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Santa Barbara

School Diversity and Students' Psychosocial Experiences

A dissertation submitted in partial satisfaction

of the requirements for the degree of Doctor of Philosophy

in Counseling, Clinical, and School Psychology.

By

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School Diversity and Students' Psychosocial Experiences

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ABSTRACT

School Diversity and Students' Psychosocial Experiences

by

Mei-ki Chan

Schools and communities are increasingly diverse. Therefore, it is critical to understand diversity's impact in school, including how diversity relates to students' psychosocial experiences and who is thriving or experiencing more challenges in a high diversity context, to inform practices that support students in culturally diverse educational environments. This dissertation assessed school diversity's relations with students' psychosocial experiences built upon cultural-ecological theory using a sample of California public school students. Considering the limited diversity measures, which show inadequacy in measuring dual-concept diversity in educational research, this dissertation also discussed diversity measures and proposed alternative mathematical formulas to capture diversity. Three studies were structured. Study 1 used latent profile analysis to explore school diversity profiles indicated by student racial/ethnic and socioeconomic diversity and teacher racial/ethnic diversity among California public schools. Multilevel multigroup analysis was employed to assess profiles' relations with two indicators of psychosocial experiences (i.e., race-based victimization and school connectedness) across four racial/ethnic groups—Asian, Black, Latinx, and White students. Results suggested that a balanced racial/ethnic representation reduced racial/ethnic disparities in race-based victimization. Study 2 investigated how the teacher and student racial/ethnic diversity were uniquely related to students' perception of school climate by intersecting identities between socioeconomic and racial/ethnic identities among White and Latinx students. The results showed that among Latinx and White students

with low socioeconomic levels, greater teacher racial/ethnic diversity was associated with more positive reported school attitudes in parental engagement and perceived school equality and safety. Study 3 discussed concerns about using the existing diversity measures and operationalizations of three distinct diversity concepts: normic, dual-concept, and representative. Additionally, it proposed alternative mathematical expressions to capture dual-concept diversity and underscored some of the conceptual ambiguities of current research in measuring and applying different diversity concepts. The collective findings imply that maintaining a power balance is vital to protecting students from social exclusion experiences; efforts in facilitating positive psychosocial experiences are particularly needed for schools with diverse student populations and students with historically marginalized identities. More research is also warranted in diversity measures and conceptualizations. Practical implications for fostering psychosocial experiences in a diverse school context are discussed.

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Introduction

The population in the U.S. has been rapidly diversifying. Although non-Latinx / Hispanic White individuals still occupied 60.1% of the total U.S. population in 2019 (U.S. Census Bureau, 2019), the U.S. census projected that the U.S. would approach majority-minority between 2040 and 2050 (U.S. Census Bureau, 2015). That means the U.S. population keeps diversifying, and people of color will soon comprise more than 50 percent of the population. Apart from race/ethnicity, populations diversify in class, education, age, and other dimensions (Crul, 2016). These demographic changes compel individuals to learn to coexist and collaborate with people of different colors, values, and cultures. Likewise, more and more U.S. schools compose a wide diversity of populations (Frankenberg et al., 2019). A diverse educational context is an opportunity to promote social inclusion (Juvonen et al., 2019), but it may also lead to more exposure to discrimination and oppression. These demographic changes and the importance of race/ethnic diversity have sparked researchers' interest in examining how a diverse school context relates to students' functioning (e.g., Graham et al., 2018; La Salle et al., 2020; Lindsay & Hart, 2017; McGlothlin & Killen, 2010). This line of research is of importance in informing educators and administrators to identify students' needs in the face of a diverse school context. First, this dissertation explores how various school diversity factors (i.e., socioeconomic composition and student and teacher racial/ethnic composition) interactively and uniquely relate to students' psychosocial experiences in school and how these ecological factors interact with students' social identities. Another part of this dissertation discusses the operationalization of distinct diversity concepts in mathematical expressions and proposes alternative measures for capturing diversity concepts.

Theoretical Orientation

The importance of studying how students' psychosocial experiences are shaped by students' race/ethnicity interacting with school diversity is grounded in cultural ecological theory (La Salle et al., 2015; Ogbu, 1981). Cultural-ecological theory highlights that individual perceptions of and responses to a school context are reciprocally influenced by individual, cultural, and contextual factors (La Salle et al., 2015; Ogbu, 1981). Ogbu (1981) argued that child-rearing practices vary due to distinctive cultures, values, and expectations. Beyond that, racial/ethnic identity is also a salient social identity. Students sharing the same broad racial/ethnic identity may elicit similar demands from their environments because of their racial/ethnic identity, such as stereotypes that accompany their racial/ethnic group membership (Pauker et al., 2010; Rowley et al., 2008).

Although broad racial/ethnic categories inevitably neglect within-group differences and homogenize individual experiences, a broad racial/ethnic categorization helps recognize some common experiences that group members in the same racial/ethnic group may share, informing systemic practices. In the literature, using broad racial/ethnic categories (e.g., Black, Asian, and Latinx) in research has uncovered meaningful findings to inform practices (e.g., Gregory et al., 2010). For instance, Asian Americans have been commonly found to experience model minority stereotypes in the U.S. context (Atkin et al., 2018). As further evidence, nearly 60% of hate crimes happened due to offenders' race/ethnicity bias (U.S. Department of Justice, 2020). In school, students of color have been consistently observed to perceive less belonging to school and higher racial victimization (Anyon et al., 2016; Voight et al., 2015). With vigilant interpretations and taking social contexts into consideration, research using broad racial/ethnic categorization may provide helpful information to inform

school practices (e.g., findings of disciplinary disproportionality among Black students have been calling for actions to remedy such inequities; Skiba et al., 2011).

Regarding theoretical assumptions of relations between diversity and students' psychosocial experiences, multiple theories (i.e., contact theory, person-context fit theory, conflict theory, and constrict theory) have been applied to explain relations of psychosocial experiences with school diversity in the literature. However, they explain diversity's impact in opposite directions. Contact theory depicts that high racial/ethnic diversity provides a fundamental condition for positive intergroup contacts and abundant opportunities for people to get to know each other (Pettigrew et al., 2011). More interethnic interactions are related to fewer prejudices mediated by positive affect, social identity complexity, and mere exposure (Brewer, 2010; Knifsend & Juvonen, 2014; Pettigrew et al., 2011). In contrast, person-context fit theory suggests that a racial/ethnic diverse setting potentially poses more challenges for student belonging because people find it harder to fit in a group if they perceive fewer similarities with group members (Magnusson & Stattin, 1998). Building upon person-context fit theory's assumption of forming groups with people sharing similarities, conflict theory suggests that diversity enhances in-group and out-group distinction leading to increased out-group distrust and in-group solidarity (Brewer, 2012). Esteban et al. (2012) corroborated this theory by analyzing within-country conflicts over five decades and concluded that ethnic division was associated with increased inter-ethnic conflicts. In contrast to the hypothesized inverse relations of attitudes towards out-group and in-group, constrict theory assumes that diversity reduces both in-group and out-group solitary (Putnan, 2007). All these theories offer explanations for different school diversity influences on

students' social interactions and respectively received empirical evidence (e.g., Esteban et al., 2012; Putnan, 2007).

Investigating how students function and interact with school contexts is essential, considering school is a network in the youth's immediate environment (Bronfenbrenner & Morris, 2007). Despite the rise of research on school diversity and students' school adjustments, there are several research gaps. First, school diversity research often focuses on student ethnic composition and rarely conceptualizes diversity in a more complex way, such as how student and teacher racial/ethnic diversity and other school ecological factors interact to affect students' social inclusion and exclusion experiences at school. Second, there have been inconsistent conceptualizations of diversity and inadequacy of diversity measures, which may explain conflicting evidence with respect to school diversity's impact on social inclusion and exclusion (Benner & Graham, 2011; McGlothlin & Killen, 2010; Vervoort et al., 2010). Finally, school diversity is proposed to benefit students' school adjustment (Graham, 2018) and social integration (Juvonen et al., 2019). However, existing empirical evidence is mixed. How students' social experiences in response to contextual diversity vary with students' characteristics, such as racial/ethnic groups, is also under-researched. To review the existing research on this topic, this chapter first discusses conceptualizations of diversity in educational research. Then it focuses on the existing school diversity research on students' psychosocial experiences, followed by a summary of the three studies in this dissertation.

Dual-Concept Diversity

A clarification of diversity conceptualization and developing an adequate tool for capturing the concept is of vital importance to advance school diversity research. However,

there have been inconsistencies and ambiguities in defining diversity and limited tools in measuring diversity concepts (Graham, 2018; Rjosk et al., 2017). Educational researchers commonly adopt the dual-concept diversity definition, comprising two dimensions–variety and concentration in education (Rjosk et al., 2017). Variety refers to the number of categories, program types, and racial/ethnic groups. Concentration describes the allocations of the elements to the categories (i.e., each category's proportion). Based on McDonald and Dimmick's (2003) summary, there are at least 12 measurements of dual-concept diversity in the literature and all these measures are in considerable agreement because these variants are based on the mathematical basis of the Simpson's *D* index, a widely used diversity measure in psychology and education (Rjosk et al., 2017). The Simpson's *D* formula takes the number of categories and their proportion into account simultaneously. The Simpson's *D* index is interpreted as the probability that two persons picked at random from a population come from different categories (Simpson, 1949). In other words, a higher diversity is defined by higher numbers of categories and more even distribution among the categories.

$$\textit{Simpson's } D = 1 - \sum Pi^2$$

In addition to the Simpson's *D* index, another common approach to evaluate diversity in education research is "simplistic majority–minority approach" (Budescu & Budescu, 2012). This majority–minority approach calculates the percentage of racial/ethnic minority students in context (Budescu & Budescu, 2012), assuming a higher percentage of racial/ethnic minority students represents higher diversity (Rjosk et al., 2017). The measure is conceptually different from the Simpson's *D* index on the ground that it captures a distinct diversity concept–*normic* diversity (Steel et al., 2018). Normic diversity defines a context's diversity by the extent it diverges from a predefined "norm" (Steel et al., 2018). Given that it

neglects the heterogeneity among ethnic minorities, this approach does not seem to be appropriate in the U.S context provided that there are a variety of racial/ethnic groups in the U.S. (Nishina et al., 2019). The limited choice of diversity measures and little discussion of diversity operationalization in mathematical expressions may hinder the advancement of school diversity research.

School Diversity

Student Population

U.S. students are diversifying at the national level but not necessarily at the school level. At the national level, according to the National Center for Education Statistics (2018), as of the fall of 2014, the K-12 U.S. student population was made up of more students of color (52%) than White students (48%) with the rapid growth in Latinx students' enrollment followed by Black, Asian, multiracial students, and American Indian students (Frankenberg et al., 2019). In the state of California, the percentage of White students is much less (22%) and Latinx students is the largest numerical group in the year of 2020–2021 (California Department of Education [CDE], 2022). Despite the increasing number of students from diverse races/ ethnicities, there is a wide range of differences regarding students' ethnic composition across schools, in which some schools are still highly occupied by one racial/ethnic group among students (e.g., predominantly Latinx), but some schools have students coming from an array of racial/ethnic groups (Billingham, 2019; Fuller et al., 2019; Taylor et al., 2019).

In addition to diversity in race/ethnicity, the student population in public schools is different on other axes, such as socioeconomic status (SES). Some recent evidence showed that students' socioeconomic segregation has been rising with income inequality. Owens et

al. (2016) estimated that from 1990 to 2010, between-district SES segregation in large metropolitan areas increased by approximately 15%, while within-district segregation increased by over 40%. Another study that used students' free lunch eligibility as a proxy of socioeconomic background showed that socioeconomic segregation within-district in U.S. public education increased from 1998 to 2015, with a notably higher rate in large school districts and charter schools (Marcotte & Dalane, 2019). However, Fuller et al. (2019) found that more Latinx children from lower SES status are exposed to middle-class peers in elementary school at both district and school level based on national data from 1998 to 2010.

In sum, the demographics in U.S. public schools have undergone considerable changes, although the trend of changes manifests differently depending on school types, geographical locations, and the levels of analysis (e.g., school, district, or national levels; Marcotte & Dalane, 2019; Reardon & Owens, 2014). The differences in student diversity in race/ethnicity and socioeconomic across schools underscore the need to understand how such contextual variations relate to students' social interactions and other outcomes in order to build a welcoming school for *all* students.

Teacher Workforce

Although more teachers of color are entering the teacher workforce in the U.S., it is at a much lower rate than the student population. Students of color make up more than 40% of the public-school population at the national level, whereas teachers of color are only 18% of the teacher force (U.S. Department of Education, 2017). There are more teachers of color in California than the national average, but still less than 40% (CDE, 2022). The difference in the proportions of students of color and teachers of color has been tremendous across states. Although the proportion of teachers of color has increased (Carver-Thomas, 2018), the 2012

statistics showed that this student-teacher diversity gap remained large and has continued to widen at national, state, and district levels (Boser, 2014), because the student population has been racially/ethnically diversifying at a much higher rate than the teacher workforce (Boser, 2014). Nearly a decade after the Boser (2014) study, La Salle et al. (2020) found that approximately one out of every five schools had at least 40% more students of color than teachers of color using a sample of 360,653 high school students and 32,323 school personnel in a southeastern state in the U.S.. Generally, the student-teacher diversity gap remains huge.

Yet, a diverse teacher workforce has been consistently proposed to be essential and significant for multiple reasons (Gershenson et al., 2021). Research has shown positive influences of teachers of color on students' perception of teaching quality (Cherng & Halpin, 2016). A higher teacher diversity fosters educational and behavioral benefits of assignment of students to same-racial/ethnic teachers (Banerjee, 2018; Egalite et al., 2015; Gershenson et al., 2017; Grissom & Redding, 2016; Redding, 2019). Likewise, a diverse teacher workforce has been shown to enhance justice and fairness in school practices (Hughes et al., 2020; Lindsay & Hart, 2017). For example, a study using 2007–2013 school-level data from North Carolina showed that for Black students, they had less likelihood to receive exclusionary discipline in schools with a higher concentration of Black teachers than students in schools with less proportion of same-racial/ethnic teachers (Lindsay & Hart, 2017). Existing research indicates that racial/ethnic composition of teachers is a vital and influential component of the school context in multiple ways.

School Ecology: A Microsystem Embracing Multiple Components

While school ecology is constructed by multiple dimensions and groups (e.g., teacher and student population), most school diversity research has only investigated the dimension of race/ethnicity amongst the student body (e.g., Felix & You, 2011; Juvonen et al., 2018; Kogachi & Graham, 2020; Marcotte & Dalane, 2019; Morales-Chicas & Graham, 2017; Thijs & Verkuyten, 2014; Vitoroulis et al., 2016). The concept of *super-diversity* has been proposed to describe the multidimensional nature of diversity encompassing various axes, including but not limited to ethnicity, socio-legal and political status, socio-cultural background (e.g., language and religion), and economic status (Meissner & Vertovec 2015). Corresponding to the concept of *super-diversity*, diversity across multiple dimensions of a school ecology intersect to affect social integration outcomes and students' experiences (Grzymala-Kazlowska & Phillimore, 2018). These axes of differences are interconnected, and their sum is more than any single axis (Schiller et al., 2006).

Different diversity dimensions may interact to influence social dynamics among students, and school staff. Thus, not taking multiple aspects of school diversity into account may fail to capture the actual school ecology and its influences. However, limited prior studies on school diversity have considered multiple diversity axes, such as including both student and teacher ethnic diversity (Ackert, 2018; Benner & Graham, 2011; Brown & Chu, 2012; La Salle et al., 2020). Amongst the studies examining student and teacher ethnic diversity simultaneously, Benner and Graham (2011) indicated that teacher ethnic diversity was negatively associated with 10th graders' perceived discrimination, and student ethnic diversity was positively related to

perceived discrimination among Latinx high school students. However, this study did not assess the potential combined effects between teacher ethnic diversity and student ethnic

diversity. Another recent study using a sample of 16,200 students in 750 schools throughout the U.S. found that White and students of color expressed lower liking of their school and lower engagement in schools with a higher proportion of White peers and higher SES based on aggregated student-level household SES (Ackert, 2018). This study captured the impact of concentration of White students and affluent peers on students' academic engagement instead of ethnic and SES diversity in schools.

Understanding how different school contexts characterized by teacher and student diversity relate to student outcomes through a mixture modelling approach may render a nuanced perspective to explore the interactions across the school diversity facets. Mixture modelling helps identify heterogeneities, which has been commonly used in research to explore heterogeneities within a population, such as among students (e.g., Garnett et al., 2014; Price et al., 2019). This methodology may be helpful in recognizing heterogeneities of school contexts, and school ecological aspects are expected to interact to shape students' school experiences. Mixture modelling helps examine how teacher diversity affects school contexts characterized by varying student demographic compositions. Such explorations may inform strategic policy planning at the district level, such as effectively allocating teachers of color to meet increasingly diverse student populations (Gershenson et al., 2021).

Paradox of School Diversity's Impact

Mixed findings have been observed in the literature on structural school diversity and students' school experiences. Researchers and educators generally proposed that a racially/ethnically diverse setting helps nurture positive values and skills for social inclusion (Brown & Juvonen, 2018; Hymel & Katz, 2019; Juvonen et al., 2018; Rucinski et al., 2019). As suggested by contact theory, a heterogeneous context encourages students to interact and

form social bonds with others with dissimilar social identities (Brown & Juvonen, 2018; Knifsend & Juvonen, 2014; Graham et al., 2014). When individuals interact with dissimilar others, they have less prejudiced attitudes (e.g., McGlothlin & Killen, 2010; Rutland et al., 2005) and higher acceptance of outgroup members (Crystal et al., 2008; Gaias et al., 2018; Killen et al., 2010), leading to positive student outcomes, such as lower social vulnerability (e.g., peer victimization, loneliness, and perceived school safety; Graham et al., 2014; Gonzalez et al.2017), and stronger competence in dealing with differences (Sincer et al., 2020).

Some recent studies substantiated the powerful effect of a racially/ethnically diverse school environment against racial bias. For instance, Gaias et al. (2018) showed that early exposure to culturally diverse people in preschool promoted cross-ethnic friendship in first grade, resulting in less racial bias and more cross-ethnic friendship in third grade among 670 U.S. children. Another experimental study showed that children with an average age of 10 years showed less pro-White (versus Black) bias measured by Implicit Association Test (IAT) after exposing them to counterstereotypical Black exemplars than control groups exposed to a control stimulus (i.e., flower) and White exemplars based on a sample of 369 White and Asian children in Canada, suggesting the potential benefits of cross-ethnic interactions against racial bias (Gonzalez et al., 2017). A heterogeneous setting has been corroborated by a handful of studies in its role of facilitating positive intergroup interactions among students and better school adjustment (i.e., Chen & Graham, 2015; Graham et al., 2014; Juvonen et al., 2018).

Nevertheless, a racially/ethnically diverse setting does not always result in favorable intergroup dynamics and benefit individual outcomes in existing research findings. Some

studies observed more intergroup conflicts and threats to minority students in schools with a more racially/ethnically diverse student body (e.g., Brenick et al., 2018; Jansen et al., 2016; Motti-Stefanidi et al., 2018). Greater diversity exacerbates negative intergroup racial/ethnic interactions if there are status differences among ethnic groups or competition rather than cooperation between them (Pettigrew et al., 2011). For instance, Goldsmith (2004) found that perceived racial/ethnic conflict increased in more racially/ethnically diverse high schools, especially when academic tracking was widely used. These findings echo the person-context fit perspective that suggests whether a person fits the context depends on similarity on psychological characteristics (Muchinsky & Monahan, 1987). A context with people from different racial/ethnic groups may create challenges for individuals to find similarities with others. This concept is particularly relevant with respect to how educators can help overcome differences in a racially/ethnically diverse student body to enhance students' sense of collective belonging and cohesion in school.

The literature indicates that a diverse educational context is potentially a nurturing environment for combating racism and discriminations to benefit society extensively in the long run. However, as shown in the conflicting evidence, a racially/ethnically diverse student body is not enough in and of itself. To have positive social outcomes from a racially/ethnically diverse context requires support to assist inter-racial/ethnic group collaboration and power balance instead of competition and to develop shared values across racial/ethnic groups (Pettigrew et al., 2011). A racially/ethnically diverse teacher workforce may play an important supportive role to bring out the positives of a diverse school setting.

Dissertation Purpose

To fill the aforementioned research gaps, this dissertation aims to extend existing school diversity research by 1) applying latent profile analysis to examine how multiple school diversity aspects interactively relate to students' psychosocial experiences in school, 2) assessing how student and teacher racial/ethnic diversity are uniquely associated with students' perception of school climate by intersecting identities of racial/ethnic x socioeconomic groups, and 3) discussing limitations of current diversity measures and proposing alternative ways to measure distinct diversity concepts. Below introduces each study briefly. Each chapter is structured as an individual manuscript. A general discussion of the research findings and future direction is presented in the last chapter.

Using the mixture modeling approach, Study 1 attempted to understand the confluence of various school ecological aspects on students' experiences of race-based victimization and school connectedness. Factors at a contextual level are expected to intersect at same-level and cross-level empirically and theoretically (Ayscue et al., 2017; Bottiani et al., 2016; La Salle et al., 2015). Nevertheless, research on understanding interactions across contextual factors is limited. To understand how contextual parameters (e.g., school SES and teacher ethnic diversity) interact with student racial/ethnic diversity through mixture modeling can potentially inform district policy, such as allocating resources and teacher workforce to match students' demographics at a school-level.

