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STEM(ing) the Tide: A Critical Race Theory Analysis in STEM Education[1]

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ABSTRACT

At the most basic level of human existence is the need to feel like one belongs. Sense of belonging is correlated with a person's motivation, drive, behavior, and identity. Research suggests institutions of higher education do much to foster students' sense of belonging and create positive learning environments in which faculty use their potential to influence student learning, motivation, and belonging. This paper uses Critical Race Theory (CRT) to examine the problems of student attrition, lack of persistence, and lack of a sense of belonging among marginalized populations undergoing science, technology, engineering, mathematics (STEM) education within U.S. institutions of higher education. Using constructs and tenets of CRT, this paper specifically explores how race and racism in post-secondary STEM education exacerbate the problem while using contextual factors as a guide. Researchers and practitioners alike can use this critical analysis to support current and future work in understanding how educational programs are socially constructed in a way that historically excludes marginalized persons.

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At the most basic levels of human existence is the need to feel like one belongs. A person's sense of belonging is correlated with their motivation, drive, and behavior, while also playing a role in how they view themselves (Maslow, 1954; Tinto, 2017; Won et al., 2018). Strayhorn (2012) described sense of belonging at the collegiate level as students' perception of campus support both from peers and faculty/staff. Research suggests institutions that foster their students' sense of belonging "could help increase retention and graduation" (Ingram, 2012, p. 4). Research also demonstrates the need for positive learning environments that meet the basic needs of students by targeting motivation, self-efficacy, and engagement along with a sense of belonging (Copeland & Levesque-Bristol, 2011). Finding a sense of belonging is crucial to the success of college students—it mediates achievement goals, metacognition, and learning strategies employed (Strayhorn, 2012; Tinto, 2017; Won et al., 2018).

Attitudes and behaviors of faculty have the potential to create a culture that influences student learning, motivation, and belonging. In fact, environments that emphasize effective educational practices see greater gains from undergraduate students (O'Hara et al., 2020; Umbach & Wawrzynski, 2005; Zumbrunn et al., 2014). On the other hand,

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contextual factors rising from systemic racism in post-secondary education have a disproportionate negative effect on students of color in science, engineering, technology, and mathematics (STEM) programs (Bottia et al., 2015; Cromley et al., 2016; Strayhorn, 2015; Villalpando, 2004; Wilson et al., 2015). With this in mind, Wilson et al. (2015) argued for the importance of sense of belonging and academic success in STEM classroom environments as relevant for all students. Furthermore, Cromley et al. (2016) observed that a better understanding of academic achievement can "point in the direction of policies to increase students' success and stem the tide of students who leave science majors, among whom … African American and Hispanic students (of both sexes) are over-represented" (p. 4).

The purpose of this paper is to analyze problems in STEM education using a critical race theory (CRT) framework to show structural, cultural, and ideological impacts on students of color in STEM education. CRT allows researchers to examine the relationship among race, racism, and power (Delgado & Stefancic, 2017). What follows is a description of the tenets and constructs of CRT, a description of broad problems affecting students in STEM education, analysis of contextual factors influencing those problems, and how we can address the problem using critical race theory.

Critical race theory – tenets and constructs

A working definition of the constructs and tenets of CRT allows readers to situate themselves in the context in which the problems within STEM education are framed. In the context of the U.S., CRT derives from the intersection of social constructionism and critical theory. Within CRT, race is socially constructed rather than biologically based (Crenshaw, 1991; Delgado & Stefancic, 2017; Pulliam, 2017). As a result, society has assigned characteristics to the various socially constructed racial categories (Delgado & Stefancic, 2017; Pulliam, 2017). Through the constructivist side of CRT, resource allocation to white people and nonwhite people rests on the ideology that white people dominant and hold power; therefore, resource allocation is structured so that white people continue to hold power at the expense of nonwhite groups (Ladson-Billings, 2009; López, 2006; Pulliam, 2017). This is racism at work.

According to Delgado and Stefancic (2017), the basic tenets of CRT are

- Race is a social construct and racism is the system of oppression that works to maintain white supremacy. The process of determining which social and material conditions are given to people based on race is called racialization.
- Racism is endemic, meaning that racism is viewed as something that is normal and an everyday occurrence. Because racism is understood as an ordinary occurrence, it becomes difficult to recognize and address—therefore, racism is often not acknowledged (Delgado & Stefancic, 2017).
- A critique of liberalism challenges these hegemonic narratives and works to show the self-interests of dominant groups that benefit from traditional liberalism (Bonilla-Silva, 2014; Delgado & Stefancic, 2017; Liu, 2011; López & Burciaga, 2014). Traditional liberalism espouses ideas of meritocracy, race neutrality,

colorblindness, and equal opportunity. These dominant notions tell hegemonic narratives about race and racism.

