

Delaware Education Funding Simulator

Documentation and User Guide

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Overview

The following document briefly describes the contents and functionality of the Delaware Education Funding Simulator developed using findings from the Assessment of Delaware Public School Funding conducted by the American Institutes for Research (AIR), a study that examines the cost of providing an adequate education in Delaware public schools. The simulator is a tool designed to allow users to explore different policy options for funding an adequate education for students attending Delaware’s public K-12 schools through the development of a funding allocation formula and local revenue generation scenarios. The simulator has been programmed in Microsoft Excel and consists of a series of linked worksheets that leverage results from the AIR cost analysis, data on student characteristics and funding for Delaware schools and districts, and information on statewide educational revenue streams. Data included in the Delaware Education Funding Simulator is from the 2021–22 school year, the most recent year of publicly available data at the time of developing the simulator. Below we describe the contents of the funding simulator as well as simple steps for performing simulations.

Description of Simulator Worksheets

- Title Page – The title, authorship, and publication date for the Delaware Education Funding Simulator.
- School Weighted Fund Simulator – This worksheet shows how dollars would be distributed to schools based on weighted funding formulas developed from the education cost model (ECM) and professional judgment panel (PJP) analyses. The worksheet also allows users to specify custom weights and custom target funding levels to generate simulated school funding projections.
- LEA Weighted Fund Simulator – This worksheet shows how dollars would be distributed to LEAs (districts and charter schools) based on weighted funding formulas developed from the ECM and PJP analyses. In addition, the worksheet models how target funding levels could be achieved through state funding and minimum local effort (represented by a constant property tax applied to all districts). The worksheet allows users to specify custom weights, and custom target funding levels to generate simulated LEA funding projections, as well as specify the amount of funding that will come from the state (as opposed to local sources).

- **School Unit Simulator** – This worksheet models how a revised unit-based funding formula would distribute units and funds to schools and has been closely aligned with the target funding levels for each school estimated from the ECM and PJP analyses. In addition, it allows the user to specify custom unit value definitions based on student enrollments to generate simulated school funding projections.
- **WF Simulator Variable List** – This worksheet contains a list of all variables included in the weighted funding simulator worksheets. In addition to the list of variables, we have provided a description of each variable and either documentation of its source or a definition of how it was calculated. This worksheet is for informational purposes only.

Simple Steps for Performing Simulations

School Weighted Funding Simulator

This worksheet allows users to model how funding would be distributed to schools based on a weighted student funding formula. The top portion of the worksheet (Rows 1–23) allow users to change settings and evaluate the results. The lower portion of the worksheet (Rows 25–230) shows school-by-school results. The top panel of the worksheet can be collapsed by clicking on the minus (-) symbol to the left of Row 24. Users may need to zoom out to show Rows 1–24 and to see the school-by-school results.

Descriptions of User-Input Cells

Cells that the user can change are highlighted in gold. They include the following:

- **Custom Weight** – This panel (cells D1 through D22) allows users to enter their own custom weights. Values greater than 1 will result in increased funding for students represented by the given weight category. Values less than 1 will result in decreased funding for students represented by the given weight category. Values equal to 1 mean that a given weight category will have no effect on funding.
- **Use recommended or custom weights?** – A dropdown menu (cell J3) allows users to choose the weights to apply, where the options are the ECM recommended weights, PJP recommended weights, and custom weights.
- **Use recommended or custom target funding?** – A dropdown menu (cell J4) allows users to choose the overall amount of funding to be distributed through the formula, where the options are ECM recommended target funding, PJP recommended target funding, or custom target funding.

- **Custom Target Funding** – This user-input cell (cell J9) allows users to enter a custom amount of overall funding that will be distributed through the formula. This allows users to change the total amount budgeted (consisting of both state and local revenue) for district and charter school operations. This would not include funding for capital and debt services and does not include any additional revenue from federal sources, as that would be distributed through other mechanisms.

When both the ECM recommended weights and ECM recommended target funding are chosen in the dropdowns for selecting which weights and funding amounts to use, the target funding levels based on the ECM analyses are replicated. Likewise, when the PJP option is selected for both dropdowns, the target funding levels based on the PJP analyses are replicated.