Study 2 assessed how two salient aspects of school diversity, teacher and student racial/ethnic diversity, are related to students' perception of school climate by race/ethnicity x socioeconomic groups upon controlling other school- and student-level characteristics. Empirical research on how individuals or groups respond to a racially/ethnically diverse setting differently is valuable because such findings may inform educators about ways to

support all students to thrive in a racially/ethnically diverse setting. Instead of focusing on racial disparity in outcomes, Study 2 attempted to understand group differences in processes––how does school diversity relate to students' perception of school climate by racial/ethnic x socioeconomic identities among Latinx and White students.

Study 3 discussed the limitations of existing probability-based measures of dual-concept diversity with an example for illustration and proposed alternative measures to capture diversity concepts. Limitations of the most used diversity measure, Simpson's *D* index, in education and psychology research have been discussed before, mainly related to losing detailed racial/ethnic composition information using a composite diversity score (Graham, 2016). However, Study 3 illustrated another inadequacy of the Simpson's D index in operationalizing the dual-concept diversity. To follow up on this inadequacy and the lack of a thorough review of the operationalization of distinct diversity concepts in educational research, this study deliberated three distinct diversity concepts and proposed measures for each concept in educational contexts.

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Study 1: How School Diversity Relates to Race-based Victimization and School Connectedness: Using Latent Profile Analysis

Abstract

School diversity has been shown to be associated with students' school experiences. However, most studies have focused solely on student racial/ethnic diversity, in spite of the multifaceted nature of diversity. This study assessed how the combined influence of student and teacher racial/ethnic diversity and socioeconomic diversity were related to race-based victimization, school connectedness, and racial/ethnic disparities of these outcomes. The participants were Asian, Black, Latinx, and White students (n = 100,408; 46.2%-53.5% female) in Grade 7 to Grade 12 attending 278 public schools in California. The participating schools' diversity contexts were categorized into four latent profiles differentiated by varying levels of student and teacher racial/ethnic diversity and socioeconomic diversity. Race-based victimization was the least prevalent in schools with low student racial/ethnic diversity, low socioeconomic diversity, and moderate teacher racial/ethnic diversity. The magnitude of racial/ethnic disparities in race-based victimization differed across the four latent profiles; racial/ethnic disparities were minimal when there were similar numbers of students in each racial/ethnic group. School diversity's relation with school connectedness was minimal. White students perceived higher school connectedness than other racial/ethnic groups across profiles, but the White-Latinx gap was smaller in profiles with schools having a homogeneous Latinx student population. The findings underline the importance of understanding school diversity's interaction with students' characteristics, particularly racial/ethnic identity, on students' school experiences.

Keywords: student racial/ethnic diversity, socioeconomic diversity, teacher racial/ethnic diversity, race-based victimization, school connectedness

How School Diversity Relates to Race-based Victimization and School Connectedness: Using Latent Profile Analysis

Given the increasingly diverse U.S. educational context (Fabes et al., 2018), researchers have been interested in how school diversity relates to students' school experiences (e.g., perceived school safety, racial discrimination, and school belonging; Fisher et al., 2015; Juvonen et al., 2018). At the same time, researchers have called for the need to expand the unit of analysis in diversity research beyond race/ethnicity to include other important aspects of diversity (Crul, 2016). There is increased recognition that diversity aspects (e.g., socioeconomic diversity and racial/ethnic diversity) affect individual experiences interactively and simultaneously within a context (Bottiani et al., 2016; Crul, 2016). However, there is limited research conceptualizing diversity as having multiple aspects or studying their combined influence. To date, research has primarily focused on how student racial/ethnic composition relates to students' school experiences (e.g., Basilici et al., 2022; Munniksma et al., 2022). Yet students' race/ethnicity and socioeconomic background are both salient demographic characteristics empirically relating to group dynamics (Graham, 2006; Park et al., 2013). Teacher racial/ethnic diversity has also been proposed to play a major role influencing school practices and students' functioning (Gershenson et al., 2021). To address the need to better understand the combined effect of school diversity aspects and its role in differential school experiences across racial/ethnic groups, this study takes a preliminary step to explore how three prominent diversity aspects (i.e., student race/ethnicity, teacher race/ethnicity, and student socioeconomic background) converge to construct different school diversity contexts among California public schools. Additionally, this study

examines how their combined influence is related to students' school experiences (i.e., race-based victimization and school connectedness) and racial/ethnic disparities in these experiences.

School Diversity and School Experiences

In educational and psychological research, diversity has often been conceptualized as having two elements that describe heterogeneity of group compositions (Rjosk et al., 2017). These two elements are the number of groups and group distribution (Teachman, 1980). According to this conceptualization, an ideal diversity would include a high number of groups and an even distribution of these groups (Graham, 2018). Furthermore, different aspects of diversity can be evaluated (Crul et al., 2016). In addition to student racial/ethnic diversity which has received the most attention due to its profound impact on group dynamics (Graham, 2006), teacher racial/ethnic diversity and socioeconomic diversity have received research attention because of their theoretical and empirical basis for their influences on students (Gershenson et al., 2021; Park et al., 2013).

Theoretical Underpinnings

Two primary theories, contact theory and person-context fit theory, help explain the impact of these three aspects of diversity on students' psychosocial experiences. Contact theory states that high racial/ethnic diversity provides a fundamental condition for positive intergroup contacts and abundant opportunities for people to get to know each other (Pettigrew et al., 2011). These positive intergroup contacts are crucial to social harmony because they are related to fewer prejudices. Contact theory's assumption of positive interactions in diverse contexts is built upon a power balance condition (Pettigrew et al., 2011); only when there is equal power across groups will diversity encourage positive intergroup contacts. This power balance thesis has been extended to suggest that the power of

a racial/ethnic group is influenced by the relative number of group members (Graham, 2006). In contrast, person-context fit theory proposes that a racially/ethnically diverse setting potentially poses more challenges for positive school experiences and developing belonging to school (Magnusson & Stattin, 1998; Georgiades et al., 2013). According to this theory, people find it harder to fit in a group if they do not perceive similarities with group members, leading to less connectedness to school (Benner & Graham, 2007; Georgiades et al., 2013). These two theories suggest opposite directions of diversity's impact on students' school experiences; however, they both highlight the importance of numerical representation (i.e., the relative number of group members).

Relation of Student Racial/Ethnic Diversity with Race-Based Victimization and School Connectedness

Research on relations of school diversity with student's school experiences has surged (e.g., Basilici et al., 2022; Parris et al., 2018). In this study, race-based victimization and school connectedness were selected as indicators of negative and positive school experiences because they are robustly related to distal educational and psychological outcomes (Allen et al., 2022; Benner & Wang, 2017). Race-based victimization is a type of identity-based victimization whereby individuals are targeted because of their racial/ethnic identity (Garnett et al., 2014). Experiencing race-based victimization has been shown to adversely affect adolescents' psychosocial, behavioral, and academic adjustment (e.g., Benner & Wang, 2017; Garnett et al., 2014). Perpetrators of race-based victimization usually hold prejudicial beliefs against individuals with lower status because of their perceived group affiliation or stigmatized characteristic (Garnett et al., 2014). Thus, race-based victimization is likely affected by the demographic composition within a context.

Extant findings of student racial/ethnic diversity's impact on race-based victimization are mixed. A recent meta-analysis including 20 empirical studies examining the relations between school/classroom racial/ethnic diversity and bullying victimization indicated that 9.4 % of analyses found a negative association, 18.2% observed a positive relation, and while 42.4 % reported a null result (Basilici et al., 2022). The inconsistent results could be due to the level of diversity (i.e., school or classroom) that was measured in each study and the students' age (i.e., differences may exist among younger and older students; Basilici et al., 2022). Inconsistencies in results may also differ due to the various ways that diversity has been operationalized. For example, studies have been adopting different operationalizations of diversity (i.e., the percentage of a minority group and a composite diversity score) which may obscure interpretations of diversity's impact.

School connectedness refers to students' perception of being supported by peers and adults in schools and connected to school (Allen et al., 2022). Enhancing students' sense of connectedness to school may help reduce racial/ethnic disparities in educational outcomes and foster positive educational consequences, including dropout, academic performance, social-emotional development, and school satisfaction (Allen et al., 2022; Chan et al., 2021). However, despite the fact that demographic composition of a context may affect students' sense of belonging to a school based on person-context fit theory (Magnusson & Stattin, 1998), research on how contextual factors is related to school connectedness is relatively less studied (Allen et al., 2022).

Regarding student racial/ethnic diversity's connections to school connectedness, little research has directly assessed its association. One study indicated that student racial/ethnic diversity was related to better perceived safety and less loneliness at school among Black,

Asian, Latino, and White middle students in the U.S. (Juvonen et al., 2018). Another study observed negative associations of student racial/ethnic diversity with school climate and connectedness (Parris et al., 2018). Again, differences in findings may be due to different ways of operationalizing diversity and controlling for different covariates in the analyses. For instance, the study conducted by Parris et al. (2018) did not control for other school-level variables whereas the study of Juvonen et al. (2018) included classroom-level diversity and its interaction with school-level diversity. These two studies also employed different diversity operationalizations. Collectively, diversity has been operationalized inconsistently across studies, and existing studies often did not consider other school-level factors when assessing the influences of student racial/ethnic diversity.

Relation of Socioeconomic Diversity with Race-Based Victimization and School Connectedness

Little empirical research has investigated socioeconomic diversity that exists among students in schools. However, socioeconomic differences have been hypothesized to create social distance and discontent between members of a community (Eglar et al., 2009). Students' perception of their social status and power is likely to be affected by socioeconomic diversity as well (Park et al., 2013). Income inequality was associated with school bullying among a large sample of 66,910 11-year-olds across 37 countries (Eglar et al., 2009). In a study conducted across 15 countries, schools with high socioeconomic diversity experienced a higher frequency of bullying when compared to schools with homogeneously low and high socioeconomic status (Menzer & Torney-Purta, 2012).

Compared with studies on bullying and victimization, research on socioeconomic diversity's association with positive school experiences is even fewer. One study identified

that higher socioeconomic diversity was associated with a higher frequency of cross-class interactions among college students (Park & Densone, 2013). Moreover, school socioeconomic composition is also often associated with overall school and neighborhood resources, which are robustly associated with educational outcomes (Palardy, 2013). A review of the current literature reveals that socioeconomic diversity's impact on students' school experiences is understudied despite its association with group affiliation and perceived power (Park et al., 2013).

Relation of Teacher Racial/Ethnic Diversity with Race-Based Victimization and School Connectedness.

In addition to socioeconomic diversity and the racial/ethnic diversity of students, teacher racial/ethnic diversity is another prominent aspect of diversity that impacts school outcomes (Gershenson et al., 2021). Diversifying the teacher workforce seems to be a promising intervention to addressing inequities and discrimination in U.S. public schools, and diversification efforts have been invigorated at the state and national levels (Sleeter et al., 2014). These efforts to diversify the teacher workforce are grounded in the arguments that early and regular exposure to a diverse population combats bias and has benefits for educational outcomes (Gershenson et al., 2021). The voices of teachers of color can enhance justice and fairness in school practices (Hughes et al., 2020; Lindsay & Hart, 2017) and remedy racial/ethnic gaps in teachers' expectations of students' performance (Gershenson et al., 2021). Among the few research studies focused on teacher racial/ethnic diversity's association with victimization, there is some evidence to support the positive impact of having high teacher racial/ethnic diversity. For example, higher teacher racial/ethnic diversity has been associated with lower levels of discrimination and racial bullying in school (Benner

& Graham, 2011; Larochette et al., 2010). Despite strong theoretical foundations, there is a limited amount of research directly assessing the influence of teacher racial/ethnic diversity on students' school experiences.

Racial/Ethnic Disparities in Race-based Victimization and School Connectedness

Research has consistently revealed that some racial/ethnic groups report less support from school personnel, less connectedness to school, and more victimization (e.g., Furlong et al. 2011; Voight et al., 2015). The role of school diversity in racial/ethnic disparities in school experiences is understudied. Apart from the direct effect of school diversity on the school-level outcomes, racial/ethnic groups are likely to have differential school experiences in the same school context, as proposed by cultural-ecological theory. This theory recognizes racial/ethnic identity as a salient social identity, which significantly affects individuals' experiences and behaviors in an environment (La Salle et al., 2015) and perceived status characteristics in peer relationships (Graham, 2006). Moderating effects of diversity, mainly student racial/ethnic diversity, were shown in the relations of students' racial/ethnic identity with school experiences (Bottiani et al., 2016; Fisher et al., 2015). A study indicated that students were more likely to experience race-based victimization in a school where they belonged to a numerical minority group (Fisher et al., 2015). This study also found that White students were at a higher risk for victimization than Black students when they were the minority group. Another study revealed that racial/ethnic disparities in perceived school support between Black and White students were lower in schools with higher student racial/ethnic diversity than schools with primarily Black or White students (Bottiani et al., 2016). An understanding of contextual factors' role in racial/ethnic disparities may help address inequities at a structural level.

Combined Influence of School Diversity Aspects

Instead of assessing the individual effect of each aspect of diversity (i.e., student racial/ethnic diversity, teacher racial/ethnic diversity, socioeconomic diversity), researchers have argued that the analysis unit of diversity should consider combinations of various diversity aspects (Crul, 2016). However, prior research has rarely examined diversity by understanding the combined impact of several school contextual factors together (i.e., student racial/ethnic diversity, teacher racial/ethnic diversity, socioeconomic diversity). Among the few existing studies examining multiple school contextual factors together, student racial/ethnic and socioeconomic compositions have been found to intersect to influence students' school experiences (Ackert, 2018; Bottiani et al., 2016). For instance, based on a sample of 16,200 students in 750 schools throughout the U.S., racial/ethnic minority students in schools with a higher proportion of White peers and higher school socioeconomic status expressed lower satisfaction with school and lower levels of academic engagement (Ackert, 2018). However, this study only examined the proportions of White students rather than examining racial/ethnic diversity across the student population. To assess the collective impact of socioeconomic diversity and racial/ethnic composition on students, one study grouped schools into six categories (e.g., primarily White, lower socioeconomic status) using a sample of 19,726 Black and White students from 58 U.S. high schools (Bottiani et al., 2016). When grouping schools based on these school characteristics, a racially/ethnically diverse school with upper and lower socioeconomic status showed the smallest racial/ethnic gap in perceived equity than schools with low racial/ethnic diversity. However, perceived equity at the school level was also lower in high racially/ethnically diverse schools. These findings reveal that students' experiences are likely affected by a combination of coexisting

diversity aspects rather than a single diversity aspect. Grounded in the conceptual and empirical relations of teacher racial/ethnic diversity, student racial/ethnic diversity, and socioeconomic diversity with students' experiences of race-based victimization and school connectedness (Ackert, 2018; Basilici et al., 2022), research on the combined influence of these three diversity aspects may help better inform students' school experiences in different school contexts.

In order to examine the combined influence of these three diversity aspects (i.e., student racial/ethnic diversity, teacher racial/ethnic diversity, and school socioeconomic diversity), this study uses latent profile analysis. This mixture modeling approach presents multiple benefits to understanding diversity and its relation to students' school experiences. Latent profile analysis allows for a multidimensional understanding of diversity to create combined categorizations of diversity, thus moving beyond a single aspect of diversity. Additionally, this analytical approach is exploratory, which has the advantage of objectivity compared with previous research heavily relying on researchers' decisions to categorize school contexts (e.g., Bottiani et al., 2016); this exploratory approach allows for a more nuanced understanding to emerge. Further, the categorical nature of the latent profile analysis posits that diversity profiles are different from each other in meaningful ways, specifically allowing for the relations among other variables to be different for the emergent profiles of diversity. That is, this approach does not assume that the impact of diversity is either additive or linear.

Demographic Influences on Race-based Victimization and School Connectedness

Several school and student demographic variables have been shown to relate to school connectedness and victimization in school. Regarding school characteristics, school

size was observed to be positively associated with bullying victimization (Bowes et al., 2009). Mixed findings have been found regarding the association between school level (e.g., elementary, middle, and high school) and school connectedness; some studies observed higher school level associated with lower school connectedness and some did not find a significant relation (Allen & Kern 2017). Regarding student demographics, the relations of individual characteristics (i.e., gender, grade level, sexual orientation, and English proficiency) with students' race-based victimization and school connectedness have been documented (e.g., Larochette et al., 2010; Xu et al., 2020). For instance, sexual minorities, female students, and lower English proficiency were observed to experience lower school connectedness (Hughes et al. 2015; Joyce, 2015); students with stigmatized identities (i.e., gender and sexual minorities) and higher grade level reported more victimization (Price et al., 2019; Salmon et al., 2018). Empirical evidence suggests that these school- and student-level characteristics likely affect school experiences; As such, these school (i.e., school level and school size) and individual characteristics (i.e., gender identity, sexual orientation, socioeconomic status, and language mostly spoken at home) were included as covariates in the current study.

The Current Study

Rarely has prior research examined how the combined effect of different school diversity aspects is related to students' school experiences and racial/ethnic gaps in these experiences. Hence, latent profile analysis was employed to explore school diversity profiles indicated by student racial/ethnic diversity, socioeconomic diversity, and teacher racial/ethnic diversity in this study. Figure 1 shows the conceptual models. Different configurations of school diversity profiles were expected to emerge. Profiles' association

with students' self-reported race-based victimization and school connectedness were assessed by multilevel multigroup analysis. School-level race-based victimization and school connectedness were anticipated to vary across the various diversity profiles. Based on cultural-ecological theory, the emerging profiles were expected to moderate racial/ethnic disparities in school connectedness and race-based victimization. Given the evidence of school characteristics' (i.e., school size and school level) and student demographics' (i.e., gender, sexual orientation, grade level, and English proficiency) impacts on the two outcomes (i.e., school connectedness and race-based victimization), their effects were controlled.

Method

Procedure

This study included school-level and student-level data. Student-level data were from the California Healthy Kids Survey (CHKS; WestEd, 2014), which is California's biennial statewide survey that anonymously inquiries about student risk and resilience factors. Participants responded to the survey between October 2017 and June 2019. The demographics in the current sample were similar to California's 2019–2020 public school enrollment in terms of the gender and racial/ethnic distribution (California Department of Education [CDE], 2020). The proctors' survey administration was standardized. Designated school personnel administered the CHKS following a script that reminded students that the survey was anonymous and voluntary. Students completed the survey during school hours. Parents provided passive consent following the standard procedures (see http://chks.wested.org/administer/instructions).

Samples

The original dataset included 119,756 students attending 294 public high, middle, and elementary schools in California. Sixteen schools were excluded: one private school, schools with student enrollment less than 100, and schools with less than 10 respondents. Considering the power for school- and student-levels estimates and current suggestions for sample size in multilevel analysis (Hoyle & Gottfredson, 2015; Snijders & Bosker, 2012), the sample sizes for each level were sufficient. The final analysis included 278 public schools. School information (students' ethnicity composition, percentage of students in Free or Reduced-Price Meals [FRPM], and teachers' race/ethnicity composition) in the academic years of 2017–2018 of public schools were extracted from the California Department of Education (CDE) public dataset.

In the participating schools, the number of respondents ranged from 10 to 3,268 (Mean = 369; Median = 220) from the CHKS completed between 2017 and 219. Given the dataset's characteristics and sample sizes of each group, this study chose to focus on Latinx, White, Black, and Asian students, resulting in 100,408 participants. Table 1 shows the demographic information of participants in the present study per racial/ethnic groups and the schools' demographics.

Measures

Profile Indicators: Student and Teacher Racial/Ethnic Diversity

The Simpson's *D* formula was used to calculate the diversity of student and teacher race/ethnicity. This index is interpreted as the probability of having two randomly picked people from two different racial/ethnical groups (Rjosk et al., 2017). That means the higher the Simpson's *D* index, the more diverse the group is. Groups included in the calculation were percentages of Black, White, Latinx, Asian (i.e., Asian and Filipino), and Others (i.e.,

American Indian or Alaska Native, Pacific Islanders, and Two or More Races) among students/teachers within each school. The following is the Simpson's D equation, whereby p_i is the proportion of the racial/ethnic group.

$$Simpson's\ D = 1 - \sum p_i^2$$

Profile Indicators: Socioeconomic (SES) Diversity

School socioeconomic diversity was indicated by the percentage of students eligible for Free or Reduced-Price Meal (FRPM). The use of FRPM as a proxy has been shown to be a satisfactory indicator of students' educational disadvantages better than other indicators (e.g., income; Domina et al., 2018). A school's socioeconomic diversity can be reflected by its enrollment percentage in FRPM, with low or high FRPM percentage representing homogeneously low or high school SES. When the enrollment percentage is close to 50%, it means a balanced representation of students from relatively low and high socioeconomic status, indicating high SES diversity (Park et al., 2013).

Race-based Victimization

An item from the 2017–2019 California Healthy Kids Survey was used to assess experiences with race-based victimization. Students were presented with the prompt: "During the past 12 months, how many times on school property were you harassed or bullied for any of the following reasons?" Types of bias-based victimization that were presented include "your race, ethnicity, or national origin." Possible responses were: 0 times, 1 time, 2 to 3 times, and 4 or more times. Analyzing the skewed distribution of the responses, combined with prior research indicating that even infrequent victimization may negatively affect adolescent health (Gower & Borowsky, 2013), responses were recoded as never (0) or one or more times (1) experiencing victimization in the past 30 days.