- Experiential knowledge and storytelling reflect an understanding that the lived experiences of persons of color are valued and appreciated. It is the collective lineage of lived experiences told through stories that is considered valued, appropriate, and crucial to understanding racial subordination (Delgado Bernal, 2002; Yosso, 2005).
- *Intersectionality* is a term used to describe the intersection of socially constructed identities and their respective systems of oppression. Using this tenet, researchers can better understand the unique experiences of individuals who experience multiple forms of oppression (Delgado & Stefancic, 2017).
- *Praxis* is the idea that we need theory to inform the work we do, and, in turn, our work informs theory. CRT calls for solutions that go beyond theory—praxis gives us the mechanism to perform that work (Ladson-Billings, 2012; Stovall, 2016).

These tenets merge with one another to form the following constructs that assist with CRT as an analytic tool for reframing and addressing systemic problems:

- *Interest convergence* is the understanding that outcomes or solutions to problems will always benefit white people as a group more than nonwhite groups. Solutions happen when the interests of the dominant group converge with the interests of the subordinate group (Baber, 2015; Dudziak, 2009).
- *Counter-storytelling* is a tool to challenge the dominant narratives that maintain racism and systems of oppression. This construct refers to stories about the experiences of communities of color while challenging ahistoricism (Solórzano & Yosso, 2002; Villalpando, 2004).
- *Black-White binary* establishes that race is either black or white; all other races must affiliate with one of the two to be considered. Out of this construct we understand differential racialization (racial groups racialized according to the needs of the majority) and horizontal hostilities (pitting of communities of color against one another by dominant narratives). This binary makes it difficult for communities of color to build coalitions (Alcoff, 2003).
- *Whiteness as a property* is a structuring property that organizes the world. This construct rests on the idea of property referring to both tangible things and intangible things—the right to something based on your skin color (Bondi, 2012; Donner, 2013; Owen, 2007).

In this paper, I employ the tenets and constructs of CRT to analyze the problem of race and racism in post-secondary STEM education using relevant contextual factors as a guide.

Description of the problem and contextual factors

Student attrition, a lack of persistence, and a diminished sense of belonging for marginalized populations in STEM may be complicated by systemic issues of racism in the

U.S. higher education system (Baber, 2015; Bancroft, 2018; Geisinger & Raman, 2013; Grossman & Porche, 2014; Strayhorn, 2012). Adding to this structure of power is the inherent problematic culture of STEM higher education. Students receive implicit and explicit messages from faculty inside the classroom that drastically impact their sense of belonging and their academic success in STEM programs (Deshler et al., 2019; Nguyen & Herron, 2020; Rodriguez & Blaney, 2020; Strayhorn, 2015; Wilson et al., 2015). Issues rolling over from K-12 education and the STEM "pipeline"[2] seem to compound the issues of belonging and academic success in STEM for marginalized populations (Bottia et al., 2015; Madrigal-Garcia & Acevedo-Gil, 2016; Strayhorn, 2015). Situated within these overarching problems lie contextual factors that are relevant to the identified problems.

Defining relevant contextual factors

Contextual factors that exacerbate many of the problems associated with attrition, persistence, and belonging in STEM undergraduate students begin in the K-12 education[3] system. Students spend their foundational years navigating school systems in communities where funding is tied to property values (Bottia et al., 2015). Gatekeeping policies (i.e., access to advanced placement[4] courses) send implicit messages as to who belongs in STEM programs and who does not. Within the context of higher education, factors are centered on curriculum, classroom environments, and a general culture of college and, particularly, STEM culture (Baber, 2015). Using a critical race lens, we begin to understand how hegemonic narratives within STEM teaching create a single epistemology that dictates pedagogy in the classroom. Over time, the repetition of dominant narratives can then discount other ways of knowing that students might bring with them (Delgado Bernal, 2002). This interaction perpetuates an unwelcoming culture in STEM that disenfranchizes people of color. For example, perpetuated stereotypes about the ability of students of color might influence the type of feedback given by the instructor. If faculty rely on the use of meritocracy in STEM classrooms, they may be more inclined to tell students of color that if they cannot do the work, perhaps STEM is not for them. CRT as an analytical tool is useful to better understand the problem of student attrition, lack of persistence, and diminished sense of belonging in marginalized STEM undergraduates. Using the notions of socialization of race, racism, and racialization we see marginalized students are historically disadvantaged from STEM fields.

