



INEQUALITY AND INEQUITY IN GENERAL PUBLIC OPERATING APPROPRIATIONS

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INTRODUCTION

Recent reports have highlighted the inequalities that exist in how state and federal funding is allocated to different institution types and the students they serve (Ahlman, 2019; Carnevale et al., 2018; Foster & Fowles, 2018; Mugglestone et al., 2019; Taylor & Cantwell, 2019; Taylor et al., 2020). Because these different types of institutions serve distinctive student populations, concerns have heightened in recent years that government funding for public institutions is both unequal and inequitable to students from diverse demographic groups. While *inequality* in funding is often an unintended consequence of the design of funding formulas for higher education that are based on enrollment and performance metrics (Lingo et al., 2021), *inequity* in funding occurs when unequal funding disproportionately harms certain student populations, such as low-income students and students of color (Hillman, 2020). Inequities in government funding for institutions can have long-term implications for student success, resulting in lower completion rates for low-income students and students of color attending less-resourced institutions (Ahlman, 2019; Carnevale et al., 2018).

This report uses an unbiased source of data in higher education finance – the Integrated Postsecondary Education Data System (IPEDS) – to rigorously analyze inequalities and inequities in funding levels by student race/ethnicity and income. Inequities in general public operating appropriations by race/ethnicity and income category are compared across three established methodologies in the field of higher education finance (You et al., 2022; Dziesinksi et al., forthcoming; Johnson, 2022). Findings from each approach are considered in the context of broader implications for inequities in public higher education funding.





DATA

The primary variable for measuring state funding for higher education in this report is general public operating appropriations. This measure of funding incorporates direct state and local support for public institutions and does not include financial aid. Because financial aid is excluded, this measure is not affected by variations in tuition and grant funding models (e.g., high-tuition, high-aid vs. low-tuition, low-aid). Consequently, general public operating appropriations are comparable across institutions, states, sectors, and academic years.

General public operations in IPEDS are modeled after the general public operations variable in the State Higher Education Finance (SHEF) data collection.¹ An approximation of the SHEF variable using IPEDS data sums state appropriations, state operating grants, local appropriations, and local operating grants. Values are aggregated to six-digit parent OPEID to adjust for parent-child reporting relationships in IPEDS. Financial data are adjusted for inflation to 2022 dollars using the consumer price index (CPI). Because of the differences in how data are reported and categorized across the two sources, the SHEF and IPEDS measures of general public operations vary by year, state, and sector. At the national level, IPEDS general public operating appropriations exceed the amounts reported in SHEF by roughly 14 to 28 percent.² Only IPEDS financial data are used in this report, as measures of inequality and inequity in funding are calculated at the institution level.³

Enrollment data by student race/ethnicity are collected from IPEDS to include headcounts for graduate and undergraduate 12-month enrolled students.⁴ Race/ethnicity categories vary by enrollment type and academic year, but generally include nine categories. Enrollment data by income are also collected from IPEDS and are available only for first-time, full-time credential-seeking undergraduates paying the in-state tuition rate who are awarded title IV federal student aid. Income bands measuring students' or parents' adjusted gross income (AGI) range between \$18,000 and \$35,000, resulting in five categories from \$0 to more than \$110,000.⁵

Institutional classification variables are also derived from IPEDS. These include the institution sector, modified Carnegie classification, and state. Observations are limited to institutions in the public two-year and public four-year sectors. Modified Carnegie classifications are based on the basic Carnegie classification variable in IPEDS and include seven categories: associate, bachelor's, master's, doctoral, research, and other institutions.⁶



^{1.} General public operations in SHEF consist of state and local support for higher education institutions and agencies, excluding research and medical (RAM), non-credit and continuing education, and federal stimulus funding.

^{2.} See the SHEF Expansion Codebook for more detail.

^{3.} SHEF data are available at the national, state, and sector level.

^{4.} SHEF enrollment data are collected by full-time equivalent (FTE) enrollment.

^{5.} See the SHEF Expansion Codebook for more detail.

^{6.} See the SHEF Expansion Codebook for details on the determination of the institutional sector and modified Carnegie classification.



METHODS

This report compares three distinct approaches to measuring equity and equality in higher education funding.