School Connectedness

The School Connectedness Scale (SCS) measured students' general feelings towards interpersonal relationships and attitudes towards the school (Libbey, 2004). The five items from the SCS that are included on the CHKS were adapted from the original Add Health study (McNeely et al., 2002). Previous research has supported the validity and reliability of the SCS across socio-cultural groups (Furlong et al., 2011). An example is *I feel close to people at this school.* The response scale is *strongly disagree* (1), *disagree* (2), *neither disagree nor agree* (3), *agree* (4), and *strongly agree* (5). Higher mean scores indicate stronger school connectedness. The omega value of the internal reliability is 0.83.

Racial/ethnic Identity

Students were asked about their race and ethnicity by two questions. Students reported six racial identifications (*American Indian*, *Asian*, *Black or African American*, *Native Hawaiian or Pacific Islander*, *White*, or *Mixed Race*) to the question "What is your race?" Students were also asked if they were Latinx (*yes* or *no*). Students with intersecting racial/ethnic identities (e.g., Latinx Black and Mixed race) were excluded from the study due to findings in the literature suggesting they may have different outcomes and experiences (Dixon, 2021). Moreover, students who identified with more than one racial/ethnic identity, American Indian, and Native Hawaiian or Pacific Islander had small sample sizes in the dataset. Thus, this study chose to focus on students who identified as non-Latinx Black, non-Latinx White, non-Latinx Asian, and Latinx.

School and Student Demographics

School size and school level (elementary, middle, and high school) were included in the dataset as control variables. Students' sexual orientation, gender identity, grade level,

socioeconomic background, and home language were added to the analysis as covariates. Grade level was included as a continuous variable. Socioeconomic status was indicated by participation in FRPM using three categories (*yes, no*, or *don't know*), with students selecting "don't know" categorized the same as missing responses. Students responded to the gender identity item using a binary option (*female, male*). Students were asked about their preferred sexual orientation using six categories (*straight, gay or lesbian, bisexual, I am not sure yet, something else,* or *decline to respond*), which were regrouped into *straight* and *sexual minorities.* "What language was spoken most of the time at home" was adopted as a proxy for students' and their families' acculturation to the U.S. and was regrouped into *English* and *Non-English*.

Data Analysis

The analyses were conducted in three primary stages with Mplus 8.4 (Muthén & Muthén, 2017) using maximum likelihood estimation with robust standard errors (MLR). First, data were screened for their pattern of missing values and descriptive statistics. Then, LPA was employed to explore school diversity profiles among the school-level data from CDE. Using the three indicators (i.e., student and teacher Simpson's *D* index values and percentage of students' enrollment in FRPM), 1-to 7-class LPA models were estimated. Since latent profiles can vary by indicators' variances and covariances, four model structures were analyzed with different constraints placed on indicators' variances and covariances (Masyn, 2013). The final model was selected based on relative fit indices of the plausible competing models along with conceptual merits and profiles' meaning (Masyn, 2013). The fit statistics, suggested by current best practices in mixture modeling (Nylund-Gibson & Choi, 2018), are: Bayesian information criterion (BIC), sample size adjusted BIC (saBIC),

consistent Akaike information criterion (CAIC), approximate weight of evidence criterion (AWE), Bayes factor (BF), correct Model probability (cmP), bootstrap likelihood ratio test (BLRT; McLachlan & Peel, 2000), and Vuong–Lo–Mendell–Rubin LRT (VLMR-LRT; Vuong, 1989). Lower information criterion values suggest a better model fit among the models compared (Nylund-Gibson & Choi, 2018). Higher BF values and cmP values provide more robust evidence to the specific model as the best fitting relative to other models considered (Masyn, 2013). The BLRT and the VLMR-LRT tests compare the fit of a *k*-class model with a *k*−1 class solution. Non-significant *p* values suggest there is evidence supporting the *k*−1 class solution compared to the *k*-class model.

After confirming the final model for this study, a multilevel multigroup analysis was employed to examine profiles' association with school connectedness and race-based victimization, and the moderating role of school profiles in the relation between students' race/ethnicity and outcomes. Schools were coded into four groups based on the results from latent profile analysis. School-level outcomes' means/threshold values and student-level relations of racial/ethnic identity with the outcomes were estimated in each profile. Then, Wald tests were used to assess the significance of the school-level outcomes' means/threshold values differences and the magnitude of student-level racial/ethnic disparities between profiles. School demographic variables (i.e., school size and school level) and student demographic variables (i.e., language used at home, sexual orientation, gender, and enrollment in FRPM) were included as control variables. School-level covariates were regressed on the latent profiles; school- and student-level covariates were regressed on each outcome. The estimates of control variables were fixed to be the same across profiles. Student-level variables, including gender (0 = male, 1 = female), enrollment in FRPM (0 =

no, 1 = yes), language used at home (0 = English, 1 = non-English) and sexual orientation (0 = straight, 1 = sexual minorities), were grand-mean centered to ease interpretation of the results (Enders & Tofighi, 2007). School-level continuous variables (i.e., enrollment in FRPM and school size) were grand-mean centered.

Missing Data Analysis

At the school level, the rate of missing responses to the items measuring the profile indicators and demographics ranged from 0.4% to 2.8%. At the student level, the missing rates of the demographic and dependent variables were all under 5.0%, except for sexual orientation with 5.5% missing responses, and FRPM with 13.1% missing or "*don't know*" responses. Thus, the proportions of the missingness for most items were at an acceptable range (Dong & Peng, 2013). For the items with relatively high missing rates, independent *t*-tests and chi-square tests were conducted to assess if the missingness had a significant influence on responses to the distal outcomes. A significant statistical difference of school connectedness between those who responded to the FRPM item and those that did not respond or know the answer was small, with a negligible effect size (Cohen's $d = .04$). A significant chi-square test result between missingness on sexual orientation and race-based victimization was observed, but the effect size was minimal ($\varphi = 0.02$). These results were adequate to assume data were missing-at-random (MAR; Enders, 2010). Missing data were handled using full information maximum likelihood (FIML).

Results

Preliminary Analysis

Intraclass correlations (ICCs) were examined to assess the proportion of variance in each outcome that is due to between-school differences (Sommet & Morselli, 2017). An ICC

greater than 5% and a design effect greater than 2 indicates that a significant proportion of the variance occurs across schools; thus, the use of HLM is appropriate (Snijders & Bosker, 2012). The ICCs of school connectedness and race-based victimization were 8% (design effect = 43.54) and 14% (design effect = 100.26) respectively.

School Diversity Profiles

Table 2 shows fit statistics of profile enumeration. The 1-7 class models converged for both Models 1 and 2. Model 3 did not converge after a 6-profile solution, and Model 4 did not converge after a 5-profile solution. The information given by fit statistics across models seemed to suggest a 2-4 profile solution. Comparing across all converged models, Model 2 generally exhibited a slightly better fit than other models across the 1-4 profile solutions, as shown by the lower information criteria statistics. However, Model 1 might be a better model structure when considering model parsimony, sample size, and degree of differences. Thus, the 2-4 profile solutions in Model 1 and 2 were closely examined.

In Model 1 and 2, saBIC and BLRT are not informative as they showed better fit with increasing profiles. The 4-profile solution in either Model 1 and Model 2 was supported by more fit statistics than 2-3 profile solutions, including lower BIC and CAIC, VLMR-LRT, and *cm*P. Three profiles in the Model 1 four-profile solution have similar configurations as Model 2. Another profile in Model 2 with relatively high student racial/ethnic diversity, high socioeconomic diversity, and moderate teacher racial/ethnic diversity is replaced by a profile featuring moderate student racial/ethnic diversity, low socioeconomic diversity (low SES), and moderate teacher racial/ethnic diversity in Model 1. When considering the added parameters in Model 2 and the non-significant statistical difference of the four-profile solution between Model 1 and Model 2, the four-profile solution in Model 1 is preferred.

Thus, the 4-profile solution was chosen to best represent these data.

Figure 2 shows the four-profile solution. The profile labels chosen were (1) *Moderate Student Diversity, Low SES Diversity (High SES), and Low Teacher Diversity*, (2) *Moderate Student Diversity, Low SES Diversity (Low SES), and Moderate Teacher Diversity*, (3) *Low Student Diversity, Low SES Diversity (Low SES), and Moderate Teacher Diversity*, (4) *Moderate Student Diversity, High SES Diversity, and Moderate Teacher Diversity*. The entropy of this LPA model was .79. The closer the entropy to 1 is the more accurate profile membership (Asparouhov & Muthén, 2014).

(1) Moderate Student Diversity, Low SES Diversity (High SES), and Low Teacher Diversity

Schools in this profile contained a moderate student racial/ethnic diversity (Simpson's *D* index = 0.56). The overall SES composition of these schools was homogeneously high, with the lowest percentage of students enrolling in FRPM (15%) compared to other profiles. There was also relatively low teacher racial/ethnic diversity (Simpson's *D* index = 0.34) in schools belonging to this profile. The profile size was 21.54%.

(2) Moderate Student Diversity, Low SES Diversity (Low SES), and Moderate Teacher Diversity

Schools belonging to this profile (22.25%) also consisted of a moderate student racial/ethnic diversity (Simpson's *D* index = 0.51). However, a high percentage of students in schools belonging to this profile enrolled in FRPM (*M* = 73%), meaning the school SES was homogeneously low. These schools had relatively higher teacher racial/ethnic diversity (Simpson's *D* index = 0.45).

(3) Low Student Diversity, Low SES Diversity (Low SES), and Moderate Teacher Diversity

In the second largest profile (25.68%), schools had the lowest student racial/ethnic diversity (Simpson's *D* index = 0.24) than schools in other profiles. Schools in this profile contained the highest percentage of students enrolling in FRPM (*M* = 83%), and a higher teacher racial/ethnic diversity (Simpson's *D* index = 0.48).

(4) Moderate Student Diversity, High SES Diversity, and Low Teacher Diversity

This profile is the largest (30.52%); these schools had moderate student racial/ethnic diversity (Simpson's *D* index = 0.57). These schools had a balanced representation of students from low and high SES, indicating its high SES diversity within schools. However, these schools had the lowest teacher racial/ethnic diversity (Simpson's *D* index = 0.25).

Association of School Diversity with Race-based Victimization and School Connectedness

Table 3 shows threshold and mean estimates of the two outcomes (i.e., race-based victimization and school connectedness) at the school-level. With school level (i.e., elementary, middle, and high school) and school size controlled (see Table 4), profile *(3) Low Student Diversity, Low SES Diversity (Low SES), and Moderate Teacher Diversity* had the lowest prevalence of students experiencing race-based victimization, with 9%[1] of students experiencing victimization at the school level. Schools in the profiles *(1) Moderate Student Diversity, Low SES Diversity (High SES) and Low Teacher Diversity* and *(4) Moderate Student Diversity, High SES Diversity, and Low Teacher Diversity* had the highest probabilities of students reporting race-based victimization, 17% and 16% respectively. The variation of school connectedness at the school level across profiles was minimal. The profile

[1] The percentages of race-based victimization at the school-level of each profile were calculated using the equation, 1/ (1+exp (threshold value)). Threshold values of school-level race-based victimization were listed in Table 3.

of *(2) Moderate Student Diversity, Low SES Diversity (Low SES), and Moderate Teacher Diversity* had a slightly higher school-level school connectedness than other profiles. This suggests that school diversity profiles had a stronger association with race-based victimization than school connectedness at the school-level. **School Diversity Profiles' Moderating Role in Racial/Ethnic Disparities**

Table 3 shows racial/ethnic disparities of the two outcomes (i.e., race-based victimization and school connectedness) of each profile. The magnitude of race-based victimization disparities differed across profiles. Although schools in *(3) Low Student Diversity, Low SES Diversity (Low SES), and Moderate Teacher Diversity* profile had the lowest prevalence of race-based victimization, the schools in this profile contains significant racial/ethnic disparities, in which Latinx students consistently reported lower probabilities of race-based victimization than the other three racial/ethnic groups. The largest racial/ethnic gap in race-based victimization was found between White and Black students in schools belonging to profiles *(1) Moderate Student Diversity, Low SES Diversity (High SES), and Low Teacher Diversity* profile and *(4) Moderate Student Diversity, High SES Diversity, and Low Teacher Diversity*. The probability of Black students being victimized due to their race/ethnicity was five times higher than White students in schools belonging to profile *(1)* and four times higher in schools belonging to profile *(4)*. However, there was not a racial/ethnic gap in race-based victimization between Black and White students in the schools in profiles *(2) Moderate Student Diversity, Low SES Diversity (Low SES), and Moderate Teacher Diversity* and (3) *Low Student Diversity, Low SES Diversity (Low SES), and Moderate Teacher Diversity*. In addition, Black students consistently reported higher odds of experiencing race-based victimization than Latinx students across all the profiles.

Generally, the magnitude of racial/ethnic disparities in race-based victimization varied across profiles and comparison groups.

A moderating effect of profiles in racial/ethnic gaps in school connectedness was only observed between White and Latinx students. Black and Latinx students reported lower school connectedness than White and Asian students across all profiles. The White-Latinx gap was significantly larger in profiles *(1) Moderate Student Diversity, Low SES Diversity (High SES), and Low Teacher Diversity* profile and *(4) Moderate Student Diversity, High SES Diversity, and Low Teacher Diversity* than the other two profiles.

Discussion

Although different diversity aspects are proposed to intersect (Crul, 2016), little research has studied the combined effect of multiple diversity aspects. Moreover, limited research has investigated the role of school diversity in racial/ethnic disparities of school experiences. To better understand the association of school diversity with students' school experiences and racial/ethnic disparities in these experiences, this study examined the combined influence of three salient diversity aspects (i.e., student race/ethnicity, teacher race/ethnicity, and socioeconomic status) on students' experiences of race-based victimization and school connectedness. The findings reveal considerable racial/ethnic disparities in students' experiences of race-based victimization within the same school diversity profile; the magnitude of these racial/ethnic disparities differed across profiles. In addition, school connectedness did not show strong associations with school diversity profiles.

School Diversity Profiles

Four school diversity profiles emerged using three school-level indicators. Contrary to our expectation that profiles would differ by varying levels of student racial/ethnic diversity, three school profiles were characterized by a moderate student racial/ethnic diversity index. These diversity index values ranged from 0.5 to 0.56, representing over 70% of schools in the sample. Despite similar diversity index values, these three profiles differed in their student racial/ethnic compositions. In profile *(1) Moderate Student Diversity, Low SES Diversity (High SES), and Low Teacher Diversity*, 65% of the schools had White students as the largest group and 35% of the schools had White students as the second largest group; 36 % of the schools had Asian students as the largest or second largest group within a school. In contrast, Latinx students were the numerically largest group (>50%) in 75% of the schools in profile *(2) Moderate Student Diversity, Low SES Diversity (Low SES), and Moderate Teacher Diversity*. The largest profile, *(4) Moderate Student Diversity, High SES Diversity, and Low Teacher Diversity,* comprised 66% of the schools with Latinx students as one of the two largest racial/ethnic groups and 82% of the schools with White students as one of the two largest racial/ethnic groups. Unlike those schools with moderate student racial/ethnic diversity, in profile *(3) Low Student Diversity, Low SES Diversity (Low SES), and Moderate Teacher Diversity*, all schools were composed of more than 70% Latinx students, except one with 41% Latinx students. These subtleties of racial/ethnic compositions in each profile help understand the numerical representation of racial/ethnic groups among students at the schools belonging to the four profiles, which are masked when using a diversity composite score (Graham, 2016).

Schools belonging to profiles *(2) Moderate Student Diversity, Low SES Diversity (Low SES), and Moderate Teacher Diversity* and *(3) Low Student Diversity, Low SES*

Diversity (Low SES), and Moderate Teacher Diversity consisted of 42% of the total participating schools. In the schools belonging to these two profiles, Latinx students are the racial/ethnic majority in most of the schools. These schools also contained a higher proportion of students from lower socioeconomic backgrounds than the schools in the other two profiles. The findings of more than 40% of schools belonging to profiles *(2)* and *(3)* characterized by majority Latinx students and students from low socioeconomic status echoes other studies' findings on school segregation in race/ethnicity and socioeconomic backgrounds (e.g., Marcotte & Dalane, 2019). The emerging latent profiles reveal the existence of racial/ethnic and socioeconomic segregation in a significant portion of California public schools, regardless of school level and school size. Meanwhile, these two profiles comprise a relatively higher teacher racial/ethnic diversity, suggesting that teachers of color are more likely to work in schools with a higher concentration of culturally marginalized and financially disadvantaged students, in line with the findings depicted in the literature (Carver-Thomas et al., 2017). Unfortunately, there is a higher level of teacher turnover in high-poverty schools (Simon et al., 2015). Considering the multiple benefits of a high teacher racial/ethnic diversity on students and teachers of color already in the field (Carver-Thomas et al., 2017), more research is needed to understand how to retain teachers of color in high-poverty schools.

School Diversity Profiles and Race-Based Victimization

There were differences across the profiles with regard to race-based victimization and its racial/ethnic disparities. Schools with homogeneous student populations in terms of racial/ethnic diversity and socioeconomic backgrounds and moderate teacher racial/ethnic diversity (profile 3) were associated with the lowest prevalence of race-based victimization.

This result aligns with prior research showing student racial/ethnic diversity's positive association with victimization and bullying (Jansen et al., 2016). However, this study's findings also reveal that higher race-based victimization was not only contributed by student racial/ethnic diversity, but also its interplay with socioeconomic and teacher racial/ethnic diversity. For example, three profiles were characterized with moderate student racial/ethnic diversity, but the schools in profile *(1) Moderate Student Diversity, Low SES Diversity (High SES), and Low Teacher Diversity* had significantly higher school-level victimization than *(2) Moderate Student Diversity, Low SES Diversity (Low SES), and Moderate Teacher Diversity*. This result suggests that a school context composed of low teacher racial/ethnic diversity is associated with more race-based victimization. In other words, race-based victimization is likely affected by the interplay of diversity aspects in addition to student racial/ethnic diversity. A high teacher diversity may help reduce race-based victimization in schools with a highly diverse student population.

The importance of studying interactions between contexts and diverse individual characteristics was also elucidated by the current study's results. The four racial/ethnic groups had considerably different school experiences under the same school diversity context. With the lowest prevalence of race-based victimization in profile *(3) Low Student Diversity, Low SES Diversity (Low SES), and Moderate Teacher Diversity*, racial/ethnic disparities were consistently observed between Latinx and the other three groups. The magnitude of Latinx-Asian/White/Black gaps in this profile was significantly larger than other profiles. Examining the associations between school diversity and outcomes at the school level would have been insufficient to recognize distinctive school experiences that students may have due to different individual characteristics. It will be critical to obtain a

complete understanding of interactions between school diversity and individual differences when working towards creating a safe and welcoming environment for all students.

The findings also provide empirical evidence to the power balance thesis (Graham, 2006; Pettigrew et al., 2011). Although prior studies have found that students have encountered race-based victimization when they were the numerical minority (Fisher et al., 2015), rarely did empirical studies assess this power balance thesis. The patterns of racial/ethnic disparities across profiles in this study substantiates the power balance assumption. Looking into the significant Black-White and Asian-White differences and their non-significant racial/ethnic differences of race-based victimization in the four profiles, Black and Asian students reported significantly higher odds of being victimized than White students only in schools where White students considerably outnumbered them. Thus, it is likely that when there are balanced representations across groups regarding student race/ethnicity, power balance is more likely to be maintained (Graham, 2006), resulting in less racial/ethnic differences in experiences of race-based victimization. As such, it may be critical to consider how to maintain the power balance across racial/ethnic groups within a context to reduce racial/ethnic disparities in race-based victimization.

School Diversity Profiles and School Connectedness

Variations of school connectedness across schools were negligible across each of the profiles. Regarding racial/ethnic differences, White students reported the highest level of school connectedness, followed by Asian students, then Latinx and Black students across profiles. This study's results are similar to prior research (e, g., Voight et al., 2015), which consistently reveal that students of color generally perceive less favorable school connectedness than White students. Instead of the contextual factor of diversity, other school

practices and structures (e.g., inequitable disciplinary practices; Skiba et al., 2011) in current U.S. public schools may make it more challenging for students of color to build a sense of connectedness (Pena-Shaff et al., 2019). The different magnitude of Latinx-White gaps between profiles suggests that a high proportion of same-racial/ethnic peers serves as a protective factor for students of color/'s perceived school connectedness. The Latinx–White disparity was the smallest in profiles *(3) Low Student Diversity, Low SES Diversity (Low SES), and Moderate Teacher Diversity* and *(2) Moderate Student Diversity, Low SES Diversity (Low SES), and Moderate Teacher Diversity*, where Latinx students were the numerical majority in most schools. This finding implies that being in a school with a homogenous representation of students' own race/ethnicity may promote students' sense of belonging for culturally minority students; this finding aligns with person-context fit theory (Magnusson & Stattin, 1998). The non-significant difference in racial/ethnic disparity of school connectedness across Asian and Black students may be due to the small representation of Asian and Black students in all profiles.

Limitations and Future Directions

There are several limitations in this study. First, due to the sample and dataset used, this study was unable to investigate students from other racial/ethnic groups or intersecting racial/ethnic identities. Students with intersecting racial/ethnic identities have different experiences than students who identify with one race/ethnicity (Dixon et al., 2021). Future research should explore the experiences of students with intersecting racial/ethnic identities. Additionally, this study grouped students within racial/ethnic identities together, which masked within-group differences. This limitation urges cautious interpretation and further study with sufficient and diverse sample sizes to explore within-group differences.