Analysis of the problem

K-12 educational system

Due to the racialization of education and society through legal decisions, such as *Plessy v Ferguson* (1856) establishing the doctrine of separate but equal,[5] the lived experiences of people of color have been qualitatively different than those of white people. Legal decisions like *Plessy* codified what was already occurring in the United States. Liberal colorblindness led lawmakers to further naturalize race/racism in the United States. Using scientific theory, decisions were justified because people naturally segregate (Bonilla-Silva, 2014; Delgado & Stefancic, 2017; López, 2006; López & Burciaga, 2014).

Therefore, education of the populace was left to the states, thus tying funding opportunities for schools to property—something people of color historically have not been allowed to own (Ladson-Billings, 2009; Ladson-Billings & Tate, 1995; Madrigal-Garcia & Acevedo-Gil, 2016). As a result, education was socially constructed to benefit white people and further marginalize people of color (Donnor, 2013; Ladson-Billings, 2009, 2012; Ladson-Billings & Tate, 1995; Liu, 2011; Madrigal-Garcia & Acevedo-Gil, 2016). Moreover, the CRT construct of whiteness as property helps us understand the structural advantage given to white people through economic, political, and cultural wealth (Delgado Bernal, 2002; Donnor, 2013; Yosso, 2005). White people's property ownership gave them the right to a specific reputation and status, affording them the privilege to allow their children to be protected from having to learn alongside minoritized[6] groups. This socialization extended to STEM education and resulted in inequitable distribution of resources and early cultivation of interest in STEM fields and majors (Madrigal-Garcia & Acevedo-Gil, 2016; Yosso, 2005). By the time educational programs were integrated, STEM culture had already excluded people of color.

During the mid-twentieth century, however, the social construction of education shifted. The landmark case, *Brown v Board of Education* (1954) saw separate but equal overturned and segregation outlawed in education as well as early iterations of STEM pipeline programs that exposed K-12 students to STEM fields (Bottia et al., 2015; Dudziak, 2009). Yet, who did this benefit? Using the construct of interest-convergence, an understanding arises that the *Brown* decision and early STEM pipeline programs were not solely for the benefit of marginalized people. In order to compete with the Soviet Union and other countries in the race to space, lawmakers realized that the U.S. needed more people exposed to and trained in STEM fields. Therefore, integrating schools and establishing pipeline programs would be a way to broaden exposure of STEM fields to diverse students and potentially produce more STEM workers to ultimately help the dominant people in power (Baber, 2015).

Lastly, due to redistribution of wealth and rezoning policies, K-12 schools are still *de facto* segregated (Frankenberg & Taylor, 2018). Those students of color who do attend schools with material resources, however, are still met with systemic oppression by gatekeeping policies (Malcom & Feder, 2016). Gatekeeping polices are put into place to, purportedly, ensure students have equal opportunity access to types of programs that provide exposure to STEM while still in secondary education. These gatekeeping tools include programs such as advanced STEM courses in high school, funded or nonfunded summer camps with STEM themes, and preparatory classes for standardized tests. By challenging the tenets of liberalism, we can see that these types of policies are continuing the cycle of socialization and systemic oppression for students of color. Bonilla-Silva (2014) spoke about colorblindness or the modern thought that society does not see color of one's skin. Colorblindness suggests that race is not present and therefore does not exist in any specific context. Colorblindness framed as abstract liberalism allows people to sound reasonable in their arguments for gatekeeping policies—students have equal opportunity to join these programs and succeed on merit alone (Bonilla-Silva, 2014). Yet, if we scrutinize this reasoning, we begin to understand that liberal ideas like equal opportunity and meritocracy do not consider systemic issues of race and racism within the K-12 educational context. Students do not have equal access to resources and

materials. Additionally, not all students have experience with training or skills needed to succeed. If merit was all that was required to be successful, then there would be no need for formal education—everyone could just succeed on their own. Constructing success in education, specifically STEM education, solely based on meritocracy has the potential to perpetuate systemic problems in educational curriculum and culture.