APPROACH #1: FINANCIAL EQUITY USING THE GINI INDEX

The first approach is an adaptation of the analysis of financial equity among California community colleges developed by You, Hillman, and Colston (2022). The original research measures the extent to which education and related expenditures, state appropriations, and local appropriations are distributed equally among community colleges in California using the Gini index. The Gini index is a measure of how equally or unequally financial resources are distributed within a group. A Gini index of 0 indicates absolute equality in distribution (all units have the same amount of financial resources), while a Gini index of 100 represents absolute inequality (one unit has all the financial resources and all other units have no resources).

The adaptation of You, Hillman, and Colston's approach in this report measures the distribution of general public operating appropriations per 12-month enrolled student. The Gini index compares funding levels per student at the institution level between 2008 and 2022. Results are aggregated to the national, sector, and modified Carnegie level using the *pshare* command in Stata.

APPROACH #2: ANALYTICAL FRAMEWORK FOR IDENTIFYING FUNDING INEQUITIES

The second approach to measuring funding equity replicates components of the framework developed by Dziesinski, Hillman, and Orrantia (forthcoming). The framework is a guidebook for states agencies and governments to conduct funding equity analyses using multiple measures and contextualizing the data. The approach begins with identifying variables of interest, which include state and local appropriations per undergraduate FTE and the percentage of undergraduates receiving Pell Grants. The next step is to generate ranks for each measure of interest using deciles. Following ranking, the researchers combine the ranks into a single chart by calculating the sum of the ranks of each measure. The final step in the framework is to compare outcomes for focus institutions, with special attention to institutions with low levels of funding and high populations of Pell recipients.

In this report, we adapted the steps outlined in the framework using general public operating appropriations per 12-month enrolled student, the percentage of 12-month enrolled students of color, and the percentage of undergraduates receiving Pell Grants as the variables of interest. We do not identify comparison groups but do limit observations to public two-year and public four-year institutions. Ranks for general public operations per student, percentage of students of color, and percentage of undergraduates receiving Pell Grants are generated using percentiles (100 groups). Ranks are calculated as values of 1 through 100, with the lowest values (the 1st percentile) assigned a rank of 1 and the highest values (the 100th percentile) assigned a rank of 100.

In lieu of a rank sum, we calculate rank gaps between demographic and financial variable ranks. The rank gaps are calculated separately for the two population variables of interest: 1) the difference between the rank of percentage of students of color and the rank of general public operating



appropriations per 12-month enrolled student; and 2) the difference between the rank of percentage of undergraduates receiving Pell and the rank of general public operating appropriations per 12-month enrolled student. The calculated ranks and the rank gaps are graphed using the *scatter* command in Stata. Results are reported for the most recent year of data collection (2022) and are not disaggregated by student demographics or institution characteristics.

APPROACH #3: VARIATIONS IN GENERAL OPERATING BY WEIGHTED RACE/ETHNICITY AND INCOME LEVEL ENROLLMENT

The third approach is a modification of the calculated variations in spending by weighted race/ ethnicity and gender developed by Johnson (2022). The original approach uses spending on instruction and student services per student enrolled in fall 2020. Spending per student in each race/ethnicity and gender category is calculated by weighting the spending per student by the enrollment of each race/ethnicity and gender subgroup at each institution. At every institution, the spending for each demographic group is determined by the percentage of total enrollment. Total amounts (across all institutions) for each demographic group are divided by the total enrollment (across all institutions) in that group.

The modified version of Johnson's approach in this report uses general public operating appropriations in place of spending on institution and student services. We use undergraduate and graduate 12-month enrollment rather than fall enrollment. Student demographic groups include race/ethnicity in addition to income category. We do not run analyses by gender. Calculations for the years 2008 through 2022 are otherwise identical to those developed by Johnson.⁷



^{7.} See the SHEF Expansion Codebook for details on variable calculation.



RESULTS

The results of the three approaches to measuring funding equity are described below, followed by a comparison of the three outcomes.

