into mentoring and training in your field
- ◆ Track and support changes in mindset in teachers, students, and partners. Be sure to evaluate programs with long-term tools that assess bias and stereotypes in programming and communication.

Self-concept: Agency, Self-efficacy, and Self-determination

An individual's self-concept shapes their identity development as well as their expectations and behavior in CTE/STEM career paths. A student's agency, self-efficacy, and self-determination affect their ability to define themselves as independent adults. Whether self-concept is healthy or limiting also affects the vulnerable transition through grade levels, career preparation programs, work-based learning (WBL), and secondary and postsecondary certifications, and into employment opportunities. Ironically, failure in these transitions is often represented as lack of ability, character, or aptitude for individuals in underrepresented groups, rather than as a direct result of the biases in systems that have affected students' self-efficacy and assessment of their own ability and capacity.

- ◆ Use interdisciplinary and entrepreneurial training/teaching strategies to build student resilience
- ◆ Shift group work from task-based to creative problem-solving that honors diverse experiences, perspectives, and ways of learning to build belonging and self-awareness
- ◆ In institutions, create leadership teams that are diverse and systemically supported to build equitable CTE/STEM inclusion initiatives
- ◆ Address gaps in equitable participation, performance, and persistence early in schools and programs
- ◆ Build teacher and administrator self-efficacy training into professional development as a way to make student self-efficacy support more coherent and sustainable
- ◆ Even when accommodating identified deficits for students with disabilities, be attentive to individual student interests and strengths
- ◆ Build institutional career path processes to give all students an active role in making choices, and remove systemic barriers for underrepresented students

Mindset

Current mindset theory offers insight into one way teacher assumptions are reflected in student experiences in CTE/STEM career paths. When educators, counselors, and other gatekeepers assume that intelligence, skills, and abilities are fixed, their biases assign permanent deficits to specific underrepresented groups based on cultural stereotypes. Students in these groups often develop a fixed mindset about their own skills and abilities, mirroring gatekeeper bias. A growth mindset, the belief that skills and abilities can develop as people learn, is one strategy to support equity in career paths and build self-efficacy and agency in underrepresented students. When students are blamed for their failure to thrive, because their performance confirms an existing bias, they may struggle both with a fixed mindset and oppressive institutional and systemic limitations justifying stereotypes and undercutting equity. Being attentive to mindset in the classroom, the school, and in systemic structures supports strength-based individual development.

- Build growth mindset training into professional development for CTE/STEM gatekeepers to support all students, but particularly underrepresented students. Ensure that the training is nuanced to recognize how growth mindset practices can perpetuate inequities if applied through a deficit rather than asset focus.
- Support equity in program development and new programming by challenging fixed mindset biases in curriculum and teaching practices
- Normalize mistakes and failure in the classroom
- Give all students honest positive feedback as they learn, instead of reinforcing negative performances
- Use active learning methods to support goal-setting and self-assessment in study and testing tools
- Acknowledge the different life experiences of students as they learn to encourage a growth mindset in themselves
- In programs that support underrepresented students in CTE/STEM career paths, build performance assessments that reinforce a growth mindset
- Acknowledge the value of social-emotional learning tools and integrate them into CTE/STEM career paths early, starting in elementary school and continuing at appropriate age levels until graduation

Stereotype Threat

Stereotype threat is a mirroring process that students adopt unconsciously, performing negative cultural, racial, ethnic, or gender stereotypes that have been imposed on them and that they have internalized as personal beliefs and fears. In academic and career path activities, underrepresented students may perform these stereotypes in behaviors, expectations, and academic contexts. It is a common root cause for self-selected exclusion from CTE/STEM pathways and other self-sabotaging behaviors. Stereotype threat is also connected to classroom climate as individuals, responding to stereotypes, internalize assumptions about capacity, underestimate their potential, under perform on important assessments, or fear to participate fully. These behaviors are often interpreted as confirmation of discriminate practices and attitudes, confirming stigmas and increasing the likelihood of bullying and inequitable treatment of marginalized learners. It is critical for people in education working with students who have been affected by stereotype threat to recognize and address the ways that the educational environment as a system has affected a student's internalized self-assessment in the context of CTE and STEM.

- Include training in implicit and explicit bias for CTE/STEM teachers on every level, with practical strategies to adapt classroom work to prevent stereotype threat
- On a program and institutional level, commit to regular assessment for curriculum initiatives and assessment/testing to minimize bias
- Acknowledge school and classroom climate as a force in individual student performance, reducing bullying and stigmatization as part of diversity initiatives
- Use alternative assessment tools to acknowledge diverse learning styles and shift student assumptions about ability and expectation

Community

Current theory and evidence-based research on community development support the need for a significant mindset shift in CTE/STEM career path preparation to include meaningful community-building. Conventional community development is limited to building bridges for a few exceptional individuals. Active engagement in marginalized communities requires educators and leaders to be aware of systemic power structures that limit social and economic access for underrepresented populations. Recent calls for justice and equity recommend decentering unexamined biases embedded in unexamined cultural ideas of individualism, community outreach, and CTE/STEM inclusion. The requirements in Perkins V for stakeholder input and engagement open the door to greater reciprocity in relationships with the community our institutions ultimately serve.