STEM curriculum and culture

In STEM undergraduate education, a single epistemology and pedagogy make it harder for students of color to succeed (Ladson-Billings, 2009; Wilson et al., 2015). These practices discount the experiential knowledge that students of color bring to STEM environments. Furthermore, from an ontological perspective, this narrow view makes it more difficult for minoritized students to see themselves as STEM majors. Taking a step back from the immediate student experience, STEM education rests on the "conceptualization of culture … which prepares students to become members of a group: professional scientists, technologists, engineers, or mathematicians" (Malcom & Feder, 2016, p. 62). This idea leads STEM education to reflect practices and values of the STEM professions—education is meant to enculturate students for the profession. Structurally, this is seen in what counts as scientific knowledge, directs beliefs about students' ability to learn, and the idea of meritocracy.

Narratives in STEM education are traditionally "white, middle-class, masculine norms" (Malcom & Feder, 2016, p. 62). Through a CRT lens, the STEM education values of merit, scientific theory, competition, and independence are antithetical to non-western, hegemonic thought. Whiteness, then, becomes the structuring property, and this manifestation of STEM education as white creates problems of persistence, attrition, and belongingness (Bondi, 2012; Donner, 2013; Malcom & Feder, 2016; Owen, 2007). This systemic understanding of STEM education allows us to critically examine the overall curriculum of STEM education at the post-secondary level.

The lack of change in K-12 funding, a lack of resources to better prepare students, and the reliance on meritocracy in STEM higher education as a measure of success are a few examples of the critique of liberalism using CRT. These counter-stories to liberalism highlight the self-interest of dominant groups. When students of color struggle in STEM classrooms, it is often assumed that they are not able to withstand the rigor of STEM education. Because whiteness is the structuring property of STEM education, the majoritarian narratives do nothing to examine other issues that might cause these struggles—the blame falls on the student (Bottia et al., 2015).

Finally, we can take each of these tenets and drastically increase the systemic oppression inflicted on students of color by considering intersectionality. Intersectionality is a lens that allows researchers to shift from a single system of domination and subordination to multiple, intersecting systems of domination and subordination. When marginalized students come from lower socioeconomic backgrounds, are non-heterosexual, or are women, for example, the issues they face come from multiple systems of oppression (Delgado & Stefancic, 2017). Messages students receive about persistence and belonging are multiplied because they come from different systems of oppression. Moreover,

intersectionality emphasizes the idea that marginalized students do not have the same experiences just because they share a similar skin color.

Essentializing students of color to a singular experience (e.g., the black student experience or the Asian student experience) further supports negative stereotypes based on race and continues the system of oppression in STEM. Shrouded in equal opportunity, the dominant narrative in STEM education that students should have natural talents in STEM fields or, at the very least, early exposure to quality training, manifests most ardently in the classroom environment.

Classroom environments

Bronfenbrenner (2001/2005) explains that a person interacting with an environment, such as a STEM classroom, is situated within interconnecting ecological systems that explain human development over a lifespan through a person-process-context-time (PPCT) model. Context is essential to understanding student behavior in a specific environment, but context is not the sole defining factor of behavior. Students' motivation to persist and understanding that they belong in the classroom are seen in the behaviors they exhibit in the classroom. Student behavior in a STEM classroom is a by-product of the individual student interacting with a classroom environment. The dynamic nature of students interacting with a STEM classroom environment holds profound implications for individual belonging, persistence, and attrition in obtaining a STEM degree (Bancroft, 2018; Bottia et al., 2015; Cromley et al., 2016; Deshler et al., 2019; Geisinger & Raman, 2013; Malcom & Feder, 2016; O'Hara et al., 2020; Rodriguez & Blaney, 2020; Wilson et al., 2015). Creating an environment that relies on a singular framework of interpreting scientific theory devalues the experiential knowledge minoritized students bring with them. For example, Heath (1982) aimed to understand why black students were not responding the same way as other students when asked questions in the classroom and found that black students were socialized to use language differently than white students. Without this understanding, teachers failed to engage students using different pedagogical methods because they assumed that students were not able to comprehend simple questions.

When students enter the environment, they bring with them experiential knowledge that has shaped who they are fundamentally and influences how they approach the content of the course. Situating this understanding through CRT, we begin to understand the impact faculty have on students of color. Faculty assumptions about what students should know, telling students to pull themselves up by their bootstraps, and using examples of other minoritized students as examples of why students should be successful send messages about who belongs in STEM and who should work to persist in STEM (Cromley et al., 2016; Liu, 2011; Strayhorn, 2012). For example, the model minority myth (Alcoff, 2003) upholds the narrative that all Asian students are successful in STEM. Through the Black-White Binary construct of CRT, this narrative creates horizontal hostilities which set different minoritized groups against one another. Holding up other minoritized students as model students reinforces majoritarian narratives about other races, creates rifts that damage coalition building, and further justifies beliefs that certain students do not belong and should not persist.