APPROACH #1: FINANCIAL EQUITY USING THE GINI INDEX

The Gini index for IPEDS general public operating appropriations per 12-month enrolled student is reported in *Figure 1*. The Gini index has declined from 0.54 at the start of our data collection in 2008 to a low of 0.44 in 2022, indicating that the inequality in per-student appropriations has decreased in the past 15 years. The lines in *Figure 1* for public four-year and public two-year institutions indicate that despite following the same national trend of declining inequality, the level of inequality has declined more significantly in the two-year sector, dropping from a high of 0.53 in 2008 to a low of 0.40 in 2022. Across Carnegie classifications, per-student funding inequality is lowest at associate and research institutions (0.28 and 0.27, respectively) in 2022 and highest at other institution types and doctoral institutions (0.79 and 0.65, respectively). In contrast to the national trend, inequality has increased since 2008 in associate, bachelor's, master's, medical, and other institutions. The institution type with the largest increase in per-student funding inequality since 2008 is master's institutions, rising from a low of 0.21 to 0.31 in 2022.

FIGURE 1 GINI INDEX FOR GENERAL PUBLIC OPERATING APPROPRIATIONS PER 12-MONTH ENROLLED STUDENT, 2008-2022



NOTES:

- 1. Enrollment headcounts include all undergraduate and graduate students enrolled for credit during the 12-month academic year.
- 2. IPEDS general public operating appropriations include state appropriations, state operating grants, local appropriations, and local operating grants.
- 3. General public operating appropriations are adjusted for inflation to 2022 dollars.
- A Gini index closer to 0 indicates more equal distribution of funding, while a Gini index closer to 100 indicates more unequal distribution of funding.





APPROACH #2: ANALYTICAL FRAMEWORK FOR IDENTIFYING FUNDING INEQUITIES

Results from the analytical framework for identifying funding inequities are presented for the most recent year of data collection in 2022 using IPEDS financial data. *Figure 2* shows the correlation between per-student general public operating appropriations and per-student spending rank, serving as a visual representation of the magnitude of differences in per-student funding across institutions. As institutions receive greater per-student appropriations, the inequality among institutions in funding increases. For institutions in the bottom quintile (the 357 institutions in 20th percentile and below), funding ranges from \$0 to \$2,690 per student. Institutions in the top quintile (the 374 institutions in the 80th percentile and above) demonstrate a much larger variation in funding, ranging from \$7,589 to \$163,052 per student.⁸ This means that the greatest levels of funding are disproportionately concentrated among the most well-resourced institutions.

FIGURE 2

GENERAL PUBLIC OPERATING PER STUDENT BY GENERAL PUBLIC OPERATING PER STUDENT RANK, 2022



NOTES:

1. Enrollment headcounts include all undergraduate and graduate students enrolled for credit during the 12-month academic year.

2. IPEDS general public operating appropriations include state appropriations, state operating grants, local appropriations, and local operating grants.

3. General public operating per student rank is calculated by percentiles (100 groups).

SOURCE: Integrated Postsecondary Education Data System (IPEDS)

 There are several outliers in general public operating appropriations per student in the dataset with high levels of funding and comparatively low enrollment. The 99th percentile for general public operating appropriations per student is \$43,868.





FIGURE 3

The correlation between percent students of color and percent students of color rank appears in *Figure 3*. Compared to per-student appropriations, the distribution of percent students of color is less unequal but still higher as the percentage of students of color increases. Institutions in the bottom quintile (20th percentile and below) range from 0% to 16.5% students of color, while institutions in the top quintile (80th percentile and above) enroll between 53.7% and 96.5% students of color. This suggests that students of color do not enroll at equal distributions across institutions.



PERCENT STUDENTS OF COLOR BY PERCENT STUDENTS OF COLOR RANK, 2022

NOTES:

1. Enrollment headcounts include all undergraduate and graduate students enrolled for credit during the 12-month academic year.

2. Students of color include Black, Hispanic, American Indian/Alaska Native, and Native Hawaiian/Pacific Islander students and students of two or more races.

3. Percent students of color rank is calculated by percentiles (100 groups).







Figure 4 combines general public operations per student rank and the gap between percent students of color rank and general public operations per student rank. The gap between the two ranks is intended to identify institutions with a high percentage of students of color and low per-student funding (positive rank gap) and institutions with a low percentage of students of color and high per-student funding (negative rank gap). Institutions in the same rank for percent minority students and per-student funding have a rank gap of 0. Institutions in the bottom right quadrant are focus institutions because they enroll a large percentage of students of color and have comparatively low per-student funding. Thirty-five percent of the institutions in the sample fall into this quadrant.