Fields Included to Evaluate Results

There are several descriptive statistics included at the top of the simulator to allow users to evaluate simulated funding projections generated by a custom funding formula in comparison to the funding targets specified by the ECM and PJP analyses. They are intended to demonstrate how far off the simulated target funding levels are from the targets based on the ECM and PJP results. In particular, if the simulated results using custom weights deviate substantially from the ECM and PJP-based results, that is a signal that the custom weights as specified will not provide equal opportunity to achieve the state’s outcome goals. The descriptive statistics included are as follows:

- Needs index correlation with PJP needs index – Cell L11 shows the correlation between the simulated needs index across schools and the needs index for schools estimated based on the PJP analysis. Note that when PJP recommended weights are used, the correlation is 1 because these values are the same by default. The needs index represents the relative difference in needs or target funding relative the base. For example, a needs index of 2 indicates that a school’s target funding is two times the base amount of funding. A description of the needs index can be found on page 149 of the main report (Atchison et al., 2023).
- Needs index correlation with ECM needs index – Cell L12 shows the correlation between the simulated needs index across schools and the needs index for schools estimated based on the ECM analysis. Note that when the ECM recommended weights are used, the correlation is 1.
- Student needs index correlation with PJP student needs index – Cell L13 shows the correlation between the simulated student needs index across schools and the student needs index for schools estimated based on the PJP analysis. The student needs index only accounts for the strength of the student needs weights whereas the needs index above

accounts for the weights specified across all weight categories. Note that when PJP recommended weights are used, the correlation is 1. A description of the student needs index can be found on page 149 of the main report (Atchison et al., 2023).

- Student needs index correlation with ECM student needs index – Cell L13 shows the correlation between the simulated student needs index across schools and the student needs index for schools estimated based on the ECM analysis. Note that when ECM recommended weights are used, the correlation is 1.
- Average needs index and average student needs index – Cells I17 through K18 show the average of the needs index and student needs index across all schools for the simulated results, the PJP results, and the ECM results. The average needs index and student needs index describe the strength of these collective sets of weights. With stronger weights, more funding will be distributed on the basis of weights relative to the base. Note that when PJP recommended weights or ECM recommended weights are selected, the simulated needs indexes will equal those of the PJP or ECM-based results, respectively.
- Total state and local current spending, total simulated state and local funding, and funding gap – These fields provide points of reference showing the actual total statewide state and local current spending from the 2021–22 school year, the total simulated funding, and the difference between the two.

School-By-School Results

Below the user-input cells and the descriptive statistics for evaluating results are the school-by-school results. The school-by-school results fields are as follows:

- District name, school name, total school enrollment (defined as the average of Fall and end-of-year enrollment), and an indicator of charter school status are included in columns A through E.
- Variables that are relevant for the distribution of funding through the weighted formulas, including student enrollment percentages by need category, geographic cost adjustments, enrollment percentages by school level, school enrollment size categories, and population density categories are included in columns F through X. Note that charter schools with low enrollments are assigned to the enrollment category that represents the average-sized district school across schools with the same grade configuration as the charter school to account for the fact that charter schools may be small by choice rather than necessity.
- The results of the funding simulation in terms of the needs index, student needs index, target funding, and both absolute and percentage funding gaps (as well as the total current spending excluding federal dollars) are shown in columns Y through AD.

LEA Weighted Funding Simulator

This worksheet allows users to model how funding would be distributed to LEAs under a weighted student funding formula and how revenue could be raised locally in an equitable manner to support the projected funding levels. The top portion of the worksheet (Rows 1–23) allow users to change settings and evaluate the results. The lower portion of the worksheet (Rows 25–67) shows LEA-by-LEA results. The top panel of the worksheet can be collapsed by clicking on the minus (-) symbol to the left of Row 24. Users may need to zoom out to show Rows 1–24 and to see the LEA-by-LEA results.

Descriptions of User-Input Cells

Cells that the user can change are highlighted in gold. They include the following:

- **Custom Weight** – This panel (cells D1 through D22) allows users to enter their own custom weights. Values greater than 1 will result in increased funding for students represented by the given weight category. Values less than 1 will result in decreased funding for students represented by the given weight category. Values equal to 1 mean that a given weight category will have no effect on funding.
- **Use recommended or custom weights?** – A dropdown menu (cell J3) allows users to choose the weights to apply, where the options are the ECM recommended weights, PJP recommended weights, and custom weights.
- **Use recommended or custom target funding?** – A dropdown menu (cell J4) allows users to choose the overall amount of funding to be distributed through the formula, where the options are ECM recommended target funding, PJP recommended target funding, or custom target funding.
- **Custom Target Funding** – This user-input cell (cell J8) allows users to enter a custom amount of overall funding that will be distributed through the formula. This allows users to change the total amount budgeted (consisting of both state and local revenue) for district and charter school operations. This would not include funding for capital and debt services and does not include any additional revenue from federal sources, as that would be distributed through other mechanisms.
- **State funding for District/Charter Operations** – This user-input cell (cell J10) allows users to enter the amount of total state funding that will be allocated for district and charter operations. Note that this funding is intended to support current expenses; therefore, it should not include state spending for capital improvement. After the amount of state funding is provided, the cells below make calculations for the total local obligation, tax rates, and average revenues per student raised from state and local sources.