Second, when measuring diversity in quantitative studies, groupings are inevitable. Groupings in this study were limited by the dataset, such as only creating two groups in representing school socioeconomic status (receiving Free or Reduced-Price Meals or not). More considerations and research are needed in categorization when measuring diversity. Third, the generalizability of the findings is limited by the sample, because it only included students from California with its characteristics of a high proportion of Latinx students and a low proportion of Black students. Moreover, limited by the sample, school diversity profiles with high student racial/ethnic diversity did not emerge and the teacher racial/ethnic diversity range was small; thus, students' experiences in such diversity ranges were not assessed in this study. Research is needed to explore more qualitatively different school diversity profiles. Fourth, this study chose to dichotomize the item for measuring race-based victimization. Alternative approaches for handling this construct may increase precision for such discrete and highly skewed distribution of the outcome variable. A final limitation is related to the assignment errors of profile membership. Schools with higher levels of diversity were grouped into the four profiles due to the small number of these schools.

Future research with schools spreading across the range of the Simpson's *D* index will likely improve the model's entropy and result in more varied configurations of school diversity profiles. Additional research exploring the combined effects of multiple diversity aspects (e.g., language, religion, sexual orientation) can examine different unique diversity contexts on group interactions and individuals' psychological processes and behaviors, and control for additional school- and community-level variables (e.g., urbanicity and community-level diversity). Moreover, the current findings reveal the importance of future

research examining the cross-level contextual interaction of school diversity with individual characteristics on educational and social-emotional outcomes.

Practical Implications

This study has several implications for practice that are consistent with, and build upon, research related to race-based victimization and school connectedness. Results suggest that numerical representation is key for preventing race-based victimization and promoting school belonging among students of color. Unfortunately, practices such as redlining, school choice, and other means of segregation have created distinct school diversity contexts that benefit White students to the detriment of other racial/ethnic groups (Pearcy, 2020). Thus, for schools with unequal representation, practices that enhance numerical or cultural minority groups' perceived power may help reduce inter-groups conflicts. Integrating students from various socioeconomic and racial/ethnic backgrounds, having a culturally representative student union, implementing culturally responsive practices (Bottiani et al., 2020), increasing school cultural socialization (Wang et al., 2022), and teaching culturally and linguistically minoritized students from strength-based approaches (Zacarian & Soto, 2020) may work to reduce inter-group conflicts. However, more research is warranted to understand what factors can enhance each racial/ethnic groups' perceived power within a context.

Increasing teacher racial/ethnic diversity may be an efficient school-wide approach to reduce overall racial/ethnic conflicts and enhance students of color's school connectedness; the differential outcomes across profiles support this recommendation. Additionally, this study corroborates past findings that racial/ethnic minorities in the U.S. perceived lower school connectedness than White students (Furlong et al. 2011; Voight et al., 2015). White students' perception of school connectedness appears to be less impacted by the demographic

composition of the school context, but students of color tend to perceive higher school connectedness when there is a high same-racial/ethnic group proportion. This observation suggests the need for interventions designed to promote school connectedness among students of color in schools with diverse student populations.

Conclusion

School diversity research has primarily focused on student racial/ethnic diversity. This is insufficient given the solid understanding that school contexts are constructed by multiple diversity aspects. This study contributed to understanding the combined effect of three salient diversity aspects (i.e., student racial/ethnic diversity, socioeconomic diversity, and teacher racial/ethnic diversity). The findings reveal the importance of looking into the interaction between school diversity and students' racial/ethnic identity in students' school experiences. Considerable variations of racial-based victimization experiences between racial/ethnic groups within schools with different diversity configurations were observed. Racial/ethnic disparities in race-based victimization were minimal when there were similar numbers of students in groups based on their racial/ethnic diversity. Moreover, schools with a homogeneous student population with regard to race/ethnicity were observed to have higher school connectedness among Latinx students. An increasingly diverse student population may make it harder for students of color to develop a sense of belonging to their schools, indicating the need for culturally responsive interventions. The results of this study have important implications for school-wide policies to prevent race-based victimization for all racial/ethnic groups by increasing numerical minority groups' perceived power and other practices to build school connectedness of students from minority or marginalized groups.

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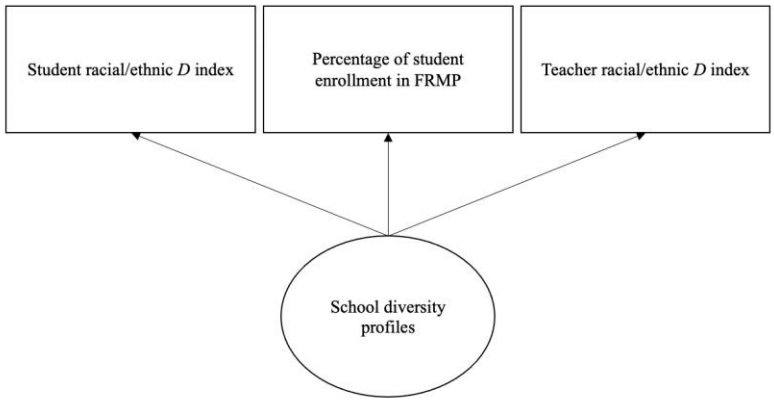
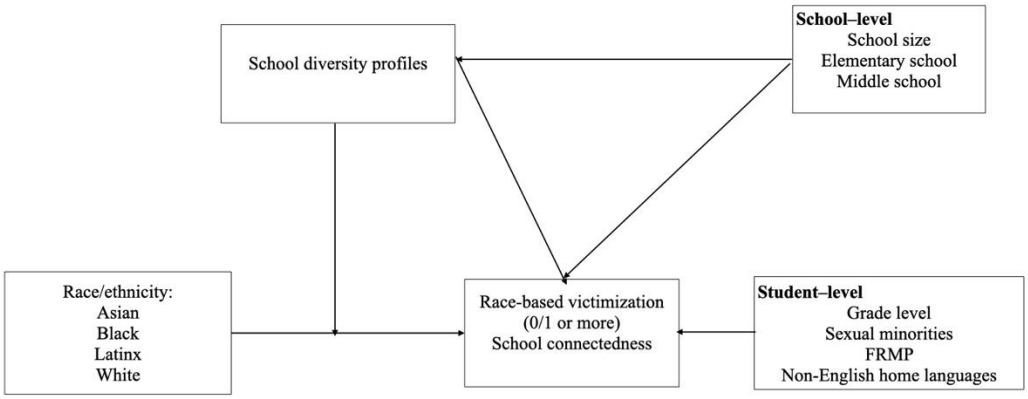
Figure 1.

Conceptual Models

A



B



Note. Model A depicts the latent profile analysis of school diversity profiles. Model B depicts the multilevel multigroup analysis with school diversity profiles predicting school-level race-based victimization and school connectedness and moderating racial disparity in race-based victimization and school connectedness upon controlling school- and student-level demographic covariates. FRMP = Free and Reduced Meals Program.

Table 1

Student Demographics

Participating Students (n = 100,408)				
Variables	Asian (n = 15,354)	Black (n = 2,692)	Latinx (n = 53,047)	White (n = 29,315)
Female	49.1%	46.2%	53.5%	50.3%
FRPM	21.8%	50.2%	69.8%	18.2%
Sexual Minorities	17.0%	16.1%	15.8%	16.9%
Non-English Home Language	40.9%	9.7%	50.1%	5%
Grade 7	25.4%	26.1%	16.4%	19.4%
Grade 8	3.7%	5.1%	4.7%	4.1%
Grade 9	25.5%	25.8%	26.0%	28.7%
Grade 10	11.5%	8.8%	13.5%	11.5%
Grade 11	23.3%	26.1%	28.0%	26.1%
Grade 12	10.5%	8.1%	11.4%	10.1%
Race-based Victimization (at least 1 time)	19.3%	27.8%	12.6%	10.2%
	M (SD)			
School Connectedness	3.70 (0.75)	3.42 (0.88)	3.54 (0.80)	3.71 (0.81)

Participating Schools (n = 278)	M (SD) / Percentage
FRPM	55% (27.1%)
School Size	1057 (710)
School Level	
Elementary	16.8%
Middle/Junior High	38%

High/Alternative	45.2%

Note. FRPM = Free or Reduced-Price Meal.

Table 2

Fit Statistics for LPA Class Enumeration (n = 278)

	k	LL	BIC	saBIC	CAIC	AWE	BLRT *p*	VLMR-LRT *p*	*cmP*
Model 1									
	1	139.493	-245.01	-264.04	-239.01	-193.03	—	—	<.001
	2	235.400	-414.17	-445.88	-404.17	-327.54	< .001	< .001	< .001
	3	268.436	-457.59	-501.99	-443.59	**-336.31**	< .001	< .001	0.001
	4	288.893	**-475.85**	-532.93	**-457.85**	-319.92	<. 001	**0.02**	13.05
	5	299.233	-473.88	-543.65	-451.88	-283.30	<. 001	0.67	4.87
	6	314.792	-482.35	-564.80	-456.35	-257.11	< .001	0.02	**335.59**
	7	321.479	-473.07	**-568.20**	-443.07	-213.18	0.03	0.24	3.24
Model 2									
	1	139.493	-245.01	-264.04	-239.01	-193.03	—	—	< .001
	2	279.902	-486.19	-592.11	-473.19	**-373.57**	< .001	**< .001**	0.003
	3	303.676	-494.09	-657.05	**-474.09**	-320.83	< .001	0.58	0.136
	4	325.341	**-497.78**	-717.77	-470.78	-263.88	< .001	**0.01**	**0.861**
	5	336.356	-480.17	-757.20	-446.17	-185.63	< .001	0.69	< .001
	6	353.912	-475.64	-809.71	-434.64	-120.46	< .001	0.02	< .001
	7	349.499	-427.18	**-818.27**	-379.18	-11.35	0.03	0.24	< .001
Model 3									
	1	208.365	-365.76	-394.30	-356.76	-287.80	—	—	< .001
	2	265.269	-439.93	-570.30	-423.93	-301.32	< .001	< .001	< .001
	3	294.021	**-457.79**	-645.19	**-434.79**	**-258.55**	< .001	**0.004**	**0.934**

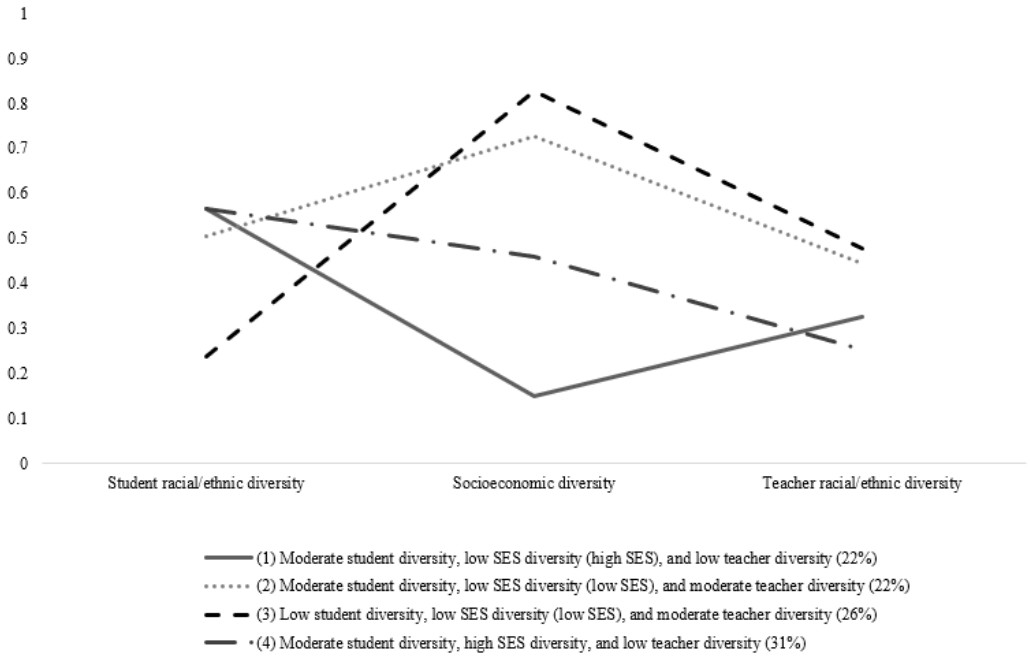
	4	311.192	-452.50	-696.93	-422.50	-192.61	**< .001**	0.224	0.066
	5	320.998	-432.47	-733.94	-395.47	-111.94	0.217	0.392	< .001
	6	338.082	-426.99	**-785.50**	-382.99	-45.82	< .001	0.271	< .001
Model 4									
	1	208.365	-365.76	-394.30	-356.76	-287.80	—	—	
	2	299.942	**-492.29**	-647.10	**-473.29**	**-327.69**	< .001	**< .001**	**0.99**
	3	323.788	-483.35	-719.64	-454.35	-232.12	**< .001**	0.10	0.01
	4	338.558	-456.26	-774.03	-417.26	-118.41	0.03	0.02	< .001
	5	357.959	-438.43	**-837.68**	-389.43	-13.95	< .001	0.23	< .001

Note. Model 1 indicates fixed variance across classes and no covariances specified. Model 2 indicates within-class variance are specified; Model 3 specified within-profile covariance; Model 4 specified within-profile covariance and variance. **Bold** = best fit statistic for each individual statistic.

k = number of classes; LL = model log likelihood; BIC = Bayesian information criterion; saBIC = sample size adjusted BIC; CAIC = consistent Akaike information criterion ; AWE = approximate weight of evidence criterion; BLRT = bootstrapped likelihood ratio test; VLMR-LRT = Vuong-Lo-Mendell-Rubin adjusted likelihood ratio test; *p* = *p* value; cmP = Correct Model Probability.

Figure 2

School Diversity Profiles



Note. Socioeconomic diversity was indicated by the percentage of students eligible for Free or Reduced-Price Meal (FRPM). Low or high FRPM percentage represents homogeneously low or high school SES. When the enrollment percentage is close to 50%, it means a balanced representation of students who enrolled in FRPM and who did not receive FRPM.

Table 3

Odds Ratios/ Standardized Regression Coefficients and Standard Error of Race-based Victimization and School Connectedness across School Diversity Profiles (n =81,980)

	1. Moderate Student Diversity, Low SES Diversity (High SES), and Low Teacher Diversity	2. Moderate Student Diversity, Low SES Diversity (Low SES), and Moderate Teacher Diversity	3. Low Student Diversity, Low SES Diversity (Low SES), and Moderate Teacher Diversity	4. Moderate Student Diversity, High SES Diversity, and Low Teacher Diversity
Race-Based Victimization				
School Level				
Threshold Estimate	1.57 (0.06)^{**a}	1.99 (0.06)^{**b}	2.29 (0.06)^{**c}	1.69 (0.07)^{**a}
Student Level				
Asian $_{(reference = Latinx)}$	0.94 (0.09)^{b}	2.44 (0.37)^{***a}	3.79 (0.41)^{***c}	1.69 (0.18)^{***a}
Asian $_{(reference = White)}$	2.34 (0.36)^{***a}	1.22 (0.21)^{b}	1.05 (0.12)^{b}	2.68 (0.39)^{***a}
Black $_{(reference = Latinx)}$	2.01 (0.27)^{***a}	2.19 (0.24)^{***a}	3.83 (0.67)^{**b}	2.62 (0.34)^{***a}
Black $_{(reference = White)}$	5.04 (0.85)^{***a}	1.09 (0.14)^{b}	1.07 (0.21)^{b}	4.16 (0.81)^{***a}

White (reference = Latinx)	0.40 (0.04)^{***a}	2.00 (0.22)^{**b}	3.60 (0.33)^{***c}	0.63 (0.09)^{***d}
School Connectedness				
School-Level				
Intercepts	3.60 (.03)^{***a}	3.46 (.03)^{***b}	3.54 (.02)^{***a}	3.55 (.02)^{***a}
Student-Level				
Asian (reference = Latinx)	0.07 (.01)^{***a}	0.03 (.01)^{**a}	0.02 (.00)^{***a}	0.03 (.01)^{***a}
Asian (reference = White)	-0.03 (.01)^{*a}	0.01 (.04)^{b}	0.02 (.01)^{b}	-0.01 (.01)^{a}
Black (reference = Latinx)	-0.01 (.01)^{a}	-0.04(.01)^{***a}	-0.02 (.01)^{*a}	-0.04 (.01)^{***a}
Black (reference = White)	-0.04 (.01)^{***ab}	-0.05 (.01)^{***ab}	-0.03 (.01)^{*a}	-0.06 (.01)^{***b}
White (reference = Latinx)	0.10 (.01)^{***a}	0.03(.01)^{*b}	0.01 (.01)^{b}	0.07 (.01)^{***a}

Note. The odd ratios and coefficients represent differences between the racial/ethnic groups and the reference group in each profile. Parameter estimates that do not share superscripts within a row differ by $p < .05$. Coefficients of demographic covariates were estimated for the overall model; thus, they are same across profiles. * $p < .05$; ** $p < .01$; *** $p < .001$ (two-tailed tests).

Table 4

Standardized Coefficients of School Level and Student Level Covariates

	Race-based Victimization β (SE)	School Connectedness β (SE)
Student level		
FRMP	0.01 (0.03)	-0.02 (0.01)**
Grade level	-0.06 (0.03)***	-0.09 (0.01)***
Non-English Home Language	0.14 (0.04)***	-0.03 (0.01)***
Female	0.07 (0.03)*	-0.04 (0.01)***
Sexual minorities	0.30 (0.03)***	-0.10 (0.01)***
School level		
Elementary	0.13 (0.10)	0.14 (0.11)
Middle	-0.06 (0.07)	0.00 (0.13)
School Size	0.00 (0.00)	-0.19 (0.10)

Note. The parameters were estimated for the overall model; thus, they were the same across profiles.
* $p < .05$; ** $p < .01$; *** $p < .001$ (two-tailed tests).

Study 2: School Climate Perception Among Latinx and White Students: An Examination of Intersecting Race/Ethnicity and Socioeconomic Status Identities in Context

Abstract

Limited research has explored how students' perceived school climate may be explained by contextual factors, despite its potential implication to address school climate disparities across student groups. Particularly, although some studies have shown that student and teacher racial/ethnic diversity played a role in students' perceived school climate, they rarely examined different school climate aspects and considered the interaction between school diversity and students' intersecting racial/ethnic and socioeconomic identities. This study used stratified analysis to assess the associations of two prominent diversity aspects (i.e., student racial/ethnic diversity and teacher racial/ethnic diversity) with students' perceived school climate (i.e., perceived safety and equity, school support, and school attitude to parental participation) upon controlling student- and school-levels demographic characteristics among 41,237 Latinx and 23,819 White students from 250 California public schools. The findings indicated that higher teacher racial/ethnic diversity was associated with more favorable perceived school attitudes in parental engagement and perceived school equity and safety among Latinx and White students with low socioeconomic status. Moreover, only Latinx students from low socioeconomic status perceived less favorable school safety and equity in schools with a more racial/ethnic diverse student population. The results suggest that diversifying teacher racial/ethnic diversity is a promising way to enhance parental involvement and perceived equity among students from the lower socioeconomic background. More implications of the study were discussed.

Keywords: school diversity, school climate, intersectionality, teacher racial/ethnic diversity, student racial/ethnic diversity

School Climate Perception Among Latinx and White Students: An Examination of Intersecting Race/Ethnicity and Socioeconomic Status Identities in Context

Research on students' perceived school climate has been burgeoning (Thapa et al., 2013; Wang & Degol, 2016) because of its positive impact on students' physical, mental health, and educational outcomes (Berkowitz et al., 2017; Wang & Degol, 2016). Students' perception of school climate results from reciprocal interactions between individual and contextual characteristics (La Salle et al., 2015). However, limited research has examined how school demographic composition, a contextual characteristic within the school microsystem, may shape school climate perception, even though a diverse school environment is theorized to affect school climate perception, and such effect is also likely to vary with students' backgrounds (Rudasill et al., 2018). Furthermore, an understanding of school diversity's association with school climate from an intersectionality perspective is even more lacking. Racial/ethnic identity and socioeconomic status (SES) are two salient status-based identities (Deaux, 1994; Graham, 2006; Park et al., 2013); prior research has shown these intersecting socioeconomic and racial/ethnic identities produce multiplicative effects on individuals' developmental contexts and outcomes (Henry et al., 2018). Thus, this study examines how student and teacher racial/ethnic diversity are related to three aspects of school climate (i.e., school support, safety and equity, and parental involvement) by student groups with intersecting identities between race/ethnicity and SES (i.e., high and low) among White and Latinx students in California public schools.

School Climate

School climate can be defined as "*cognitive and affect perceptions of social interactions, relationships, safety, values, and beliefs held by students, teachers,*

administrators, and staff within a school" (Rudasill et al., 2018, p.46). This broad definition of school climate is often measured as a multidimensional construct, such as the perceived quality of interpersonal relationships, school safety, and shared norms and practices (Rudasill et al., 2018). The positive impact of school climate has received rich evidence (Thapa et al., 2013). Nevertheless, despite more than a decade of work in promoting school climate for all students (U.S. Department of Education, 2007), underrepresented and marginalized groups (e.g., racial/ethnic minorities and sexual minorities) still perceive less favorable interpersonal relationships, safety, and support in school compared with their counterparts (Bottiani et al., 2016; Konold et al., 2017; Hamre & Pianta, 2001; Voight et al., 2015). Moreover, schools with a high concentration of low-income populations and students of color have been found to have a less favorable school climate (Jain et al., 2015). Efforts to improve school climate among these schools and students are much needed considering the robust evidence of a positive school climate in positive educational and psychological outcomes (Thapa et al., 2013) and its role in disrupting the positive association between low SES and academic outcomes (Berkowitz et al., 2017). In addition to other well-studied interpersonal factors' and school-wide practices' linkages with school climate perception, contextual factors are conceptually expected to construct school climate perception but relatively less studied (Rudasill et al., 2018).