FIGURE 4 GENERAL PUBLIC OPERATING PER STUDENT RANK BY STUDENTS OF COLOR RANK GAP, 2022

NOTES:

- 1. Enrollment headcounts include all undergraduate and graduate students enrolled for credit during the 12-month academic year.
- 2. Students of color include Black, Hispanic, American Indian/Alaska Native, and Native Hawaiian/Pacific Islander students and students of two or more races.
- 3. Percent students of color rank is calculated by percentiles (100 groups).
- 4. IPEDS general public operating appropriations include state appropriations, state operating grants, local appropriations, and local operating grants.
- 5. General public operating per student rank is calculated by percentiles (100 groups).
- 6. The rank gap is calculated as the difference between the percent students of color rank and the general public operating per student rank.
- 7. A positive rank gap indicates a higher percentage of students of color and relatively lower per-student funding. A negative rank gap indicates a lower percentage of students of color and relatively higher per-student funding.







FIGURE 5

The results of the correlation between the percentage of undergraduate students receiving Pell and percent Pell rank appear in *Figure 5*. Similar to the results in *Figure 3*, the distribution of students with Pell Grants is disproportionately concentrated in institutions with higher percentages of Pell recipients. Institutions in the bottom quintile (20th percentile and below) have between 0% and 21% of undergraduates receiving Pell, while institutions in the top quintile (80th percentile and above) have between 44% and 95% of students receiving Pell. This figure suggests that Pell recipients do not enroll at equal rates across all institutions are instead disproportionately concentrated at institutions with higher percentages of low-income students.



PERCENT PELL RECIPIENTS BY PERCENT PELL RECIPIENTS RANK, 2022

NOTES:

1. The percentage of students with Pell Grants includes all undergraduate students awarded Pell grant aid.

2. Percent Pell recipients rank is calculated by percentiles (100 groups).





FIGURE 6

Figure 6 combines the general public operations per student rank and the rank gap between percent Pell recipients and general public operations per student rank. As with *Figure 4*, the gap between the two ranks enables identification of institutions with a high percentage of Pell recipients and low per-student funding (positive gap) and institutions with a low percentage of Pell recipients and high per-student funding (negative gap). Institutions in the bottom right quadrant are the institutions with the highest level of inequity due to high levels of Pell recipients and low levels of per-student funding. Thirty-six percent of institutions in the sample fall into this quadrant.



GENERAL PUBLIC OPERATING PER STUDENT RANK BY PERCENT PELL RANK GAP, 2022

NOTES:

- 1. The percentage of students with Pell Grants includes all undergraduate students awarded Pell grant aid.
- 2. Percent Pell recipients rank is calculated by percentiles (100 groups).
- 3. IPEDS general public operating appropriations include state appropriations, state operating grants, local appropriations, and local operating grants.
- 4. General public operating per student rank is calculated by percentiles (100 groups).
- 5. The rank gap is calculated as the difference between the percent Pell recipients rank and the general public operating per student rank.
- 6. A positive rank gap indicates a higher percentage of Pell recipients and relatively lower per-student funding. A negative rank gap indicates a lower percentage of Pell recipients and relatively higher per-student funding.





APPROACH #3: VARIATIONS IN GENERAL OPERATING BY WEIGHTED RACE/ ETHNICITY AND INCOME LEVEL ENROLLMENT

As shown in *Figure 7*, between 2010 and 2022, IPEDS general public operating appropriations by student race/ethnicity have followed relatively stable patterns, with a general increase in funding year-over-year and a sharp rise between 2021 and 2022.⁹ Nonresident (international) students consistently report the highest per-student funding, with a high of \$8,022 per student in 2022. Asian students report the next-highest per-student funding with a high of \$7,298 in 2022. The remaining seven race/ethnicity categories (Black, American Indian/Alaska Native, Hispanic, white, Native Hawaiian/Pacific Islander, two or more, and unknown) have relatively similar per-student funding rates, ranging from \$5,527 per Native Hawaiian/Pacific Islander student to \$6,151 per student of two or more races in 2022. The relative rank of per-student funding by race/ ethnicity does not vary dramatically across time.