When both the ECM recommended weights and ECM recommended target funding are chosen in the dropdowns for selecting which weights and funding amounts to use, the target funding levels based on the ECM analyses are replicated. Likewise, when the PJP option is selected for both dropdowns, the target funding levels based on the PJP analyses are replicated.

Fields Included to Evaluate Results

There are several descriptive statistics included at the top of the simulator to allow users to evaluate simulated funding projections generated by a custom funding formula in comparison to the funding targets specified by the ECM and PJP analyses. They are intended to demonstrate how far off the simulated target funding levels are from the targets based on the ECM and PJP results. In particular, if the simulated results using custom weights deviate substantially from the ECM and PJP-based results, that is a signal that the custom weights as specified will not provide equal opportunity to achieve the state's outcome goals. The descriptive statistics included are as follows:

- Needs index correlation with PJP needs index – Cell T3 shows the correlation between the simulated needs index across schools and the needs index for schools estimated based on the PJP analysis. Note that when PJP recommended weights are used, the correlation is 1.
- Needs index correlation with ECM needs index – Cell T4 shows the correlation between the simulated needs index across schools and the needs index for schools estimated based on the ECM analysis. Note that when the ECM recommended weights are used, the correlation is 1.
- Student needs index correlation with PJP student needs index – Cell T5 shows the correlation between the simulated student needs index across schools and the student needs index for schools estimated based on the PJP analysis. Note that when PJP recommended weights are used, the correlation is 1.
- Student needs index correlation with ECM student needs index – Cell T6 shows the correlation between the simulated student needs index across schools and the student needs index for schools estimated based on the ECM analysis. Note that when ECM recommended weights are used, the correlation is 1.
- Average needs index and average student needs index – Cells Q9 through S10 show the average of the needs index and student needs index across all schools for the simulated results, the PJP results, and the ECM results. The average needs index and student needs index describe the strength of these collective sets of weights. With stronger weights, more funding will be distributed on the basis of weights relative to the base. Note that when PJP recommended weights or ECM recommended weights are selected, the simulated needs indexes will equal those of the PJP or ECM-based results, respectively.

- Total state and local current spending, total simulated state and local funding, and funding gap – These fields provide points of reference showing the actual total statewide state and local current spending from the 2021–22 school year, the total simulated funding, and the difference between the two.
- Total state current spending and state funding gap – These fields show the statewide actual spending from state sources and the gap between state spending and proposed state funding.
- Total local current spending and local funding gap – These fields show the statewide actual spending from local sources and the gap between local spending and proposed local funding.

LEA-By-LEA Results

Below the user-input cells and the descriptive statistics for evaluating results are the LEA-by-LEA results. The LEA-by-LEA results fields are as follows:

- District name, total district enrollment (defined as the average of Fall and end-of-year enrollment), and an indicator of charter school status are included in columns A through C.
- Variables that are relevant for the distribution of funding through the weighted formulas, including student enrollment percentages by need category, geographic cost adjustments, enrollment percentages by school level, school enrollment size categories, and population density categories are included in columns D through V. Note that charter schools with low enrollments are assigned to the enrollment category that represents the average sized district school across schools with the same grade configuration as the charter school.
- The results of the funding simulation in terms of the needs index, target funding, and both absolute and percentage funding gaps (as well as the total current spending excluding federal dollars) are shown in columns W through AA.
- Simulations for the raising of revenue in an equitable way are shown in Columns AB-AJ. In particular, it shows how much local revenue could be raised if a constant statewide property tax based on full property valuation was used. The state would then be responsible for the remaining obligation.
- Actual spending per pupil from local and state sources are shown in Columns AK and AL, respectively, which serve as points of reference for Columns AI and AJ.