Link Between School Diversity and School Climate

School ecological characteristics may contribute to varied psychosocial experiences across students (La Salle et al., 2015), resulting in different perceived school climate. Among different school ecological characteristics, school diversity has received burgeoning attention due to the increasingly diverse school environment in the U.S. and its conceptual associations

with students' educational and psychosocial outcomes (Graham, 2018; Juvonen et al., 2019). Diversity has been commonly conceptualized as a continuum constructed by the number of groups and distribution across groups (Rjosk et al., 2017; Teachman, 1980). A high diversity refers to a higher number of groups and more even distribution across groups (Graham, 2018).

Student Racial/Ethnic Diversity

Student racial/ethnic diversity has received the most research attention. Its association with students' perception of school climate can be built upon the power balance theory, in which students' perceived social power within a context is determined by their status-based identities and the relative number of group members sharing similar social identities (Agirdag et al., 2011). Considering the influences of race/ethnic school context in the U.S. on students' school experiences (Chan et al., 2022; Graham et al., 2022), students' perception of school climate is likely influenced by student racial/ethnic compositions in schools. Moreover, school diversity is empirically linked to group dynamics and interpersonal relationships (Graham & Echols, 2018). However, the impact of school diversity on perceived school climate or its related constructs is mixed in the literature. A line of empirical studies observed favorable effects of student racial/ethnic diversity on students' perceived safety and trust (Juvonen et al., 2006, 2018; Lanza et al., 2018). Juvonen et al. (2018) studied a sample of Black, Latinx, White, and Asian students from public schools in California. This study observed a higher school-level student racial/ethnic diversity was associated with higher perceived safety and fairness in teachers' practices and less loneliness and peer victimization.

Meanwhile, a negative association between student racial/ethnic diversity and school climate was also evident (DuPont-Reyes & Villatoro, 2019; Munniksma et al., 2022; Parris et al., 2018). Parris et al. (2018) observed that when the percentage of minority groups increased in a school, students' perception of the overall school climate decreased among 309,327 middle school students from 629 schools in Georgia. Beyond the U.S. context, a study conducted in the Netherlands found that either societal dominant or marginalized groups perceived less positive peer relations and more victimization experiences in classrooms with higher student racial/ethnic diversity and concentration of students from a lower socioeconomic background (Munniksma et al., 2022). In addition to the mixed findings, most existing research has focused on student racial/ethnic diversity's association with certain aspects of school climate without looking into other aspects of school climate, such as school attitudes in parental participation.

Teacher Racial/Ethnic Diversity

Teacher racial/ethnic diversity is a significant but frequently overlooked part of school diversity (Gershenson et al., 2021). At the state and federal levels, there has been renewed interest in diversifying the teacher workforce with the purpose of combating injustice and prejudice (Sleeter et al., 2015). Arguments built upon the benefits of early and ongoing exposure to a diverse population in preventing bias and enhancing educational achievements support diversifying teacher workforce (Gershenson et al., 2021). The voices of teachers of color are theorized to improve equity and justice in educational procedures (Hughes et al., 2020; Lindsay & Hart, 2017), close racial/ethnic gaps in teachers' performance expectations for students (Gershenson et al., 2021), and lessen the likelihood that educators are unfamiliar with the cultures and learning preferences of their students

(Blake et al., 2016). Several research showed a correlation between more teacher racial/ethnic diversity and reduced incidences of racial bullying and discrimination (Benner & Graham, 2011; Larochette et al., 2010). Despite strong theoretical underpinnings, little research has examined the impact of teacher racial/ethnic diversity on various aspects of school climate perception.

Interaction Between Students' Intersecting Identities and School Diversity

Two theoretical frameworks (i.e., the Cultural-Ecological Model of School Climate and the Systems View of School Climate) delineating factors constructing school climate perception underscore the importance of investigating the interplay between individual characteristics and school context (La Salle et al., 2015; Rudasill et al., 2018). Understanding students' differential responses to student and teacher racial/ethnic diversity by their social identities is essential to informing interventions to promote a positive school climate for all students. Additionally, an intersectionality lens recognizes how students' various social identities overlap and how the structural advantages and disadvantages experienced by various social groups affect individuals' day-to-day lives (Purdie-Vaughns & Eibach, 2008; Syed & Ajayi, 2015). Understanding people's lived experiences through their intersecting identities aids in more effectively addressing oppressive institutions and enacting structural changes (Rosenthal, 2016). Based on prior research indicating the relevance and ubiquity of interacting effects between SES and race/ethnicity, the junction between these two layers of social identity is crucial (Henry et al., 2018).

In light of the possibility that the two diversity features may have various implications for children with varied intersecting status-based identities, different responses to student and teacher racial/ethnic diversity are also conceptually expected. Notably, the

beneficial effect of teacher racial/ethnic diversity is supported by its hypothesized links with justice and fairness in educational practices and less prejudice toward minority groups (Hughes et al., 2020; Lindsay & Hart, 2017). Student racial/ethnic diversity is also proposed to lessen the existing power disparity in the educational setting (Fisher et al., 2015; Graham, 2006). High teacher and student racial/ethnic diversity may likely have stronger associations with school climate among students who perceive less social power and experience more systematic suppression in the existing school system. Hence, this study anticipates differential associations of the two diversity aspects with school climate by students' intersecting racial/ethnic and SES identities.

The Current Study

To better understand the interplay of students' intersecting racial/ethnic and socioeconomic identities with school diversity in students' perceived school climate, this study employed stratified analyses in a multilevel framework to examine how teacher racial/ethnic diversity and student racial/ethnic diversity are differentially related to three aspects of school climate (i.e., students' perceptions of school support, school safety and equity, school attitudes to parental participation) among Latinx and White students. Considering the theoretical rationales of the influences of the two diversity aspects, this study expected the associations between the two diversity aspects and school climate would differ across groups grounded in ecological models (La Salle et al., 2015; Rudasill et al., 2018). This study anticipated that student and teacher racial/ethnic diversity were positively associated with the three aspects of school climate, and these associations were anticipated to be stronger among Latinx students from low socioeconomic backgrounds. Additionally, this study included student-level demographics (gender, grade level, and sexual orientation) and

school-level factors (percentage enrollment eligible for free and reduced-price meals, school size, and school level) as covariates to reduce the risk of confounding in the analysis.

Method

Procedure and Participants

Data from the study were collected at the school and student levels. School-level data of all pertinent demographic information were extracted from the California Department of Education (CDE) public dataset. The California Healthy Kids Survey (CHKS; WestEd, 2014), a biennial statewide survey conducted in California that inquires anonymously about student risk and resilience variables, served as the source of student-level data. Between October 2017 and June 2019, the sample for this study provided responses to the questionnaire. The way the proctors administered the survey was standardized. These trained school staff members who were designated to administer the CHKS followed a script that informed pupils that the survey was voluntary and anonymous. The survey was voluntarily completed by students during class time. Parents gave passive consent by following the protocol (see http://chks.wested.org/administer/instructions).

School information (students' racial/ethnic composition, number of students in Free and Reduced Meals Program [FRMP], teachers' racial/ethnic composition, school size, and school level) of the participating schools in the CHKS was extracted from the CDE in the academic years of 2018–2019. For student-level data, the CHKS were collected from the academic years of 2017-2018 and 2018-2019. Given the dataset's characteristics and sample sizes of each group, this study focused on students who identified as Latinx and non-Latinx White. An average of 50 high SES Latinx, 114 low SES Latinx, 89 high SES White female, and 18 low SES White students per school provided data for the study. Table 1 shows the

demographic information of participants in the present study per race/ethnicity × SES and participating schools in this study.

Measures

School Level: Student and Teacher Racial/Ethnic Diversity

Student and teacher racial/ethnic diversity were captured by the Simpson's *D* formula as seen in Equations 1, whereby $p_i$is the proportion of the racial/ethnic group. The Simpson's *D* has been widely used in school diversity research (Rjosk et al., 2017), assuming a context is more diverse when there is a higher probability of randomly picking two persons from different groups within a context (Simpson, 1949).

$$Simpson's\ D\ Indiex = 1 - \sum p_i^2 \quad (1)$$

Groups included in the calculation of the statistic for all schools were the percentages of Black, White, Latinx, Asian (i.e., Asian and Filipino), and Other (i.e., American Indian or Alaska Native, Pacific Islanders, and Two or More Races) students/teachers in each participating school. ***Student-Level: Students' Intersecting Identities***

Students were asked their race and ethnicity by two questions. Students reported six racial identifications (*American Indian*, *Asian*, *Black or African American*, *Native Hawaiian or Pacific Islander*, *White*, or *Mixed Race*) to the question of "What is your race?" Students were also asked if they were Latinx. Students who identified as non-Latinx White and Latinx were included in the analysis. Students' socioeconomic status was indicated by enrollments in Free or Reduced-Price Meal (FRPM) using three categories (yes, no, or don't know), with students selecting "don't know" categorized the same as missing responses. The use of FRPM as a proxy has been shown to sufficiently reflect students' educational disadvantages (Domina et al., 2018). Students who enrolled in FRPM were categorized as low SES. Based

on these questions, students were categorized into four groups (i.e., high SES Latinx, low SES Latinx, high SES White, low SES White).

Endogenous Variables

Safety and Equity. School safety and equity was measured by three items. Items were rated on a 4-point response scale (1 = *not at all true*, 2 = *a little true*, 3 = *pretty much true*, and 4 = *very much true*). An example items is "*I feel safe in my school*." "*The teachers at this school treat students fairly*," and "*My school is usually clean and tidy*." The survey has been found to be a valid and reliable measure of various aspects of school climate (Hanson & Voight, 2014). The omega values of each subscale's internal reliability for each group ranged from 0.69 to 0.71.

School Attitudes to Parental Participation. Three items were used to measure students' perceived school attitudes to parental participation (Hanson & Voight, 2014). An example item is "*Parents feel welcome to participate at this school, School staff takes parent concerns seriously."* Higher values indicate more favorable perception of schools' attitude towards parental participation in school. The omega values of the scales' internal reliability for each group ranged from 0.76 to 0.79.

School Support. Students' perceived social support from school was assessed using three items from the Social Emotional Health Survey-Secondary (SEHS-S; Furlong et al., 2020). Items were rated on a 4-point response scale (1 = *not at all true*, 2 = *a little true*, 3 = *pretty much true*, and 4 = *very much true*; Furlong et al., 2020). An example items is "*At my school, there is a teacher or adult, who always wants me to do my best*." The omega values of each subscale's internal reliability for each group ranged from 0.85 to 0.88.

Control Variables

School and Student Demographics. School size, school level (i.e., elementary, middle, or high school), and school socioeconomic composition were included in the dataset. School SES was indicated by the percentage of students' enrollment in FRMP from the CDE dataset. Their associations with school climate are documented in the literature (Daily et al., 2019; Stevenson, 2006). At the student-level, students reported their sexual orientation, grade level, and gender identity, which were controlled due to their documented impact on students' perception of school climate and engagement (e.g., Elmore & Huebner, 2010; Sansone, 2019). Students responded to the gender identity item using a binary option (*female* or *male*). Students were asked about their preferred sexual identification using six categories (*straight, gay or lesbian, bisexual, I am not sure yet, something else,* or *decline to respond*), which was regrouped into *straight* and *sexual minorities.* They were included in the analysis as categorical variables.

Data Analysis

First, descriptive statistics and correlations among variables were assessed. Missing data were screened and assessed for patterns of missingness. A preliminary descriptive analysis was conducted to examine the observed means of the outcomes and demographic information of each racial/ethnic and SES group (e.g., High SES Latinx and Low SES Latinx). High SES Latinx, low SES Latinx, high SES White, and low SES White students were the unit of investigation in stratified analysis. A series of multilevel regression models were estimated using maximum likelihood estimation on Mplus 8.4 (Muthén & Muthén, 2017) by each race/ethnicity × socioeconomic group.

To examine the effect of student and teacher racial/ethnic diversity on the three aspects of school climate, the model building involves three steps (Peugh, 2010). First, the

three school climate outcomes were entered in the unconditional model without any covariates and predictors to get intraclass correlation coefficients (ICCs). A design effect would be generated using the ICCs and a value greater than 2 indicates that a significant proportion of the variance occurs across schools to indicate the need of multilevel modeling (Heck & Thomas, 2020). Second, the student-level predictors were added. Predictors included at the student-level were grade level, gender, and sexual orientation. Student-level covariates were grand-mean centered to control its effects on the outcomes. The third step was adding the school-level predictors (i.e., the percentage of students receiving FRMPs, student and teacher racial/ethnic diversity, school level, and school size). Continuous variables at the school-level were grand-mean centered. Categorical variables were not centered at the school-level because they had meaningful zeros. The regression coefficients of predictors on the three outcomes were estimated simultaneously because the correlations between the dependent variables were than accounted (Snijders & Bosker, 2011). The model comparison was evaluated by Akaike and Bayesian information criteria and likelihood ratio tests (Raudenbush and Bryk 2002; Peugh, 2010). Standardized coefficients were generated to interpret as effect sizes (Nieminen et al. 2013). The model included the student-level and school-level predictors' main effects. These steps were repeated by each race/ethnicity x SES group. The multilevel regression equation for each outcome is illustrated as follows:

$$Y_{ij} = \gamma_{00} + \gamma_{01}\left(Teacher\ Diversity_j - \overline{Teacher\ Diversity}\right) + \gamma_{02}\left(Student\ Diversity_j - \overline{Student\ Diversity}\right) + \gamma_{03}\left(\%FRMP_j - \overline{\%FRMP}\right) + \gamma_{04}\left(School\ Size_j - \overline{School\ Size}\right) + \gamma_{05}\left(Middle\ School_j\right) + \gamma_{05}\left(Elementary\ School_j\right) + \gamma_{11}\left(Female_{ij} - \overline{Female}\right) + \gamma_{12}\left(Sexual\ Minorities_{ij} - \overline{Sexual\ Minorities}\right) + \gamma_{13}\left(Grade_{ij} - \overline{Grade}_j\right) + u_{0j} + r_{ij}$$

Missing Data

The missing rates of the demographic (i.e., grade level) and dependent variables were all under 5.0% at an acceptable range (Dong & Peng, 2013). However, an item of sexual orientation had 6.1% missing responses in low SES Latinx groups respectively, but 2.4%, 3.7%, and 4.8% missing responses in high and low SES White students and high SES Latinx students. For the sexual orientation items, independent *t*-tests were conducted to assess if the missingness has a significant influence on responses to the outcomes among low SES Latinx students. There were statistical differences on safety and equity and school attitudes in parental participation between those who responded to the sexual orientation item and those that did not among low SES Latinx students, but the effect size was small. The significant result was likely due to the large sample size. Data missing-at-random were assumed (MAR; Enders, 2010); thus, full information maximum likelihood (FIML) was used to handle missing data in the analysis.

Results

Preliminary Analysis

The design effects for all outcomes ranged from 2.18 to 29.25 for the four groups, indicating the need of multilevel modelling of all four outcomes. Correlations among the endogenous variables were moderate (r = 0.25-0.41; see Table 2). At the school-level, the percentage of enrollments in FRMP was negatively correlated student racial/ethnic diversity and positively correlated with teacher student racial/ethnic diversity.

Relations of Student and Teacher Racial/Ethnic Diversity and School Climate

Table 3 lists fit statistics of the models and Table 4 shows standardized coefficients of models by the four student groups. Student racial/ethnic diversity was only found to be negatively associated with students' perceived safety and equity among low SES Latinx students ($\beta = -.20, p < .05$). Student racial/ethnic diversity was not significantly related to other aspects of school climate across groups.

Regarding teacher racial/ethnic diversity, among White and Latinx students from low SES backgrounds, teacher racial/ethnic diversity was positively associated with perceived school attitudes to parental participation (low SES Latinx students: $\beta = .16, p < .05$; low SES White students: $\beta = .37, p < .01$) and safety and equity (low SES Latinx students: $\beta = .16, p < .05$; low SES White students: $\beta = .19, p < .01$). However, null results of these relations were observed among students from high SES.

Student and School Characteristics

Regarding student characteristics, the results of multilevel analyses showed that sexual minorities were negatively associated with the three aspects of school climate across groups ($\beta = -0.04 - -0.16, p < .05$). Another consistent relation across student groups was higher grade level relating to less positive perceived school attitudes in parental participation ($\beta = -0.12 - -0.17, p < .001$). For school characteristics, a higher

concentration of students' enrollment in FRMP was related to less favorable perception of school climate across groups, particularly school safety and equity. A relation of larger school size with less positive school attitudes to parental participation was consistent found in all groups. There was less overall school support in high schools than elementary or middle schools.

Discussion

Considering the limited research on contextual factors contributing to school climate perception, this study employed multilevel analysis to assess differential relations of teacher and student racial/ethnic diversity with students' perceived safety and equity, school support, and school attitudes to parental participation by race/ethnicity x socioeconomic status among White and Latinx students. The results revealed that student characteristics (i.e, gender, grade level, and sexual orientation) were consistently related to the three school climate aspects across student with intersecting identities. Teacher racial/ethnic diversity was observed to be positively related to perceived school attitudes to parental participation and safety and equity only among students from low SES. A negative association between student racial/ethnic diversity and perceived safety and equity was found among low SES Latinx students. The findings provide evidence to the positive impact of diversifying teacher workforce in school climate perception for students from low SES background. This study revealed school racial/ethnic compositions were associated with students' school climate perception, whereas the relations varied with students' social identities.

School Racial/Ethnic Diversity

The current study showed that student racial/ethnic diversity was negatively related to perceived school safety among low SES Latinx students. Nevertheless, unlike prior research

with similar results on the negative impact of student racial/ethnic diversity on students' school experiences across students' racial/ethnic identities (Munniksma et al., 2022; Parris et al., 2018), this study only observed this association among Latinx students from low SES in their perceived school safety and equity. This result reveals that students with multiple status-based identities linked to disadvantages and less social power perceived less positive school safety and equity with an increasingly diverse student population. In addition, the intersectionality perspective of this study suggests that student racial/ethnic diversity adversely impacts Latinx students from low SES feeling safe and equitable school climate but not White students and Latinx students from better socioeconomic backgrounds. This observation corroborates the disproportionate impact of socioeconomic disadvantages on persons of color in the U.S. (Henry et al., 2018).

The positive influence of teacher racial/ethnic diversity was observed among Latinx and White students from low SES backgrounds. Students from low SES in this study perceived more positive school attitudes to parental participation and school safety and equity when attending a school with higher teacher racial/ethnic diversity. However, the positive influence of teacher racial/ethnic diversity was not observed in student groups from high SES. The findings suggest that teacher racial/ethnic diversity is particularly conducive to students from low SES, and its positive impact does benefit not only students of color but also White students. Generally, this study's results indirectly corroborated the hypothesis that a high teacher racial/ethnic diversity likely enhances fairness and justice in school-wide practices (Hughes et al., 2020; Lindsay & Hart, 2017). The differential impact across students' socioeconomic status may be explained by the impact of teacher racial/ethnic diversity on school-wide practices, such as disciplinary measures (Sleeter et al., 2015),

resulting in a more equitable and welcoming climate for students and parents from lower socioeconomic backgrounds. However, more empirical research is warranted to assess the underlying mechanism of this relation.

School and Student Characteristics

Apart from student and teacher racial/ethnic diversity, at the school-level, having a higher concentration of students from lower SES was negatively associated with the three aspects of school climate. The current study's findings aligned with the literature regarding the negative impact of school or classroom SES on students' school climate (e.g., Voight et al., 2015). This observation has various potential explanations, given the complex association of school SES with other school-level and community-level factors. For instance, schools with more students from low SES tend to have fewer quality teachers (Clotfelter et al., 2006; Ingersoll, 2004), higher teacher turnover rates (Simon & Johnson, 2015), and fewer school resources (Bettini et al., 2022). Solving these deep-rooted inequities requires structural and fundamental changes in policies governing education. In the meantime, research about what critical school- and community-level factors mediate and moderate the associations would be meaningful to minimize the discrepancy in students' perceived school climate across schools.

At the student-level, regardless of racial/ethnic and SES identities, students who identified as sexual minorities reported a less favorable school climate. These findings echoed the literature, showing that students identified as sexual minorities have encountered more barriers to having positive school experiences and engagement (e.g., Allen et al., 2022; Fullarton, 2002; Ioverno & Russell, 2021).

Practical Implications

The collective evidence from the current study and previous research on student racial/ethnic diversity on student outcomes implies its complex nature. Its influence is likely moderated by family, school, and community factors, including students' social identities. A highly diverse school context has a differential impact on students. The current study indicated that low SES Latinx were more likely to perceive less favorable school safety and equity in a school with a racial/ethnically diversity student population. Meanwhile, a positive association of teacher racial/ethnic diversity with school safety and equity and perceived school attitudes towards parental participation was found among students from low SES. This evidence suggests that diversifying the teacher workforce may be a promising way to address the less favorable school climate among students from low socioeconomic backgrounds.