FIGURE 7

GENERAL PUBLIC OPERATING APPROPRIATIONS PER 12-MONTH ENROLLED STUDENT BY RACE/ETHNICITY, 2008-2022



NOTES:

- 1. Enrollment data prior to 2010 are volatile due to changing race/ethnicity categories and inconsistent reporting by institutions.
- 2. Enrollment headcounts include all undergraduate and graduate students enrolled for credit during the 12-month academic year.
- 3. IPEDS general public operating appropriations include state appropriations, state operating grants, local appropriations, and local operating grants.
- 4. General public operating appropriations are adjusted for inflation to 2022 dollars.
- SOURCE: Integrated Postsecondary Education Data System (IPEDS)
- 9. Prior to 2010, enrollment data by race/ethnicity were volatile due to changing categorizations and inconsistency in institution reporting.





Results for first-time, full-time undergraduates receiving Title IV financial aid appear in *Figure* 8. IPEDS general public operating appropriations per student dropped dramatically between 2009 and 2012, and have risen gradually since to a peak in 2022. Prior to 2021, funding per student by income category followed a predictable pattern: students from the highest income category (\$110,000 and greater) report the highest per-student funding, followed by students with each successively lower income category. Students from the lowest income category (\$30,000 and less) consistently reported the lowest per-student funding. At their lowest point in 2012, students with income greater than or equal to \$110,000 reported per-student funding of \$69,549, which is almost \$15,000 higher than the per-student funding level of \$54,552 for students with income less than or equal to \$30,000. Funding levels across income categories began to merge in 2021 and 2022, with just \$7,672 separating the highest and lowest per-student funding in 2021 and \$6,670 separating the highest and lowest per-student funding in 2022. These final two years in the data collection were also the first time that per-student funding for lower income levels overtook per-student funding for students in the highest income category.

FIGURE 8

GENERAL PUBLIC OPERATING APPROPRIATIONS PER AIDED STUDENT BY INCOM	۱E
CATEGORY, 2009-2022	



NOTES:

1. Enrollment data by income category was not collected prior to 2009.

2. Enrollment headcounts include first-time, full-time, credential-seeking undergraduates paying the in-state tuition rate who are awarded Title IV financial aid.

3. IPEDS general public operating appropriations include state appropriations, state operating grants, local appropriations, and local operating grants.

4. General public operating appropriations are adjusted for inflation to 2022 dollars.



DISCUSSION

All three approaches explored in this report capture inequalities in government funding for public postsecondary institutions, measuring how general public operating appropriations vary across institutions and time.

The first approach, financial equity using the Gini index, can only measure equality across institution types and cannot be disaggregated by student race/ethnicity or income. Encouragingly, the Gini index reports that at the national level, inequality in per-student funding has decreased in the past 15 years by 0.1 points. However, the national index of 0.44 in 2022 indicates that there are still large discrepancies in per-student funding across institutions, even when subsetting only to institutions in the public two-year and four-year sectors. When disaggregating by sector, the Gini index remains relatively high for both four-year and two-year institutions. The steady rate of decline in the two-year sector since 2008 of 0.13 points suggests a movement toward greater equality in funding among two-year institutions. The relative stagnation of the index in the four-year sector (down 0.03 points), meanwhile, suggests that four-year institutions are not moving toward funding equality.

Disaggregation by institution type indicates that inequality is lowest among associate and master's institutions and highest at doctoral and other institutions. The low index values at associate and master's institutions are likely due to relative homogeneity among institutions in these respective categories, including similar missions and student populations served. The high index values at doctoral and other institutions, meanwhile, point to heterogeneity among institutions in these respective categories.¹⁰ This approach to measuring inequality unfortunately does not permit direct comparisons across institution types. While inequality is lower *within* associate institutions, it is certainly true that *between* institution types, associate institutions. These differences between institution types in turn have implications for funding equity, especially given the different student populations these institutions typically serve.

The second approach explored in this report provides more insight into funding inequities that exist across institutions, and subsequently, student demographics. While the framework for identifying funding inequities does not enable disaggregation by each student race/ethnicity or income category, it does permit comparisons by the percentage of students of color and the percentage of students receiving Pell Grants enrolled at the institution. This approach reveals that, consistent with the high Gini index from approach one, per-student funding is disproportionately concentrated among well-resourced institutions. Similarly, students are stratified across institutions by race/ethnicity and Pell receipt, with disproportionately high percentages of students of color and Pell recipients at the institutions in the highest percentiles. This finding suggests that despite efforts to promote diversity and equity by race/ethnicity and socioeconomic status, many institutions fall short of diversifying their student body and enrolling representative populations of students of color and low-income students.