The history of race and racism in the United States helps to reveal another tenet emerging from this examination of STEM education—racism is endemic. This tenet aids in understanding the problem of persistence and belonging in marginalized STEM undergraduates. Because racism is viewed as a normal, everyday occurrence, we can forget the impact our common sayings and interactions might have on students of color—especially in the classroom environment (Cromley et al., 2016; Ingram, 2012; O'Hara et al., 2020; Umbach & Wawrzynski, 2005). These interactions in the classroom environment impact students differently and their behaviors are affected differently because of their individual lived experiences. Moreover, the reliance on dominant STEM narratives in the classroom essentializes and devalues student experiential knowledge, and by extension, perpetuates understanding of STEM education structured as whiteness.

Praxis – next steps

Critical race theory calls for researchers to use extreme solutions in response to solving problems associated with race and racism. Gloria Ladson-Billings (2009) reasoned that "adopting and adapting CRT as a framework for educational equity means that we have to expose racism in education *and* propose radical solutions for addressing it" (p. 33). In response to the understanding of the problems of student attrition, persistence, and belonging in STEM education using CRT we must start to dismantle the racist structure embedded in STEM higher education. Departments and programs need to rethink their curricular structures and evaluate how knowledge is disseminated—examining the epistemological and ontological orientations present in classroom environments. This type of praxis means breaking the yoke of making changes to benefit faculty only (Baber, 2015) and asking all stakeholders involved, from bottom to top, how we can be more inclusive now that we know about systemic issues.

Constructivist literature and research in science education offer several examples of how departments and programs could align constructivist ideology with CRT to address not only curricular issues, but also how to better structure classroom environments. Taber (2016) offers an in-depth review and critique of using constructivism in science education. One area in which constructivism and CRT converge is through the use of experiential knowledge. Taber (2016) argues that constructivist teaching in science education should focus on using activities to help students identify relevant prior knowledge, including incorporating students' own interest and lived experiences, which is a tenet of CRT. Faculty should present material in the classroom as a form of knowledge and through guided participation (in the form of labs and hands-on work) assist students as they grapple to make sense of the knowledge presented. Through a CRT lens, this means faculty must "raise the level of thinking to that of theorizing and problem solving" (Bentley & Fleury, 2017, p. 8). For example, Kranzfelder et al. (2019) presented a study showing faculty in a biology classroom using less class time on lectures and more time with students actively engaging one another. This pedagogical shift allowed students to explore biology concepts through their own lenses.

Additionally, we should endeavor to avoid the pitfall of thinking about marginalized students as merely numbers. Policies and procedures need to do more than simply invoke the language of diversity, but rather should call for innovative pedagogies and

teaching methods that consider all walks of life—not just a plurality of those we see. For example, Chavez and Longerbeam (2016) present a cultural frameworks model for college teaching and learning. The model consists of a continuum ranging from an individuated framework to an integrated framework that allows faculty to transform "teaching over time towards more culturally balanced and inclusive practices" (p. 11). Faculty, at all levels, need knowledge and training in multiple ways to handle discourse in the classroom. The cultural frameworks model allows faculty to develop a better understanding of how student learning is impacted by the culture students bring to the classroom environment. For example, Solórzano and Yosso (2002) offered counter-storytelling as a methodology to give voice to marginalized ideas and knowledge (e.g., using counter-storytelling to retell the story of black females' contributions to NASA).

Furthermore, collaborative work between researchers needs to continue fixing STEM pipelines and recruitment of minoritized populations into STEM majors. This collaboration includes dismantling gatekeeping policies and addressing de facto racial inequity in K-12 school funding. For example, high-stakes[7] testing is often used as a gatekeeper in schools. Ladson-Billings (2009), in response to high-stakes testing in K-12 education stated that assessments "may tell us that students do not know what is on the test, but fail to tell us what students actually know and are able to do" (p. 30). Madrigal-Garcia and Acevedo-Gil (2016) research investigating Latino/a pathways to postsecondary education offers insights into addressing de facto racial inequity in U.S. public schools. They found that inadequate resources coupled with zero-tolerance disciplines and a high-security environment created a "culture of control" (p. 174). Policies and procedures took precedence over student learning and development. Schools should examine how those policies impact students and teachers need to create opportunities for students to develop cultural wealth in schools (Yosso, 2005).