School Unit Funding Simulator

Delaware’s current system is known as the unit system and distributes units to schools rather than dollars. Units are intended to represent teacher positions along with a small portion of funding to cover costs of nonpersonnel and utilities. Units are assigned based on ratios of

students to units. In other words, for a certain number of students defined by the student to unit ratio schools will receive one unit. Following the description of the simulator, we describe the process we took for translating our ECM and PJP results into a unit-based funding formula.

Descriptions of User-Input Cells

User-input cells are identified using gold cells. They include the following:

- **Custom Amounts** – This panel (cells D1 through D13) allows users to enter their own custom student-to-unit ratios. Higher values generate fewer units for a given enrollment and lower values generate more units. Values of 0 and negative values are not plausible. Cells should be left blank if units should not be assigned for a given category. At minimum, units must be assigned on the basis of elementary, middle, and high school enrollment.
- **Use recommended or custom ratios?** – A dropdown menu (cell J2) allows users to choose the ratios to apply, where the options are the ECM-based estimates, PJP-based estimates, and custom amounts. The ECM and PJP-based estimates are meant to assign units to match the ECM and PJP targets as closely as possible. We describe how we calculated student to unit ratios to mimic the ECM and PJP-based approaches in the following section.

Fields Included to Evaluate Results

There are several descriptive statistics included at the top of the simulator to allow users to evaluate simulated funding projections generated by a custom funding formula in comparison to the funding targets specified by the ECM and PJP analyses. They are intended to demonstrate how far off the simulated target funding levels are from the targets based on the ECM and PJP results. In particular, if the simulated results using custom weights deviate substantially from the ECM and PJP-based results, that is a signal that the custom weights as specified will not provide equal opportunity to achieve the state's outcome goals. The descriptive statistics included are as follows:

- **Correlation with ECM target** – Cell O5 shows the correlation between simulated funding per student and the ECM target funding per student.
- **Correlation with PJP target** – Cell O6 shows the correlation between simulated funding per student and the PJP target funding per student.
- **Total funding through unit simulation** – Cell J9 shows the total amount of funding allocated through the unit simulation.
- **Total funding through ECM target** – Cell J10 shows the total amount of funding that would be allocated if the ECM target levels of funding were applied.
- **Total funding through PJP target** – Cell J11 shows the total amount of funding that would be allocated if the PJP target levels of funding were applied.

- Simulation funding as a percentage of ECM/PJP – Cells L10 and L11 show the simulated funding levels as a percentage of the ECM and PJP target funding levels, respectively.

School-By-School Results

Below the user-input cells and the descriptive statistics for evaluating results are the school-by-school results. The school-by-school results fields are as follows:

- District name and school name are included in columns A through E.
- Variables that are relevant for the distribution of funding through the unit-based formulas, including student enrollments by grade range and student need category, as well as geographic cost adjustments are included in columns F through P.
- Variables representing the dollar amounts of certain formula components are shown in columns Q through T. In particular, those columns show the floor plan amount, the overhead amount, and the unit price. The floor plan, overhead per pupil, and unit price vary across schools only as a result of geographic cost differences.
- The results of the funding simulation in terms of units assigned are shown in columns U through AB and represent the application of the selected student to unit ratios to the actual enrollments in each school.
- The results of the funding simulations in terms of funding amounts are shown in columns AC through AH, along with columns for the ECM and PJP targets and actual spending.

Translating ECM and PJP-Based Funding Targets into a Unit-Based Formula

For the “School Unit Funding Simulator,” we took several steps and made several assumptions to translate the ECM and PJP-based funding targets into a unit-based formula of sorts. This section documents those assumptions.

Currently, the unit system provides units to schools that are meant to cover teaching staff. In addition, a large number of positions (superintendents, principals, nurses, school and district-level administrative staff, school lunch supervisors, drivers’ education instructors, related service providers, etc.), additional “units” (e.g., for mental health services, academic excellence, etc.), and other forms of funding (e.g., opportunity funding and equalization funding) are provided outside of the main formula. The number of different components that contribute to overall funding in the current system makes it extremely difficult to model in a succinct and comprehensive way how resources make it to districts and schools under the current system; even if we could, the complexity (and rigidity, with respect to allocation of certain position types) would make it challenging to determine how to alter it in a way that could closely

approximate the target funding levels from our ECM and PJP analyses. Therefore, we made some assumptions and simplifications. Below we describe some of the assumptions and simplifications we made:

- Provide districts an amount per student to cover the bulk of “overhead” expenses for centralized services, food, transportation, and maintenance and operation. We chose \$2,800 per student plus actual transportation spending from state sources as the minimum overhead amount. The \$2,800 overhead portion is upwardly adjusted for schools and districts in higher geographic cost areas by 0.65 times the Delaware centered CWIFT, under the assumption that 65% of costs are salary-based and would therefore be subject to geographic differences in salaries.
- Provide each school a “floor plan amount” to cover a minimum amount of non-instructional staff required by each school. The minimum floor plan amount under our simulation is \$506,423 per school. This is the amount we calculated that is necessary to cover the salaries and benefits of a principal, counselor, administrative assistant, and secretary. The floor plan is adjusted upward for schools and districts in higher geographic cost areas in the same way as described for the overhead amount.
- Fund all other staffing positions not accounted for using the overhead and floor plan allocations through units. This would require some amount of flexibility in how units can be used. Not all staff types cost the same amount, so there would have to be some sort of system to convert units of teachers to units of different types of staff, whether that be assistant principals, teaching assistants, etc.
- Use a constant unit price that accounts for both state and local contributions. Currently, the price of units is thought of only in terms of state funding, other than a rule of thumb that the state pays about 70% of the cost of salaries. The average unit value in terms of state funding as of the 2022–23 school year is \$80,052 (Klein, 2023). However, the actual value the state pays is based on a state salary schedule, such that teachers with more experience or with more education have a higher price. This is potentially a source of inequity if certain types of districts and schools typically have less experienced teachers than others. Our model uses a fixed unit price of \$120,000 per unit, which is intended to cover the total cost (state and local portion) of a relatively experienced teacher. Although we do not model this, we would recommend that the state portion of that \$120,000 per unit cost vary across districts depending on local capacity, such that in districts with low capacity to raise local revenue at a reasonable tax rate the state portion would be higher, and the local portion would be lower. If the actual cost per unit for a district is lower than \$120,000 (because teachers are less experienced than average, for example), then they should be allowed to retain the full state funding amount, which could be used for additional resources. In districts where the actual cost per unit is higher than \$120,000 (which would likely be few,

because the unit price is pegged at the level of experienced teachers), local funding would be expected to cover the additional cost per unit. The per unit cost is adjusted upward for schools and districts in higher geographic cost areas in the same way as described for the overhead amount.

To estimate the number of units needed in each school, we converted the estimated per-pupil target funding amounts through both the ECM- and PJP-based approaches into total funding by multiplying the per-pupil amounts by total enrollment. From the total funding, we subtracted amounts for overhead and the floor plan. We then divided by the assumed unit value (\$120,000 geographically cost adjusted).

After converting total funding into units, we ran a regression model with units as the outcome variable and total enrollment, high school enrollment, middle school enrollment, low-income enrollment, total students with disabilities enrollment, and enrollments of students with complex and intensive disabilities as the predictor variables. The resulting regression coefficients for each of these variables indicates the increase in units per increase in enrollment. To express the coefficients as enrollments per unit, we divided 1 by each of the coefficients. The results are shown in Exhibit 1. Note that unlike the enrollments used to assign units in the existing system, the enrollment categories used in our calculations are not mutually exclusive. Therefore, a single student could generate units in multiple categories. For example, an elementary student who is from a low-income family and is an English learner would contribute to the units generated through the elementary enrollment category, the low-income category, and the English learner category. The high R^2 values for the regressions indicate that the unit-based formulas for both the ECM and PJP-based funding targets explain approximately 99% of the variation in units across schools.

Exhibit 1. Regression-Based Estimation of Units per Enrollment and Calculated Enrollment per Unit

Enrollment Categories	ECM		PJP	
	Units per Enrollment	Enrollment per Unit	Units per Enrollment	Enrollment per Unit
Elementary grades	0.038	26.6	0.051	19.6
Middle grades	0.032	31.7	0.034	29.4
High school	0.044	22.6	0.056	18.0
Low-income	0.095	10.5	0.069	14.5
English learner	0.005	216.9	0.096	10.5
Students with disabilities	0.175	5.7	0.164	6.1
Students with intensive disabilities	–	–	0.399	2.5
Students with complex disabilities	0.230	4.3	0.564	1.8
Vocational	0.177	5.6	–	–
Non-enrollment-based units	2.17	2.17	-1.03	-1.03
<i>N</i>	199		199	
<i>R</i> ²	0.992		0.993	

Note: This analysis omits six schools where more than 50% of students have disabilities.

References

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