Moreover, the negative relations of several student characteristics to school climate perception were consistently observed among Latinx and White students. Students identified as sexual minorities across race/ethnicity and SES encountered challenges in developing positive interpersonal relationships and perceived schools as safe and welcoming to them and their families. These observations call for practices and continuous efforts to create an inclusive environment for students, particularly those with less social power and marginalized identities.

Limitations and Future Directions

This study has several limitations. First, this study only assessed student-level intersections of race/ethnicity and SES among White and Latinx students. Moreover, students' SES was only measured as a binary variable, neglecting more refined classification of socioeconomic backgrounds. As a preliminary study with an observation of varying

students' school experiences with students' intersecting identities, future study is encouraged to explore intersections across different status-based identities further when studying school contextual impact on students. Second, this study did not capture dynamic and fluid aspects of diversity, such as controlling classroom diversity and students' prior diversity experiences (Graham, 2016). It is warranted to gather information at the student-, classroom-, school-, community-level, and macrosystem to understand how to bolster students' learning and develop healthy relationships with peers and adults with culturally diverse backgrounds. Regarding the generalizability of the findings, this study only included public schools in California and among Latinx and White students. To generalize the findings requires replication studies using different data representing characteristics of other states.

Conclusion

The current study contributed to the existing school climate research by examining how school diversity aspects were related to students' school climate perception among Latinx and White students from an intersectionality framework. The findings suggest that associations between school diversity and school climate in school varied with school climate aspects and differed across groups with different intersecting race/ethnicity and SES identities. This study is among the few available research empirically assessing the association between teacher racial/ethnic diversity and school climate perception. The results suggest diversifying the teacher workforce promotes positive school climate perception among students from low SES. Beyond SES and race/ethnicity, at the student-level, sexual minorities were consistently and robustly related to less favorable school climate perception. At the school-level, a higher concentration of poverty was consistently associated with a less positive school climate perception.

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Table 1

Student- and School-level Characteristics

Student-level Variable	High SES Latinx (*n* = 13,526)	Low SES Latinx (*n* = 31,221)	High SES White (*n* = 20,662)	Low SES White (*n* = 4,274)
Male	47.1%	46.1%	49.3%	49.9%
Sexual minorities	14.7%	14.5%	14.9%	20.6%
Grade 7	18%	22.2%	16.9%	22.4%
Grade 8	3.4%	6.2%	3.8%	5.3%
Grade 9	27.4%	28.8%	28%	28.2%
Grade 10	12.7%	10.5%	12.4%	10.4%
Grade 11	27.6%	24.7%	27.1%	26.3%
Grade 12	10.9%	7.6%	11.8%	7.5%
		M (SD)		
Safety and equity	3.52 (0.70)	3.47 (0.37)	3.64 (0.66)	3.50 (0.74)
Social support	3.01 (0.69)	2.96 (0.70)	3.17 (0.61)	3.05 (0.70)
School attitudes to parental participation	3.42 (0.72)	3.46 (0.69)	3.40 (0.75)	3.36 (0.79)

School-level Variable (n =250) / M (SD)	%
Elementary School	16.5%
Middle School	38.6%
High School	44.9%
School size	1012 (694)
FRPM (%)	0.54 (0.27)
Teacher racial/ethnic diversity	0.37 (0.18)
Student racial/ethnic diversity	0.53 (0.13)

Note. FRPM = Free and Reduced Price Meal.

Table 2.

Correlations of Continuous Variables at the Student– and School– Level

Student-Level ––Latinx				
	1	2	3	
1. Safety and equity	–	.24***	.37***	
2. School support	.25***	–	.25***	
3. Parental participation	.39***	.26***	–	
Student-Level ––White				
	1	2	3	
1. Safety and equity	–	.25***	.41***	
2. School support	.25***	–	.26***	
3. Parental participation	.38***	.26***	–	
School-Level	1	2	3	4
1.Percentage of enrollments in FRMP	–			
2.Student racial/ethnic diversity	-.54***	–		
3.Teacher racial/ethnic diversity	.38***	-.24***	–	
4.School Size	-.20**	.03	.17**	–

Note. Values of students enrolled in FRPM above the diagonal;
FRPM = Free and Reduced Price Meal.
***$p < 0.001$

Table 3

Model Fit Statistics

	AIC	BIC	Sample size-adjusted BIC	*LRT*
High SES Latinx				
No covariates	99510.436	99578.046	99549.445	–
Level 1	86218.342	86375.066	86308.330	9534.651***
Level 1 and level 2	83173.336	83485.404	83351.932	3178.548***
Low SES Latinx				
No covariates	226562.701	226637.840	226609.238	–
Level 1	193754.960	193928.974	193862.236	19850.800***
Level 1 and level 2	189400.073	189747.302	189613.827	4690.514***
High SES White				
No covariates	148732.358	148803.782	148775.181	–
Level 1	131506.840	131672.992	131606.255	10164.713***
Level 1 and level 2	127305.462	127438.936	127305.462	3993.960***
Low SES White				
No covariates	34539.466	34597.349	34568.750	–
Level 1	30313.070	30447.337	30380.608	3307.315***
Level 1 and level 2	29222.218	29489.351	29355.893	1141.643***

Note. AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; LRT = Likelihood ratio test; ***$p <$ 0.001

Table 4

Standardized Coefficients of Multilevel Analyses Predicting Psychosocial Experiences

High SES Latinx (*n* = 12,459)	Safety and equity	School support	Parental participation
Student level			
Gender identity	-0.03 (0.01)**	-0.02 (0.01)*	-0.03 (0.01)**
Sexual minorities	-0.09 (0.01)***	-0.06 (0.01)***	-0.07 (0.01)***
Grade level	-0.05 (0.02)**	0.05 (0.02)**	-0.12 (0.02)***
School level			
% of FRPM	-0.57 (0.10)***	-0.17 (0.11)	-0.14 (0.12)
Student racial/ethnic diversity	-0.08 (0.08)	0.22 (0.11)	0.09 (0.11)
Teacher racial/ethnic diversity	0.04 (0.09)	-0.23 (0.09)*	0.08 (0.11)
Elementary school	-0.05 (0.10)	0.50 (0.12)***	0.22 (0.13)
Middle school	-0.30 (0.09)**	0.51 (0.14)***	-0.08 (0.14)
School size	-0.29 (0.08)***	-0.11 (0.09)	-0.26 (0.10)*
R^2	0.35***	0.60***	0.16*
Low SES Latinx (*n* = 28,778)	Safety and equity	School support	Parental participation
Student level			
Gender identity	-0.01 (0.01)	-0.01 (0.01)	0.04 (0.01)***
Sexual minorities	-0.07 (0.01)***	-0.04 (0.01)***	-0.16 (0.01)***
Grade level	-0.08 (0.02)***	0.01 (0.01)	-0.05 (0.01)***
School level			
% of FRPM	-0.55 (0.10)***	-0.20 (0.13)	-0.30 (0.12)*
Student racial/ethnic diversity	-0.20 (0.08)*	-0.09 (0.09)	-0.11 (0.10)
Teacher racial/ethnic diversity	0.16 (0.07)*	0.06 (0.08)	0.20 (0.02)*
Elementary school	-0.07 (0.09)	0.54 (0.09)***	0.12 (0.10)
Middle school	-0.26 (0.10)**	0.39 (0.10)***	-0.10 (0.11)
School size	-0.32 (0.08)***	-0.25 (0.08)**	-0.31 (0.09)**
R^2	0.26	0.44	0.18
High SES White (*n* = 19,545)	Safety and equity	School support	Parental participation
Student level			
Gender identity	-0.03 (0.01)**	-0.02 (0.01)*	0.03 (0.01)*
Sexual minorities	-0.09 (0.01)***	-0.08 (0.01)***	-0.05 (0.01)***
Grade level	-0.08 (0.03)**	0.03 (0.02)*	-0.15 (0.02)***
School level			
% of FRPM	-0.47 (0.08)***	-0.13 (0.11)	-0.22 (0.10)*
Student racial/ethnic diversity	-0.04 (0.10)	0.09 (0.13)	0.07 (0.11)

Teacher racial/ethnic diversity	0.09 (0.10)	0.14 (0.11)	0.12 (0.10)
Elementary school	-0.01 (0.11)	0.25 (0.13)	0.17 (0.12)
Middle school	-0.22 (0.10)*	0.47 (0.13)***	-0.06 (0.12)
School size	-0.30 (0.10)**	-0.20 (0.11)	-0.27 (0.11)*
R^2	0.25***	0.34**	0.15*
Low SES White (*n* = 4,274)	Safety and equity	School support	Parental participation
Student level			
Gender identity	-0.04 (0.02)*	-0.03 (0.02)	-0.03 (0.02)
Sexual minorities	-0.07 (0.02)***	-0.07 (0.02)***	-0.04 (0.02)*
Grade level	-0.07 (0.03)*	0.01 (0.02)	-0.16 (0.03)***
School level			
% of FRPM	-0.55 (0.11)***	-0.29 (0.13)*	-0.39 (0.15)**
Student racial/ethnic diversity	-0.20 (0.12)	-0.02 (0.15)	-0.05 (0.15)
Teacher racial/ethnic diversity	0.19 (0.07)*	0.25 (0.14)	0.37 (0.12)**
Elementary school	-0.01 (0.13)	0.51 (0.15)***	0.26 (0.15)
Middle school	-0.09 (0.14)	0.64 (0.16)***	0.12 (0.19)
School size	-0.26 (0.11)*	-0.29 (0.16)	-0.26 (0.11)**
R^2	0.20**	0.46**	0.25*

Note. *p <.05. **p <.01. ***p <.001.

Study 3: Diversity Conceptualizations and Measures in Educational Contexts

Abstract

There is mounting research on the impact of diversity on students' peer interactions and school experiences. This article draw attention to a more elementary but vital issue: how diversity is conceptualized and how to measure it. Diversity can be theorized into at least three primary types: normic, dual-concept, and representative. This article 1) discusses these three diversity concepts and existing indexes to measure them, 2) critiques existing diversity measures and their application in applied research, and 3) proposes new indexes and elucidates their application using California public school data. This article proposes two new indexes to capture dual-concept diversity and representative diversity, considering the limitations of existing measures for dual-concept diversity and the lack of measurement for representative diversity. The k-person index is proposed to capture dual-concept diversity based on the probability of picking k different persons from a context with k groups. This index highlights the contribution of small groups to the overall diversity and complements Simpson's D index and its probabilistic variants. The Representative Diversity index is developed to capture how closely a target population resembles a reference population. This new index can potentially broaden the research scope in diversity research. The theoretical underpinnings for these indexes are outlined, along with their implications for future research.

Keywords: diversity conceptualization, race/ethnicity, ethnic composition, measures, dual-concept diversity

Diversity Conceptualizations and Measures in Educational Contexts

Research of diversity in educational and psychological research has surged (Fisher et al., 2015; Juvonen et al., 2018), but discussion of diversity conceptualizations and their operationalizations in mathematical expressions measures has been limited. Diversity is a measure of variation for a qualitative variable, describing how disperse the population is over nominal groups (Agresti & Agresti, 1978). There are at least three approaches to conceptualize diversity: normic, dual-concept, and representative (Steel et al., 2018). Normic diversity conceptualizes diversity in relation to an assumed "norm," chosen often to reflect the numerical majority. Representative diversity examines a context's resemblance to a reference population: the higher the similarity, the higher the diversity. This approach has rarely been used in school diversity research, potentially due to the absence of measures. Dual-concept diversity examines a context's variety and concentration to determine its diversity (Junge, 1994) and this definition has been widely employed in educational and psychological research (Budescu & Budescu, 2012; Rjosk et al., 2017). An ideal diversity condition based on dual-concept diversity is high varieties and even distribution (Steel et al., 2018). An understanding of which diversity conceptualization researchers use in their study is essential to the choice of measures and theoretical rationales for diversity impact.

Studying how diversity relates to other constructs often warrant mathematical expression of diversity (Budescu & Budescu, 2012). Diversity has been currently captured by different measures, such as the simplistic majority–minority approach, the Simpson's D index (also referred as Gini-Simpson's D and Blau's index), and other probability-based measures (Budescu & Budescu, 2012; McDonald & Dimmick, 2003; Rjosk et al., 2017). However, there has been unclear which diversity concepts each of these measures intend to

capture in the current literature, potentially obscuring inferences made from empirical studies. Moreover, there is scant study on whether alternative tools may be more effective tools to capture them. To advance diversity research, this study scrutinizes existing measures for the three diversity concepts and proposes new indexes to capture these distinctive diversity concepts.

Limitations of Existing Diversity Measures

Operationalization of Dual-Concept Diversity in Existing Mathematical Formulas

Most diversity measures are developed to measure one specific type of diversity—dual-concept diversity and share a similar mathematical basis, resulting in the same conceptual loopholes in their mathematical expression of dual-concept diversity. Given that the Simpson's D index is one of the most widely applied measures in educational and psychological research (Graham, 2018; Rjosk et al., 2017), the discussion here focuses on the Simpson's D index to elucidate the common conceptual loopholes in most of existing diversity measures. Table 1 shows other commonly used diversity measures and explains the inadequacy in each of them operationalizing dual-concept diversity.

The Simpson's D index (Eq 1) The index value can be interpreted as the probability that two persons picked at random from a population come from different categories (Simpson, 1949). The higher the index value is, the more diverse the context is. Thus, it has been prevalently treated as a continuous variable to assess its relations with other constructs in regression analysis (e.g., Espinoza et al., 2019; Lanza et al., 2018). Moreover, some used the Simpson's D index as a categorical variable, with cutoffs to categorize high or low diversity of student ethnic compositions (e.g., Juvonen et al., 2006; Mehari & Farrell, 2015).

Simpson's D is calculated as,

$$D = 1 - \sum_{i=1}^{k} p_i^2 \quad (1)$$

where p_i is the proportion of each racial/ethnic group within the context, k is the number of groups within a context/population. Its equation is formulated based on the two-person probability basis, meaning regardless the number of categories in the context, the index value represents the probability of picking two persons belonging to different groups from the context.

The two-person probability basis makes the Simpson's D index fail to differentiate the dual-concept diversity in all ranges, particularly in schools with a moderate range of diversity. This lack of differentiation results from the index's insensitivity to the presence of small groups due to its probability origin; that is, the likelihood of picking two persons from different groups is high whenever there are two or more numerically large groups. For example, suppose Context A has two groups, each with a concentration of 0.50. The Simpson's D index is 0.50 for Context A. Consider another population consisting of three groups, with 0.495, 0.495, and 0.010 proportion of each group, respectively. The Simpson's D index is 0.51 for Context B. In this example, the presence of a small group in Context B has nearly no effect on the likelihood of selecting one person from each of the large groups (i.e., the two groups with 0.495 concentration). For some disciplines and contexts, the contribution of small groups to the overall diversity can be minimal, in these cases the Simpson's D index may be suitable. However, in education context, the core problem lies in the fact that a two-person probabilistic approach to capture diversity gives very little distinction to contexts with vastly different small group profiles.

Unlike other disciplines, such as ecology where the Simpson's D index was originally developed, capturing the presence of small groups in an overall diversity value is important in social science. Much diversity research examines the influences of diversity on human behaviors in social science research, which means researchers attempt to capture a diversity index value that reflects individuals' perception of diversity. An experimental study conducted by Abascal et al. (2021) indicated that individuals regardless of their racial/ethnic backgrounds perceived a context as less diverse when it contained more small groups in a context with three groups. Although the study did not entirely uncover the weight of even distribution and variety contributing to diversity perception, this finding reveals how crucial diversity measures should attend to small groups. Nonetheless, two-person probability indexes, such as Simpson's D index, fail to capture this characteristic.

The application of the two-person probability indexes fails to discriminate some schools with different diversity contexts. Schools can have the same Simpson's D index values despite their vastly different racial/ethnic compositions. Figure 1 shows two schools with the same Simpson's D index values despite its completely different distributions. Along with the current practices in applying the Simpson's D index, for instance researchers sometimes pick a cut-off point (e.g., 0.5) to categorize high or low school diversity, it raises questions of whether all schools above the cutoff are more diverse than those below it because schools can have above 0.50/ 0.60 index value or higher despite considerably uneven distribution across ethnic groups. As a result, researchers may be at risk of aggregating qualitatively different school environments and fail to distinguish the different impact of diversity in various levels.

Another concern is the over-representation of numerical majority groups in the Simpson's D index, automatically assuming the presence of small groups to overall diversity as negligible. The numerically large groups mainly determine Simpson's D formula index values; that is, small groups have significantly smaller influences on the index value. The D index value of 0.50 is used as a cutoff-point for categorizing high and low diversity, leading to many schools could be considered diverse despite the overrepresentation of White and Latinx groups. Furthermore. when empirical research assesses how the Simpson's D index values relates to school-level outcomes aggregated from student-level responses, small groups 'responses may be unintentionally minimized because their contribution to the diversity values and school-level outcomes are underweighted compared with numerically majority groups within the same context.

Lack of Clarity in Diversity Concepts and Measures

Diversity measures and concepts are often muddled without much attention to what concept the measure operationalizes. Researchers have used an array of measures to capture diversity, such as the percentage of same-racial/ethnic groups, the percentage of minority group (i.e., the higher proportion indicates the more diverse context), and the probability-based index (e.g., the Simpson's D index). However, despite there are different conceptualizations of diversity, rarely have current research in education and psychology discussed clearly in terms of what definition it intends to capture. A clear definition of diversity in research is crucial because it directly impacts the theoretical assumptions of diversity's relations with other variables built upon the conceptualization and whether the choice of measure captures the definition (Steel et al., 2018). For instance, in the systematic review of school racial/ethnic diversity on bullying and victimization, the 20 studies included

used different measures to assess diversity including the proportion of a minority group and diversity indexes intending to capture dual-concept diversity (e.g., the Simpson's D index; Basilici et al., 2022). The use of minority proportion only points to the claim of "a greater minority share is associated with a higher/lower level of victimization," which is fundamentally different from the claim of "greater diversity is associated with a higher/lower level of victimization." The lack of clarity in the linkage between diversity measures and definitions make it hard to interpret findings in the literature, so as to inform policy. Hence, this study deliberates the three major diversity conceptualizations as well as their respective measures below.

Normic Diversity

Normic diversity defines a context's diversity by the extent it diverges from a predefined "norm" (Steel et al., 2018). This "norm" can be a category occupying the numerical majority or determined by other characteristics, such as the group holding the most social capital. The further a context deviates from this norm, the more diverse it is. Existing measures, such as simplistic majority–minority approach calculating the proportion of non-norm, reflect normic diversity concept. Using the percentage of ethnic minority groups in a context as a measure, for instance, is invoking the normic approach, which has been widely applied (e.g., Bernell et al., 2009; Wölfer et al., 2016; Vitoroulis et al., 2016).

Theoretically, normic diversity is often alluded to when explaining school outcomes and student interactions (e.g., Baysu et al., 2016; Wölfer et al., 2016; Vitoroulis et al., 2016). Normic diversity has been hypothesized to have positive effects on group performance and justice as marginalized group members are more sensitive to unjust social structures than their numerically dominant counterparts (Crasnow, 2008; Rolin, 2016). In practice,

determining the "norm" is open to researchers' judgment. This can be a debatable decision. Taking the California student population as an example, Hispanic students occupy the largest percentage, so researchers may consider it the norm based on their numerical representation. However, the norm can be different if researchers base their decisions on non-distributional groups, such as privilege or social capital. The choice of a norm impacts findings. This may not be so problematic if the norm is clearly defined and there is a consensus among researchers. Nevertheless, the normic approach homogenizes groups that do not belong to the norm and may not be the best approach for contexts with an array of groups (e.g., in majority-minority approaches, ethnic minorities are often grouped together; Budescu & Budescu, 2012; Nishina et al., 2019). Thus, normic diversity likely suits contexts with small varieties of non-norm groups.

Representative Diversity

Representative diversity considers a context as diverse when its distribution is similar to a reference population (Steel et al., 2018). "Reference" usually refers to the broader background within which the context in consideration is embedded. When considering an educational context for example, a possible reference could be the county or the state it is located at. Then by definition, the school's representative diversity is determined by its student population's resemblance to the reference population. Generally, the reference can be determined by researchers on grounds of theories and hypotheses. An index for assessing representative diversity is lacking in the literature. Thus, a measure for representative diversity index is introduced in the following.

Representative Diversity Index

Given a target and reference distribution p_i and p_i^{ref} respectively (p_i= proportion of each group of a target population; p_i^{ref} = proportion of each group in a reference population), a straightforward way to capture representative diversity would be to consider their group differences $p_i - p_i^{ref}$, then sum over their absolute values in the manner shown by Equation 2. The reason for the factor of 2 is explained in the following. If the target distribution is identical to the reference distribution, i.e., $p_i = p_i^{ref}$ for all groups i, Representative Diversity index would be 1 from Formula 2. In the other extreme where there is no overlap between the reference and context distribution, i.e., p_i is zero whenever p_i^{ref} is not and vice versa, then Representative Diversity index would be zero.

$$\text{Representative Diversity Index} = 1 - \sum \frac{\left|p_i - p_i^{ref}\right|}{2}. \quad (2)$$

Consider a number of N people, if they are distributed according to the context population p_i, there will be Np_i people in group i. Now if a person is moved from one group j to another group h, the number of people in group j will decrease by 1 while that in group h will increase by 1. The minimum number of people needed to move such that the distribution becomes p_i^{ref} is $\sum N\left|p_i - p_i^{ref}\right|/2$. Correspondingly, $N - \sum N\left|p_i - p_i^{ref}\right|/2$ is the number of people that have not been moved. The proportion of people that have not been moved is then given by the Representative Diversity index in Equation 2. As an illustration, consider 10 people, distributed into two groups A and B. If the context distribution is 0.4 and 0.6 for A and B respectively, there will be 4 and 6 people in the respective groups if the 10 people are context distributed. Now suppose the reference distribution is 0.1 and 0.9 for A and B respectively, a minimum of 3 people would need to move from A to B such that the 10 people are now reference distributed. The proportion of people that are not moved is 0.7, in agreement with Formula 2. The same logic applies to scenarios with 3 or more groups. In

short, representative diversity have been conceptualized in terms of the proportion of people required to move to change a hypothetical population from being context- to reference-distributed. The interpretation of the Representative Diversity index is simple. The index value reflects the percentage of distribution in target population resembles the reference population. It ranges from 0 to 1, with higher values indicating higher diversity.