ROOT CAUSE + THEORY	STRATEGIES
Parent and Family Engagement Families frequently have a distant role in their students' CTE/STEM career paths, with family networks marginalized, unacknowledged, or excluded. Conventional strategies for connection tend to focus on informational contexts such as career fairs and conferences to discuss problems or accommodations. Parents are rarely engaged as leaders or collaborators. Biases about families mirror biases about underrepresented students. Systemic and economic inequities also block family participation in career path development.	- Be aware that educator biases can alienate parents of marginalized students - Gather stories from a student's network to identify cultural values and contexts - Recognize how families and communities of marginalized individuals have been affected by a history of tracking and other biased systems that have limited access and opportunity in the past. Recognize the need for validation and reciprocity in future relationship and bridge-building. - Initiate culturally relevant CTE/STEM projects that involve family members, and build social and cultural capital for all participants - Evaluate parent engagement initiatives with ongoing participatory action research, and include participating families and students in the evaluation process

Employer Engagement

Employers may have consulting or mentoring roles in CTE/STEM classrooms and training programs, but they are rarely effectively included as part of the educational institution or local community for pathway development beyond recruitment efforts. This limited role blunts innovative problem solving in curriculum equity as well as workplace equity expansion through community development. Often, employers do not feel they are full participants in WBL and curriculum initiative partnerships, which affects their expectations and willingness to support equity initiatives.

- Shift systemic, institutional, and professional assumptions about students from underrepresented groups with equity-based community collaborations
- Partner with district, state, and national programs to include and support local employers in CTE/STEM
- Explore community values and needs as you establish strategic partnerships to support underserved communities
- Engage CTE/STEM professionals as active long-term mentors in the classroom community
- Assess employer needs and goals to create partnerships and work opportunities
- Use school communities to create diverse leadership teams and inclusive networks to connect employers to underserved and marginalized communities

Student Voice

Too often, students are excluded from the opportunity of addressing the equity gaps that ultimately affect them most. Students' lived experiences navigating educational systems and STEM and CTE curriculum should greatly influence evaluations of policies, procedures, and practices that cement biases into educational systems. Engaging students in decision making that directly affects them is a powerful and effective way to build relationships and solutions that can authentically address equity gaps in outcomes for marginalized groups. Students must be put at the center of the equation, and they must be directly engaged in identifying and addressing the systemic barriers that limit access and opportunity in CTE and STEM programs of study.

- Let the disability rights call for action guide your process working with all marginalized students: "Nothing about us without us!"
- Provide space for students to self-define information gathering strategies and extend strategies such as surveys and focus groups by giving participating students the opportunity to summarize and present their own findings, rather than summarizing and translating their thoughts into biased teacher/administrator frameworks
- Co-create research and curriculum initiatives with students as active partners, agreeing on team roles, responsibilities, and goals together
- Engage students as ongoing partners in long-term research projects that connect equity initiatives on individual, institutional and systemic levels. Prioritize the overrepresentation of students from marginalized groups in whole school equity initiatives as well as single program or curriculum focused equity initiatives
- Create space for students to author how they choose to share their expertise: for example, speak-outs, online reports/brochures, student-led ethnographic or action research projects, co-publications
- Select students who are routinely left out and overlooked in order to receive genuinely inclusive input. Don't fall into the trap of choosing "the usual suspects" (high-achievers or conventionally "articulate" participants). This requires deep relationship, trust, and community building to ensure authentic engagement that centers reciprocity and moves away from tokenism
- Co-design student participation with a combination of structured (such as clear reporting procedures or focus group activities) and flexible activities (such as action research or problem-based exploration) to generate diverse input
- Remember that students speak differently together than with an adult/educator present. Give students opportunities to speak together as well as in adult support contexts
- Co-create environments where students feel comfortable to speak for themselves. Give them ample space to translate their insights into their own proposals and themes, rather than imposing educator/adult summaries and conclusions to frame the results
- Be open to and take action on discoveries that may be uncomfortable, surprising, or contradictory to educator perspectives or assessments. The reason student voice is so valuable is that student experiences are so different from an educator's. Appreciate their expertise and co-create a culture where students can hold educators, administrators, and leaders accountable to decisions that directly affect their wellbeing and self-defined success.

Endnotes

1 Burbank, C., Romanillos, R., Williams, L., & Williams, B. (in press). Equity in CTE & STEM Root Causes and Strategies. PA: NAPE Education Foundation, Inc. Learn more at https://napequity.org/root

To access the full resource, visit napequity.org/root