Critical race theory has provided the framework we need to enact lasting change in STEM education. Ultimately, we must incorporate counternarratives to challenge and deconstruct hegemonic views of STEM education and, more broadly, post-secondary education as a whole. Pushing beyond STEM, education holistically is ensconced in marketplace competition, high-stakes testing, and a neoliberal view of students as consumers (Bentley & Fleury, 2017; Stovall, 2016; Taber, 2016). If we look further at this neoliberal landscape of higher education, we see a shift in priorities. Institutions, once regarded as sources of enlightenment, have given way to neatly packaged experiences and cost-benefit analyses. In this landscape, we too often turn diversity into a box to check because it is good for business, rather than seeing it as creating opportunities for all.[8]

The current political and social environment affords educators the opportunity to challenge traditional liberal and neoliberal views of what education is and who should benefit from education. In order for the situation to change, society's allocation of wealth, privilege, and material resources must coincide with a change in language, feelings, and social teaching. Certainly, movements have been underway throughout education. For example, María Torre (2009) worked with diverse youth in New York and New Jersey using participatory action research and CRT together to call to question how we bring in others to our research and understand their lived experiences. More recently, Cole and Heinecke (2020) examine student activism as a response to neoliberal

structures in higher education. For example, students protesting dramatic increases in tuition coupled with crippling student loan debt. What student activism is doing now can offer a glimpse into what education can be in the future.

Conclusion

CRT allows the understanding that student attrition, a lack of persistence, and a diminished sense of belonging for marginalized populations in STEM is underscored by systemic issues of racism in the U.S. education system. Adopting the view that there is socialization of race, racism, and racialization, as well as the view that racism is endemic, highlights the structural and historical inequities forced upon marginalized populations. Experiential knowledge and critique of liberalism help us understand how the racist structure embedded in education operates. Intersectionality provides the lens needed to understand that the way students experience the structure of racism is exacerbated by interacting systems of oppression. The constructs of CRT provide a deeper, multilayered understanding of systemic issues facing STEM education. CRT allows us to take this enhanced understanding to make radical and lasting changes to impact student attrition, persistence, and belonging in marginalized STEM students. As we are now adding the complications of COVID-19, online schooling, and the potential for further gaps in educational opportunities, the layers of structural inequality persist and evolve. Even though the impact these evolving complications have on post-secondary learning and institutions may not yet be fully understood, the resulting challenges should not deter educators from being critical of policies and practices impacting the learning and development of all students.

Notes

1. For purposes of this paper, STEM education refers to traditional college majors/programs within science, technology, engineering, and mathematics fields—as well as, more broadly, psychology and the social sciences.
2. For purposes of this paper, the STEM pipeline is defined as an educational pathway a student takes from early education through baccalaureate degree resulting in a job or additional education in a STEM field.
3. K-12 education is the compulsory education system in the United States ranging from Kindergarten (sometimes Pre-K) to 12th grade. For additional info see: https://www.k12academics.com/education-united-states
4. Advanced placement refers to courses students can take during secondary education (high school in the United States). At the end of the course, students take a comprehensive standardized exam on course content and, if specific grade thresholds are met, result in receiving college credit. See https://apstudents.collegeboard.org for additional information.
5. Plessy v. Ferguson, 163 U.S. 537 (1856). http://www.oyez.org/cases/1850-1900/163us537. The Supreme Court of the United States ruled that having separate but equal accommodations for white and black people did not violate the equal protection clause of the 14th amendment of the United States Constitution. This ruling allowed states to impose segregation of races as long as each race received equal accommodations. Thus, creating the doctrine of separate but equal within the US that lasted until Plessy was overturned in Brown v. Board of Education in 1954.

6. *Minoritized* is commonly used in CRT and social justice work. The meaning of the term implies that individuals did not choose to be in this position, rather society forced it upon them (see Bondi (2012) for example).
7. Common in the U.S., high-stakes tests are educational measures used in determining a student's future education track or whose results have a direct impact on a student's overall education. High-stakes test are commonly used for accountability purposes by different agencies (see Nichols and Berliner (2007) for additional information).
8. See Bentley and Fleury (2017) and Cole and Heinecke (2020) for a more robust analyses of the current higher education landscape.

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