Dual-Concept Diversity

In educational and psychological research, the dual-concept definition of diversity has received the most attention and has been widely employed (Graham, 2016; Rjosk et al., 2017). Dual-concept diversity comprises two dimensions–variety and concentration (Junge, 1994). Variety refers to the number of categories, such as program types and racial/ethnic groups. Concentration describes the allocations of the elements to the categories (i.e., each category's proportion). According to dual-concept diversity, a population is considered diverse when 1) it has a wide range of varieties (i.e., a large number of categories) and 2) it is evenly distributed among the varieties (Teachman 1980). This conceptualization has been particularly relevant to diversity research in education due to its alignment with theories (e.g., contact theory) in explaining interpersonal dynamics and individual experiences (Pettigrew et al., 2011). For example, contact theory states that high diversity provides a fundamental condition for positive intergroup contacts and abundant opportunities for people to get to know each other (Pettigrew et al., 2011). However, high variety is not sufficient for positive intergroup contacts if without a power balance condition (Pettigrew et al., 2011). That means only when there is equal power and representation across groups will diversity encourage positive intergroup contacts. Consistently, a school environment with a wide variety and relatively even distribution is considered the hallmark of diversity (Graham, 2018).

As aforementioned, the Simpson's D index and its variants intend to operationalize the dual-concept diversity (Simpson, 1949), whereas their mathematical basis has an inherent loophole in operationalizing the facet of even distribution in dual-concept diversity. Thus, I propose two alternative mathematical expressions with different approaches to capture dual-concept diversity.

Using Representative Diversity Index for Dual-Concept Diversity

Dual-concept and representative diversity are conceptually different in their definition of and explanation for the influences of diversity. Nevertheless, dual-concept and representative diversity can coincide when the reference population in representative diversity comprises multiple evenly distributed groups (Steel et al., 2018). A novel way to capture dual-concept diversity through the Representative Diversity index formula is by using the hallmark of dual-concept diversity as the reference distribution. For instance, for California public schools' student ethnic composition used, there are a total of five ethnic groups (Hispanic, White, African American, Asian and Others), so $p_i^{ref} = 0.2$ for all groups. The higher the value of Representative Diversity index is, the more similar the context is to the ideal condition of dual-concept diversity. This Representative Diversity index (dual-concept) index can be another alternative to measure dual-concept diversity. The formula of Representative Diversity index would not have the characteristic of the Simpson's D index's insensitivity to small groups because each group regardless of its size would contribute equally to the Representative Diversity index value unlike the Simpson's D index's formula in which groups' weight to index value depends on group size.

k-person Index for Dual-Concept Diversity

Another way to compensate for the two-person probability's deficiency in measuring evenness of distribution, a natural remedy is to consider a k-person probability, meaning the probability of randomly picking k different people from a context with k groups (e.g., in a context comprising of 3 groups, it would be the probability of picking 3 people from distinct groups). k represents the groups of race/ethnicity within context. From a diversity point of view, it makes sense the more likely to find all groups of people, the more diverse it is. This is different from the two-person probability in the sense that a context will not be deemed diverse if not all groups are well represented. For that matter, any r-persons probability with r < k will suffer similar issues as the two-person probability. For example, a 3-person probability will be insensitive to small groups when there are three or more large groups. The k-persons probability is special in that it leaves no group unaccounted for. In other words, all groups should contribute equally to a context's diversity regardless of its size.

There is no literature discussing the k-person approach to diversity, but this interpretation has several merits. First, it is sensitive to the presence of small groups. For instance, the k-person approach is much more likely to select two people from distinct groups in a context consisting only of two evenly distributed groups than three in one consisting of two large groups and one small group. Second, it is sensitive to the number of small groups. It is more likely to select four people from distinct groups in a context consisting of three large groups and one small than one consisting of two large and two small groups. Third, it is sensitive to the magnitude of a group's subdominance. It certainly matters to the probability whether the smallest group is one–tenth or one–hundredth of the whole population. While the Simpson's D index to some extent represents the number of large groups and their degree of dominance, the k-persons probability reflects the number and magnitude of the small groups.

Despite their apparent inverse relation, it is not possible to extract the k-persons probability from the two-person probability and vice versa. The k-persons probability therefore represents a distinct way to conceptualize diversity, placing particular emphasis on the details of the small groups and the balance of representation across groups as depicted by contact theory.

A new index (Eq 3) is proposed based on the k-person probability. This new index is not synonymous with the k-person probability and uses it as a core with modifying factors. The index consists of two parts: the product of the proportion of groups ($\prod p_i$) and the prefactor (k^{k+2}). The product of concentrations represents the probability that k selections will all be different in a context with k groups and the k+2 exponent represents the weight added to the number of groups. The k probabilities part represents the probability of randomly picking k different people from a context with k groups. Alone, it suffers the problem that a context consisting of two evenly distributed groups will have a value ($0.5^2 = 0.25$) higher than one consisting of three evenly distributed groups ($0.33^3 = 0.036$). To rectify this discrepancy, a second part is included, denoted by the prefactor. This ensures contexts consisting of more evenly distributed groups will have a higher value (for example, compare $2^4 * 0.5^2 = 4$ for a 2-group context and $3^5 * 0.33^3 = 8.73 > 4$ for a 3-group context) and take in the contribution of a higher number of groups to index values. This new index, which is termed k-person Index calculated as,

$$k-\text{person Index} = k^{k+2}\prod p_i \quad (3)$$

The following further demonstrates how the product of the two parts (i.e., $k^{k+2}\prod p_i$) reveals the merits of the k-person probability. First, consider a context comprising two evenly distributed groups with a concentration of 0.5 for each group and one comprising two

evenly distributed groups and one small with concentrations 0.495, 0.495 and 0.01. The values of the k-person index $k^{k+2}\prod p_i = 4$ for two contexts with two equal groups and 0.60 for the context with two equal groups and one small group. This difference between the two demonstrates the sensitivity to detect the small group, even a very small one. As a reference, the Simpson's D indexes for these two contexts would be 0.5 and 0.51, respectively. Second, consider a context composed of 4 groups, with concentrations 0.33, 0.33, 0.33, 0.01 and another with concentrations 0.49, 0.49, 0.01, 0.01. The former returns a k-person index value of 1.47 while the latter returns a value of 0.098, demonstrating an exponential decrease in the value when there are more small groups (the Simpson's D index's values are 0.67 and 0.52). Third, consider a context of 3 groups, with concentrations 0.45, 0.45, 0.10 and another with concentrations 0.495, 0.495, 0.01. The former returns 4.92 while the latter returns 0.60, seeing again an exponential decrease when the concentration of the small group is decreased by ten (the Simpson's D indexes are 0.59 and 0.51). These examples illustrate that a k-person's probability-based index is sensitive to both the number of small groups and their magnitude of their subdominance. Moreover, it can more effectively discriminate contexts with different distributions of small groups than the Simpson's D index. It serves as a great complement, if not substitute, for the Simpson's D index in scenarios where the details of the small groups matter to overall diversity. Since the values can vary exponentially, it is convenient to deal with its logarithm, as expressed in Equation 4,

$$\log(k^{k+2}\prod p_i) \tag{4}$$

This mathematical expression of the k-person index is parallel to the dual-concept diversity, unlike either the Simpson's D index or other existing probability based dual-concept index which suffers in part the same shortcoming described because they have the

same probabilistic origin. While the variants of the Simpson's D index have tried to overcome these shortcomings, most of these variants employ ad-hoc numerical transformations, so their improved sensitivities are hard to interpret. The proposed k-person index, despite still employing in part some ad-hoc adjustments, has a direct probabilistic interpretation to the dual-concept definition of even distribution.

Examples and Illustrations

The following case examples illustrate and explain the newly proposed measures of dual-concept and representative diversity[2] compared with the Simpson's D index using data from California public schools. Statistical analysis was conducted using RStudio and Python. The analysis focused on an overview of the descriptive statistics, their correlations, and dual-concept indexes' sensitivity to small groups for each diversity measure.

Data Used

Relevant school-level data were drawn from the California Department of Education (CDE) public dataset in the academic year of 2018-2019. The original dataset included 10,521 public schools. Schools with less than 100 student enrollments were excluded, resulting in 8,963 schools. The racial/ethnic groups included in the analysis were Hispanic, Asian (Asian and Filipino), African American, White, and Others (two or more races, American Indian or Alaska Native, Pacific Islander)[3].

Applying Simpson's D, k-person, and R Indexes in California Public Schools

Figure 2 displays diversity of racial/ethnic composition in schools using different

[2] The *normic* concept was not illustrated with examples because the concept and its measures are straightforward and has been less frequently used and recommended by school diversity researchers (see Nishina et al., 2019 for details).

[3] The racial/ethnic terms used followed the California Department of Education's DataQuest.

indexes. As expected, the graphs show different shapes of schools' diversity values because of the different indexes and diversity concepts employed. For the purpose of demonstrating the representative diversity concept, the state-level public school student racial/ethnic distribution was employed as reference distribution (i.e., 55% Hispanic, 12% Asian [Asian and Filipino], 5% African American, 23% White, 5% Others [two or more races, American Indian or American Indian or Alaska Native, Pacific Islander]). Table 2 lists descriptive statistics of each index.

Comparing Simpson's D, k-person, and R (dual-concept) Indexes

Correlations

Table 3 displays correlations of the three indexes in different ranges. The Representative Diversity (dual-concept) and k-person indexes showed high overall correlation with the Simpson's D index (Kendall rank-order = .87; Pearson = .97). However, when their correlation in different ranges of diversity was assessed, the agreement of schools' diversity ranking of the Simpson's D index with Representative Diversity index (dual-concept) and k-person Index were considerably different. Their agreement in ranking schools in the range between the Simpson's D index of 0.4 and 0.6 was the lowest. For schools below the 25th percentile of the Simpson's D index, the Representative Diversity (dual-concept) index showed nearly the same ranking order as the Simpson's D index; the Kendall rank-order correlation between k-person and the Simpson's D indexes was .42 only, meaning that 71% of the distinct pairs of schools were ordered similarly by the two measures. For schools above the 75th percentile of the Simpson's D index, the correlation between the Representative Diversity index (dual-concept) and the Simpson's D index was lower (Kendall rank-order = .70; Pearson = 0.90) and the correlation between the k-person and the Simpson's D indexes was moderate (Kendall rank-order = .56; Pearson = .74). These correlation patterns aligned with the theoretical grounds of the three indexes' formulas. The k-person and Representative Diversity (dual-concept) indexes show the lowest agreement with the Simpson's D index in the moderate range of the Simpson's D index values due to differences in their mathematical basis of factoring in the proportion of each racial/ethnic groups. The differences in each index's weighing the two dimensions of dual-concept diversity manifest in their correlations.

Sensitivity to Small Groups

Figure 3 show the Simpson's D, k-person, and Representative Diversity (dual-concept) indexes' sensitivity to small groups (i.e., with concentration less than 5%). The California public schools' racial/ethnic composition was used to calculate the average change in index value[4]. Specifically, every school in the actual dataset was paired with a simulated school consisting of the same racial/ethnic composition plus an extra 1% or 5% group and then calculated the difference of index value of each pair of schools. This difference of index values depicted the extend of influences of a small group to the index value, comparing index's sensitivity to small groups across the three indexes. As shown in the Figure 3, the k-person index value dropped noticeably when a 1% small group was added, whereas the Simpson's D and Representative Diversity (dual-concept) index values changed by less than a 5%. When a 5% small group was added, the k-person index again dropped while the Simpson's D and Representative Diversity (dual-concept) index values increased by roughly 5-10%. Conceptually, the magnitude of the decrease in k-person index value with the presence of small groups decreases with increasing number of groups within a context. The different sensitivities of the indexes to small groups reflect the various ways these indexes weigh variety and evenness for dual-concept diversity. In particular, the k-person index weighs heavily towards the evenness of concentrations as shown in Figures 3a and 3b.

Although Figure 3 seems to suggest Simpson's D and Representative Diversity (dual-concept) indexes are similarly sensitive to small groups, the ways their values change are different. For the Simpson's D index, the quadratic sum of concentrations means a group's

[4] In this analysis, schools with a group of concentration greater than 0.7 were excluded. These schools are dominated by one ethnicity and their Simpson's *D* index are extremely low. Adding them would defeat the purpose in showing the *D* index's insensitivity to small groups when there are already two or more large groups.

influence on index value will depend on its original composition. That means the Simpson's D value is mostly contributed by large groups. The Representative Diversity index, in contrast, involves only linear sums of concentrations. Thus, Representative Diversity index is as sensitive to large groups as it is to small groups. This mathematical difference explains the lower correlation between these two indexes in a moderate range in which schools commonly have large and small groups coexisting.

Research Implications

This article discussed three types of diversity concepts——normic, representative, and dual-concept——and introduced two indexes for measuring dual-concept and representative diversity. A California public school dataset was employed to demonstrate the properties of the newly proposed indexes in comparison with the Simpson's D index. Research implications of the three diversity concepts and the proposed diversity measures are of significance to diversity research in educational and psychological fields.

Clarification of Diversity Measures and Concepts

This article clarifies some subtle but fundamental conceptual differences of some widely-employed diversity measures. When a diversity measure does not capture the intended diversity definition, problematic interpretation may result (Steel et al., 2018). As an example, Vitoroulis et al. (2016) using the majority-minority approach and Tolsma et al. (2013) using the Herfindahl index (similar to Simpson's D index), both studied how ethnic diversity relates to bullying/victimization. Tolsma et al. (2013) observed a positive relation between bullying prevalence and racial/ethnic diversity, whereas Vitoroulis et al. (2016) observed non-significant relation. The impact of racial/ethnic diversity on bullying would seem inconclusive. However, these two studies operationalized diversity differently, making

it insensible to compare their findings. The majority-minority approach captured normic diversity but did not tap variety and balance of representation as in the Herfindahl index. Moreover, if research questions are built on contact theory to rationalize the impact of ethnic diversity on bullying victimization, the majority-minority approach would not adequately answer such questions because it does not factor in variety into its metrics. Hence, a clear understanding of the linkages between measures and diversity concepts is of crucial importance in advancing school diversity research.

Alternative Measures for Dual-Concept Diversity

Two alternative measures were proposed to capture dual-concept diversity. In contrast to the two-person probability index, the k-person index demonstrates better sensitivity to schools with different numbers of small groups and uneven distributions. The k-person index weighs the dimension of evenness in distribution significantly more than the Simpson's D index and is more discriminative of contexts with small groups as shown in its sensitivity to an additional small group. As shown in the study of Abascal et al. (2021), the presence of a small group significantly lowered individuals' rating of a context's diversity level. This suggests that the k-person index may more closely represent individual perception of diversity in certain aspects compared with the two-person probability indexes. Future research is needed to investigate perceived diversity in order to modify diversity measures.

Regarding the Representative Diversity index, it can also be used to capture dual-concept diversity by choosing the reference to be an evenly distributed population comprising of all races/ethnicities registered by the study (i.e., the ideal dual-concept scenario). Two-person probability-based indices and entropy-based indices as shown in Table 1 have relatively high sensitivity when the contexts are highly diverse. Their

sensitivities decrease when the distribution is skewed, often giving similar index values for apparently distinct distributions. In educational contexts of diversity, distributions are often skewed, and the problem with using a two-person probability-based or entropy-based index becomes concerning. The same also applies for the Hall and Tideman's TH index. The R-index, by its linear construction, has sensitivity that is relatively independent of the index values. It is very similar to Fager's NM index but has a definite range (0 to 1 for R-index) and greater applicability. Fager's NM index measures only the deviation from an even distribution whereas the R-index can be used to measure deviation from any reference distribution. Moreover, compared with the Simpson's D index in measuring dual-concept diversity, the Representative Diversity (dual-concept) index is even better in revealing the actual ethnic distribution of schools because the index value explicitly reveals the similarity of a school's ethnic distribution to an ideal dual-concept condition. For example, a Representative Diversity (dual-concept) index of 0.55 indicates 45% of the persons have to be moved to fit the ideal dual-concept ethnic distribution; an index value of 0.65 means only 35% of the persons to be moved. The difference between the Representative Diversity index of 0.55 and 0.65 means the first condition has to move 10% more persons to match the ideal condition. Based on the applied examples above and the theoretical basis for the two newly proposed indexes, they demonstrate strong conceptual foundations to complement the inadequacy of the Simpson's D index or other diversity measures in psychological and educational research.

Despite the respective merits of k-person and Representative Diversity indexes, they also have shortcomings when it comes to measuring dual-concept diversity. Regarding the k-person index, first, the values produced by the k-person formula are not directly interpretable

without comparing it with other schools. Second, due to its sensitivity to evenness of distribution, grouping methods would affect the k-person index values. For instance, if the "Others" group is disaggregated into the subgroups it originally comprises of (American Indian and Alaska Native, Pacific Islander, and Two or More Races), many schools will have very low k-person index values because these racial/ethnic groups had a very low proportion at the state level; separating them would result in the presence of multiple small groups in all public schools in California. Thus, researchers are recommended to combine racial/ethnic groups with very low proportions in a broader context (e.g., at state-level) when using the k-person index.

For the Representative Diversity index, its merit is its ease of interpretation, equal discriminatory power in all diversity ranges, and consistency with the theoretical foundation of dual-concept. However, a major limitation of the Representative Diversity index is that it needs a predefined reference. When used in a dual-concept sense, the reference is usually an evenly distributed population, which is easily determined if researchers know the "maximum" number of groups, which is relatively simple when defining broad racial/ethnic groups. This predefined ideal diversity distribution may not be possible in other disciplines where the number of categories is huge and unknown, like in biodiversity. In educational contexts, the number of groups tends to be predictable and can be referenced from the broader context.

Based on the preliminary examination of these indexes, there is one major difference in the diversity operationalization between the Representative Diversity and k-person indexes, which is the weight given to a distribution's evenness. The k-person index emphasizes evenness and index values drop with more small groups. For example, the k-

person index for context A with four evenly distributed groups (25%, 25%, 25%, 25%; k-person index=1.20) is higher than context B with four even groups and one small group (e.g., 25%, 24%, 25%, 25%, and 1%; k-person index=0.467). The Representative Diversity (dual concept) index is less impacted by evenness. For example, context A is only one point lower than context B when using the Representative Diversity (dual concept) index. Each index's formula has its unique mathematic properties, affecting how variety and concentration within a context affect index value as explained previously. Thus, a clear definition of diversity and theoretical orientation of diversity's impact is important for researchers to aid in deciding which index to be used. Ultimately, the question "which index should be used" depends on applications. Further research is warranted to understand each proposed measure's application in school diversity research. **More Applications of the Representative Diversity Index**

The Representative Diversity index is fundamentally linked to representative diversity. This concept has not been widely studied in school diversity research. The Representative Diversity index's formula is easy to calculate and interpret, which is potentially useful for researchers in educational research to explore representative diversity. The Representative Diversity index can also answer a wide range of questions by simply changing the reference. For instance, the equation of Representative Diversity index can be used to capture the student-teacher ethnic match if the teacher and student ethnic distributions are used as reference and target. In this way, the higher the R index the higher the teacher-student ethnic congruence. This tool can enrich the current research quest in the student-teacher ethnic match by providing a more rigorous measure to take the heterogeneity of racial/ethnic groups among student and teacher populations into account. The

Representative Diversity formula is similar to the teacher racial/ethnic congruence index[5] developed by Fabelo et al (2011) when it is applied to measure teacher-student racial/ethnic match. However, the Representative Diversity is more intuitive to interpret with a range between 0 and 1, reflecting the percentage of teacher-student racial/ethnic match.

Future Research

Considering the inadequacy of existing diversity measures, new measures were proposed to capture distinctive diversity concepts, whereas research is still needed to clarify diversity concepts, especially dual-concept diversity. For example, it is unclear how much weight should be attributed to variety and evenness when determining the overall diversity. For instance, if context A composes four evenly distributed groups (i.e., 25% for each group) while context B has five groups (25%, 25%, 24%, 25%, 1%), which should be more diverse? Context A shows more evenness, but context B has more variety. The current definition of dual-concept diversity does not help in determining which context is more diverse. Clarification of these areas can advance the mathematical operationalization of diversity concepts and help researchers decide which index to use. Moreover, the diversity concepts discussed in this article are not exhaustive and the new indexes were proposed based on the theoretical definitions and diversity with considerations of educational contexts. Empirical studies using these indexes to assess diversity's association with other outcomes would enhance understanding of their functions.