^{10.} This is particularly true for the "other" institution category, which includes theological schools, schools of law, art schools, business schools, tribal colleges, technology-related schools, and other special-focus schools.



The most revealing findings from approach two come from the correlations between per-student funding and gap between per-student funding and the respective percentages of students of color and Pell recipients. Thirty-five percent of the institutions in the sample fall into the lower right quadrant of the students of color graph, indicating that they have relatively high percentages of students of color and relatively low per-student funding. Another 36% of institutions demonstrate the inverse: relatively low percentages of students of color and relatively high per-student funding. This means that the highest levels of funding are directed toward institutions with the lowest proportion of students of color, and students of color on average are attending institutions with the lowest per-student funding. Similarly, 36% of institutions fall into the lower right quadrant of the Pell recipients graph, indicating they have relatively high percentages of Pell recipients and relatively low per-student funding. Thirty-eight percent of institutions display the opposite relationship (i.e., low percentages of Pell recipients and high per-student funding). Accordingly, the majority of the institutions in the sample have inequitable levels of funding to support students with the highest financial need.

The findings reported by approach two are further refined and disaggregated in approach three, which directly measures per-student funding by race/ethnicity and income category. Using IPEDS finance data, the findings of approach three suggest that students of color generally attend institutions with lower per-student funding. This is especially true for Native Hawaiian/ Pacific Islander, Black, Hispanic, and American Indian/Alaska Native students in comparison to their white, Asian, and nonresident peers. In 2022, per-student funding for Asian students was over \$1,000 higher than per-student spending for students of color, while per-student funding for nonresident (international) students was over \$2,000 higher. Per-student funding for white students was not as disproportionately high, but was still between \$86 and \$450 higher than per-student funding for students of color. These findings confirm the existence of inequities in per-student funding by race/ethnicity.

Per-student funding in IPEDS by income category also reveals inequities. Prior to 2021, students from the highest income categories attended institutions with the highest per-student funding, while students from the lowest income categories attended institutions with the lowest per-student funding. In 2020, per-student funding for students with incomes greater than \$110,000 was over \$5,000 higher than per-student funding for students from lower income categories, and over \$10,000 higher than per-student funding for students from the lowest income category. Encouragingly, this pattern appears to shift in 2021, when per-student funding across income categories began to merge. In 2022, students from the highest income category had the third-highest level of per-student funding after students with incomes between \$30,000-\$48,000 and \$48,000-\$75,000, and students with the second highest income category (\$75,000-\$110,000) had the lowest per-student funding, at over \$6,000 less than the highest level of funding. These findings confirm the prior existence of inequities in per-student funding by income, but suggest that these gaps may be closing.



POLICY IMPLICATIONS

Unlike other sources of institution revenues (e.g., tuition and fees, federal appropriations, financial aid), state governments and agencies that support higher education have direct control over the general public operating appropriations that are disbursed to institutions. States develop funding formulas that determine how much government funding an institution is eligible to receive. While many of these formulas historically relied on enrollment, recent trends suggest the rising popularity of a hybrid approach combining enrollment counts and performance (e.g., student persistence and graduation rates) (Lingo et al., 2021). With evidence of the inequitable distribution of government funding across institutions, state agencies have the opportunity to address these funding disparities through modifications to funding formulas.

The three approaches to measuring equity explored in this report can be used by state agencies in the funding formula review process. The choice of methodology, including financial and enrollment variables used in the analysis, can affect the findings of any research measuring inequity. For this reason, multiple measures and context-setting are advised. States agencies undergoing a funding formula review are encouraged not only to incorporate a measure of inequity, but to also consider several alternative approaches to measurement.

This report measures *inequality* – whether financial resources are unequally distributed across institutions – as well as *inequity* – the extent to which unequal distribution of financial resources disproportionately harms students of color and low-income students. While inequality is often a feature of the formulas used to disburse funding to institutions, inequity by student demographics can exacerbate gaps in student success and attainment. Analyses of the distribution of financial resources across institutions must account for discrepancies not only by institution type, but also by the demographics of the students served by those institutions. Only when we acknowledge the extent to which financial resources are disbursed inequitably can we begin to address and resolve the potential harms to students.





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