Another consideration to contemplate is grouping. Theoretically, regardless of which diversity index to be used, researchers have to consider how to count the groups. To be an effective measure of dual-concept diversity, a certain degree of grouping has to take place,

[5] $[(\%FacultyBlack - \%StudentsBlack)^2 + (\%FacultyHispanic - \%StudentsHispanic)^2 + (\%FacultyAsian - \%StudentsAsian)^2 + (\%FacultyWhite - \%StudentsWhite)^2]$

which in itself is a standalone problem, and researchers can ask: what is considered a meaningful grouping? Mathematically, grouping is particularly relevant to the new indexes proposed. For example, researchers may count the various ethnic minorities as distinct categories (e.g., Taiwanese, Cambodian, and Indian). However, most of these groups usually constitute a tiny fraction of the school population in California. Disaggregating them would cause the reference distribution to be very spread out, and the Representative Diversity index of most schools to cluster tightly at low values. Such a distribution of the Representative Diversity index would be unrevealing, particularly when conducting regression analysis. The same grouping problem is also true for the k-person index, which warrants theoretical and mathematical contemplations.

Another fundamental question to be answered is how people perceive diversity. There has been scant research on diversity perception. Abascal et al. (2021) conducted a series of conjoint experiments to understand heterogeneity's and minority representation's contribution to diversity perception. The study revealed that participants rated a context with either higher minority representation or more racial/ethnic groups as more diverse. However, the experiments fixed the number of groups into three. Thus, many questions regarding perceived diversity have still not yet answered, including whether there is a threshold for variety in perceived diversity. In order to advance diversity index, more research is warranted to clarify diversity perception.

Conclusion

Three major diversity concepts and their respective measures with distinctive features and mathematical origins were elucidated in this article. The primary contribution of this article is opening a discussion regarding the existing operationalizations of diversity concepts

and introducing new diversity measures to capture dual-concept and representative diversity. The Representative Diversity index is straightforward in interpretation and usage, showing great potential to be a complementary diversity measure, if not superior, to existing diversity indexes in existing research. Meanwhile, the Representative Diversity index's formula also allows researchers to capture constructs, such as student-teacher racial match and individual experience of diversity consistency across contexts. The k-person index pays more weight to evenness of distribution among groups within a context and closely aligns with the dual-concept definition compared with the Simpson's D index. With these indexes developed in consideration of educational research, researchers can select a diversity measure that matches their theoretical grounds, diversity definitions, and research questions.

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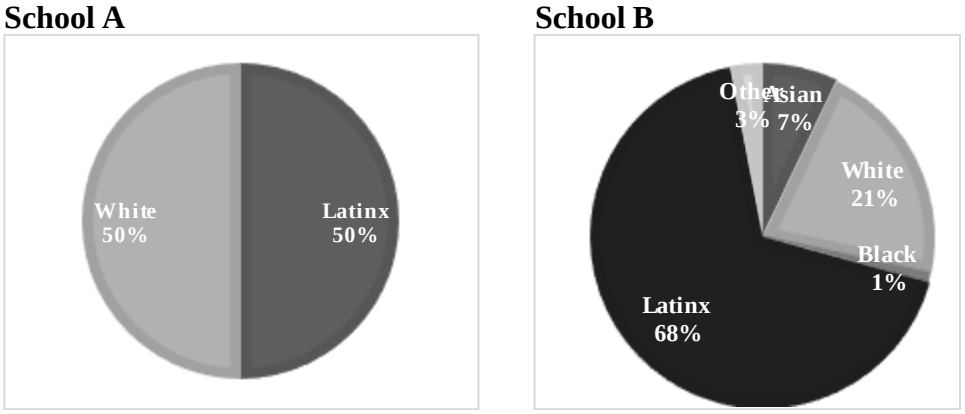
Figure 1

School Contexts with the Simpson's D Index = .50, but Different Distribution of Racial/Ethnic Groups.



Note. Others consist of American Indian or Alaska Native, Pacific Islanders, and Two or More Races. Asian includes Asian and Filipino.

Table 1

Existing Diversity Measures and Interpretations

Measure	Formula	Interpretation
Two-person probability-based indices		
Simpson's D	$D = 1 - \sum_i p_i^2$	A two-person probability that takes value between 0 to (1 – 1/k), k being the number of groups.
Standardized Simpson's D	$D' = D/\left(1 - \frac{1}{k}\right)$	Simpson's D index that is standardized to take values between 0 to 1. It takes away the effect of variety in the index value.
Les and Maher's Ω	$\Omega = \sum_{i \neq j} p_i p_j$	Identical to the Simpson's D index with the same interpretation, written in a different mathematical form.
Les and Maher's Ω_z	$\Omega' = \Omega/\left(1 - \frac{1}{k}\right)$	Same as the standardized Simpson's D index.
Junge's H	$H = \frac{1}{\sqrt{k}}\left(\sqrt{k-1} - \sqrt{k\sum_i p_i^2 - 1}\right)$	Any distribution $\{p_i\}$ is considered as a point in k dimensional space. The index represents a geometric distance of this point from a "homogeneous" point, denoted by a point in the same space where all $p_i = 1/k$ are the same. It is a mathematical transformation of Simpson's D index.

Kvalseth's OD	$OD = \left(\sum_i p_i^2\right)^{-1} - 1$	The odds that two randomly selected (with replacement) individuals from the sample will be of different groups. It is the Simpson's D index expressed in odds format.
Fager's S	$S = \left[\frac{k\sum_i p_i^2 - 1}{k(k-1)}\right]^{\frac{1}{2}}$	Diversity is conceptualized as standard deviation of the distribution $\{p_i\}$. The higher the diversity, the higher the index value. It is a mathematical transformation of Simpson's D index.
Entropy-based indices		
Shannon's H	$H = -\sum_i p_i \ln p_i$	It represents the number of ways N individuals can be arranged into k groups to result in the distribution $\{p_i\}$. The more ways there is, the more diverse the context is.
Brillouin's H	$HB = \frac{1}{N}\ln\frac{N!}{N_1!\,N_2!\,\ldots N_k!}$	A standardized version of the Shannon's H index.
Gleason's D	$GD = (k-1)/\ln N$	An index measuring the variety of the distribution but it does not consider group concentration.
Rank-based indices		
Hall and Tideman's TH	$TH = \frac{1}{2\sum_i r_i p_i - 1}$	A mathematically transformed version of the Gini coefficient. Typically used to measure income inequality but can be applied in measuring diversity. It measures in a cumulative distribution graph. In mathematical sense, the difference between the curve

		representing absolute equality and the cumulative distribution of the target distribution.
Fager's NM	$NM = \frac{N(k+1)}{2} - \sum_i r_i N_i$	The number of "moves" required to change the target distribution to an even distribution. A move is counted as moving a person in a certain group to a group with adjacent rank.

Note. p_i is the proportion in the *i*th category where categories = i through j, k is the number of categories in the distribution, N is the number of observations in the sample, n_i is the number of observations in the *i*th category, and r is the rank of the *i*th category (ranked with 1 as the largest category). The table is modified based on Mcdonald and Dimmick (2003).

Table 2

Summary Measures of the Distribution of Diversity Measures (n = 8,963)

Diversity measure	M	Mdn	SD	IQR	Range
Simpson's D	0.45	0.51	0.21	0.33	0.80
k-person	-0.77	-0.50	1.27	1.70	8.20
Representative	0.68	0.68	0.14	0.18	0.89
Representative (dual-concept)	0.48	0.49	0.15	0.19	0.74

Note. IQR= interquartile range; For *Representative* index, the state-level public school student racial/ethnic distribution (i.e., 55% Hispanic, 12% Asian [Asian and Filipino], 5% African American, 23% White, 5% Others [two or more races, American Indian or American Indian or Alaska Native, Pacific Islander]) was used as reference distribution. *For Representative (dual-concept) index* distribution, an even distribution of the five ethnic groups was adopted as reference distribution.

Table 3

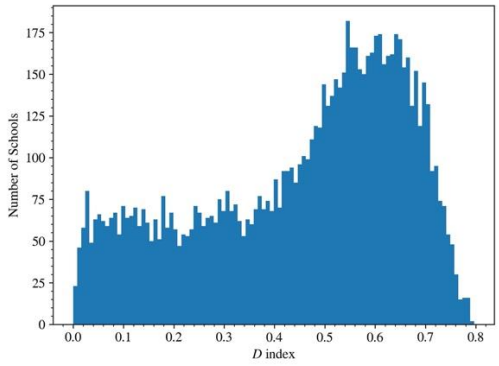
Correlations of the Simpson's D with k-person and Representative Diversity Indices

	Simpson's D	
Overall	Kendall rank-order	Pearson
k-person	.72	.87
Representative Diversity (dual-concept)	.89	.97
Simpson's D <=25th percentile		
k-person	.42	.54
Representative Diversity (dual-concept)	.99	.99
Simpson's D >= 75th percentile		
k-person	.56	.74
Representative Diversity (dual-concept)	.70	.90
Simpson's D Between 0.4 and 0.6		
k-person	.27	.37
Representative Diversity (dual-concept)	.51	.67

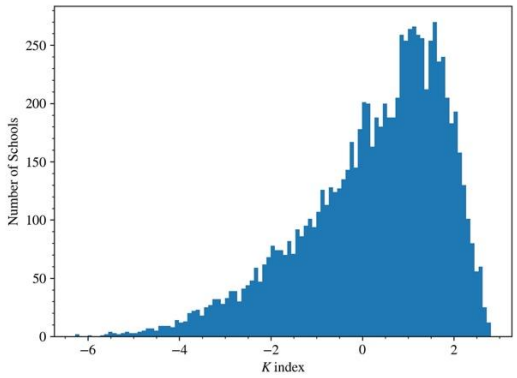
Figure 2

Diversity Distribution of California Public Schools Using Different Indices

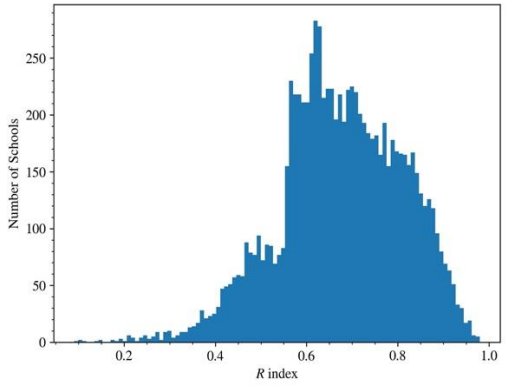
Simpson's D



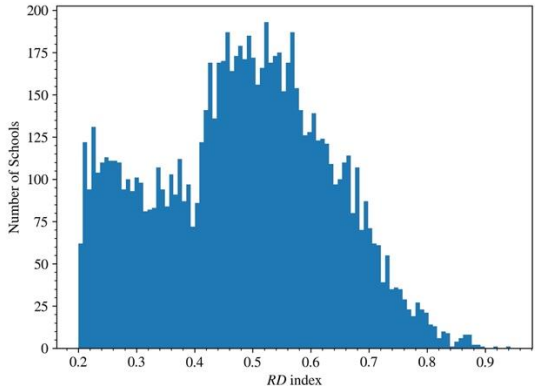
k-person



R



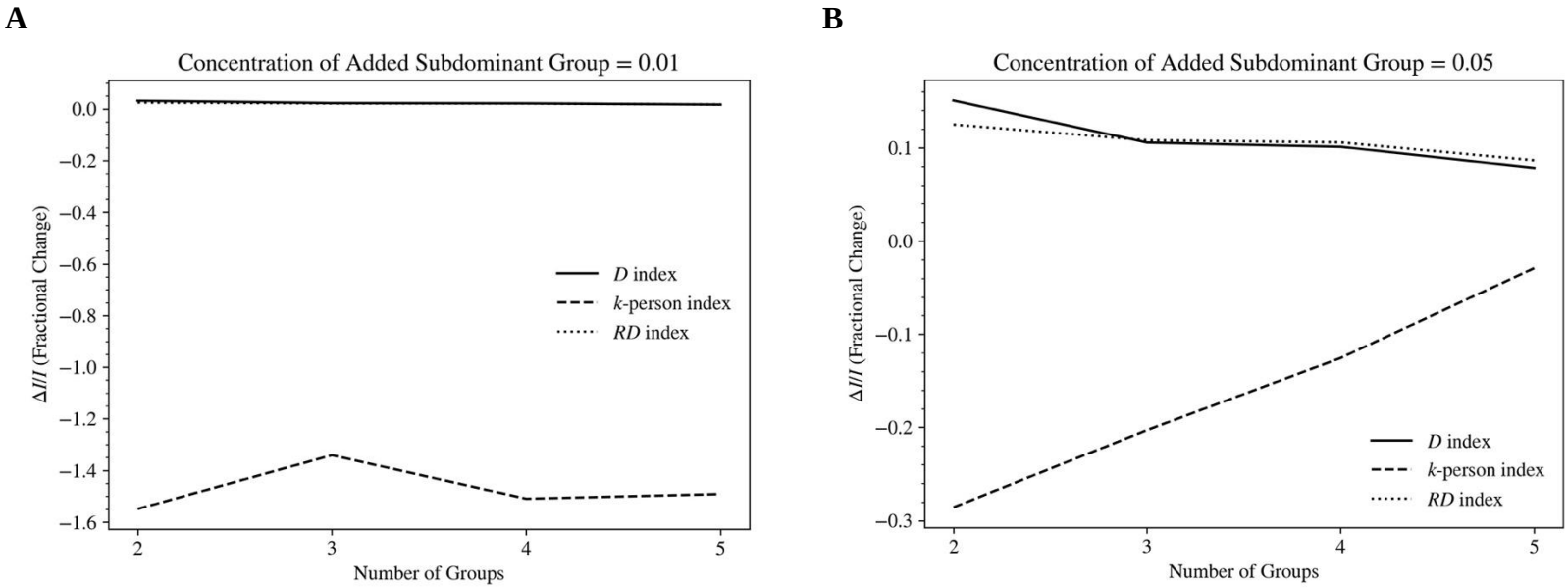
R (dual-concept)



Note. R = *Representative Diversity*. For *Representative Diversity* index, the state-level public school student racial/ethnic distribution (i.e., 55% Hispanic, 12% Asian [Asian and Filipino], 5% African American, 23% White, 5% Others [Two or more races, American Indian or American Indian or Alaska Native, Pacific Islander]) was used as a reference distribution. *For Representative Diversity (dual-concept) index* distribution, an even distribution of the five ethnic groups was adopted as a reference distribution.

Figure 3

Sensitivity to Small Size Groups



Note. X axis shows the number of groups within context. Y axis shows the change in index value before and after the addition of a small group. In this analysis, schools with a group of concentration greater than 0.7 were excluded. These schools are dominated by one ethnicity and their Simpson's *D* index are extremely low. Adding them would defeat the purpose in showing the Simpson's *D* index's insensitivity to small groups when there are already two or more small groups. *D* = Simpson's D index; *RD* = *Representative Diversity* (dual concept).

Summary and Future Directions

Summary and Concluding Discussion

Schools and communities are increasingly culturally and linguistically diverse. With this global trend, a school provides a research avenue to understand diversity's impact on social interactions and related crucial questions, such as how to measure diversity and how it relates to outcomes, and who are thriving or not in a high diversity context. These questions help identify students' needs and design appropriate interventions to meet challenges and opportunities in a diverse school context. The three studies focused on what, how, and who questions by adopting different statistical analyses and theoretical approaches to examine various school diversity aspects' combined and unique associations with students' psychosocial experiences taking their racial/ethnic and socioeconomic identities into account. Study 1 utilized a latent profile analysis to examine the combined effects of teacher racial/ethnic, school socioeconomic status, and student racial/ethnic diversity on students' experiences of school connectedness and race-based victimization and school profiles' moderating role in racial/ethnic disparity of school connectedness and race-based victimization. Study 2 assessed students' school climate perception's relations with school diversity by students' intersecting social identities of socioeconomic status and race/ethnicity. Finally, study 3 addressed another essential issue—conceptualizations and operationalizations of diversity concepts. Study 3 discussed diversity's operationalization in existing mathematical expressions and proposed alternate measures to capture distinctive diversity concepts.

Impact of School Diversity on Psychosocial Experiences

The findings reveal that school diversity's influences depend on students' social identities and domains of outcomes. Relations of school diversity with social exclusion and

inclusion experiences are not inversed as researchers might have assumed (Putnan, 2007). As found in Study 1, schools with the lowest student diversity reported the lowest prevalence of race-based victimization; racial/ethnic discrepancy of victimization experiences was related to the balance of numerical representation. In contrast to prominent associations between student racial/ethnic composition and race-based victimization, perceived school connectedness at the school-level and student-level showed mild variations across different configurations of school diversity profiles. The findings suggest that the direct impact of student racial/ethnic diversity is more substantial on conflict-related outcomes than outcomes reflecting social inclusion. These results may suggest that racial/ethnic diversity more directly influences social conflicts and exclusion, but its relations with social inclusion depend on other moderating and mediating factors.

Study 1 and Study 2 used different statistical approaches to assess student racial/ethnic diversity aspects with students' psychosocial experiences. The findings collectively showed that higher student racial/ethnic diversity was associated with increased discriminatory experiences and less positive social experiences upon controlling school-level and student-level characteristics. However, Study 2 suggests that only Latinx students from low socioeconomic backgrounds perceived a less favorable school climate in response to high student racial/ethnic diversity. The current study's results and previous evidence insinuate that an adverse effect of diversity is more likely to occur among individuals identified with marginalized identities; marginalized groups may perceive more threats and challenges in a diverse context (Wilson & Rodkin, 2011). Thus, students' prior experiences and perceived power associated with their identities likely impact their interactions with an increasingly

diverse school setting. Overall, it is vital to identify who needs support in a racial/ethnic diverse context and how to support them effectively.

The hypothesized teacher racial/ethnic diversity's favorable impact was not the same across race/ethnicity and socioeconomic status. The positive effects of teacher diversity were only observed among students from low socioeconomic status in Study 2, regardless of their racial/ethnic identities. The collective findings indicate the need to allocate more teachers of color to schools with mixed combinations of students' SES and race/ethnicity. As shown in Study 1's school diversity profiles and prior research (Boser, 2011), teachers of color tend to teach in schools with a higher proportion of students of color and students from low SES (Boser, 2011). With the phenomena of higher RBV in schools with higher diversity as well as the documented benefits of teacher racial/ethnic diversity on students from low socioeconomic status, school districts may consider allocating teachers of color to schools schools with a combination of students from different racial/ethnic and socioeconomic backgrounds

Diversity Operationalization

Applying latent profile analysis at a contextual level is rare. This statistical method classified schools into profiles indicated by contextual characteristics. It offers an alternative perspective looking into multiple diversity dimensions' combined effects, unlike most prior studies examining influences of a single diversity aspect and assuming students' outcomes and interactions with the contexts to be the same across school diversity profiles. A mixture modeling approach allows researchers to examine the impact of multiple diversity aspects, more closely depicting a school ecology composing various contextual factors.

The discussion in Study 3 is a beginning but critical step that aims to spark researchers' contemplation and interest in conceptualizations and operationalization of diversity in educational research. The proposed metrics to measure dual-concept diversity are not perfect, but each is attentive to the definition of dual-concept diversity. Their characteristics in measuring dual-concept diversity were explicitly illustrated regarding its weight to variety, evenness distribution, and sensitivity to group size. These new mathematical metrics of dual-concept diversity encourage researchers to ponder the linkages between diversity definitions, research questions, and the choice of diversity measures. Moreover, most recent school diversity research questions have focused on dual-concept diversity, while other diversity concepts have lacked discussion. The index for representative diversity may help researchers investigate school diversity from a different diversity definition.

Future Directions

In the past two decades, the current school diversity literature mainly sheds light on whether and how school diversity relates to outcomes at the school and individual levels. The "how" questions also mostly asked about the impact's direction. To provide practical implications for schools and clarify mixed evidence, future research questions likely extend to "who," "why," and "what." Moreover, research that clarifies diversity definitions and advances diversity measures is much needed to answer applied research questions.

As mentioned before, diversity operationalization warrants more research. Operationalizing dual-concept diversity in a mathematical expression requires more clarifications in its basic conceptualization, such as whether diversity can be conceptualized as a continuum and the weight of each dimension. In addition to using mathematical

expressions, is there an alternative approach to capture diversity may be captured? Apart from objective diversity, subjective, fluid, and other types of diversity have yet to be studied much in educational research. There are many ways to conceptualize diversity, probing into different research questions and theoretical assumptions. Tools for measuring diversity concepts and the impact of different diversity conceptualizations warrant more discussion and research.

Research is needed to understand its mechanisms involving other contextual and individual factors contributing to student and school consequences. The mixed evidence of diversity influences implies that its impact depends on other factors, such as students' social identities and competencies, school policies, and diversity exposure at the community level. As such, educators and administrators can be informed regarding identifying students who need interventions to flourish in a diverse school context, interventions that are effective in facilitating social inclusion in a diverse context for all students, and factors that lead to and prevent conflicts in a diverse context.

School diversity still has plenty of research questions waiting for answers. This topic is relevant to the U.S. and global demographic changes. First, students live in a much more diverse society where some may find more challenges than others—identifying who needs support and what they need in a high diversity context aligns with schools' responsibilities of building a safe and welcoming educational environment for all students. Second, a diverse school context offers educators educational opportunities to nurture the next generations with the necessary competencies and attitudes to work with people from different backgrounds, prevent and solve conflicts, and engage in a society composed of diverse populations. These efforts will have long-term social benefits to social cohesion and harmony.

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