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Fiscal and Academic Efficiency Index of the Public School Districts of Arkansas

Mary F. Hughes

In *Lake View v. Huckabee*,[1] the Supreme Court of Arkansas stated that the Education Article[2] of the Arkansas Constitution designates the state, rather than the General Assembly, as the entity to maintain a general, suitable, and efficient system of free public schools. In *Lake View*, the Arkansas Supreme Court affirmed a lower court decision declaring the state education finance system unconstitutional on the twin grounds of inadequacy under the Education Article and inequality[3] under the Equality provision of the Arkansas Constitution. The supreme court stayed its order until January 1, 2004 to allow the state to conduct an adequacy study, and "time to chart a new course for public education in the state." In September 2003, a study prepared for the Arkansas Joint Committee on Educational Adequacy[4] recommended new funding of $847 million in addition to the current state and local expenditures of $2.6 billion for 310 school districts, housing 439,742 students in average daily membership.[5] On December 8, 2003, the governor called a special session of the general assembly to consider education reform and how to fund it.

In response to the *Lake View* declaration for school reform that would meet constitutional demands, the Arkansas Association of School Administrators (AASA) proposed to the governor and the general assembly an education reform model that included an efficiency measure.[6] The central components of the model were: (1) Substantially equal teachers' salaries; (2) substantially equal curricula and equipment; (3) substantially equal school facilities; (4) substantially equal school funding; and (5) substantially efficient and effective operation of schools.

This article will discuss the efficiency component of the AASA model. The first section of the paper will provide information on how and why the first efficiency model was developed, including: Background of the First Efficiency Model Using Standardized or Z-Scores; a descriptive overview of Arkansas school districts; a review of literature on Arkansas school district size and consolidation, and the results of the first efficiency study that incorporated standardized scores. The second section will provide a formal discussion of the fiscal and academic efficiency school district index model that was adopted by the AASA and the statistical construction of the model using factor analysis.

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How and Why the First Efficiency Model Was Developed

Background of the First Efficiency Model Using Standardized or Z-Scores

The first School District Efficiency Model was developed as part of a larger research project that looked at tax savings and tax reform in response to the 2001 Pulaski County Chancery Court ruling in *Lake View v. Huckabee*.[7] One part of that project sought information about the cost-savings and benefits of restructuring Arkansas public school districts. The challenge faced was to determine which school districts would be included in the projected cost-savings. Would this determination be made by school district size, and, if so, what would be the magic number for inclusion? As the review of the literature will indicate, the recommended school district size for efficient economy of scale is varied, depending on the definition of size, the methodology, and the state in which the study was conducted. For this project, the conclusion was made that district size should not be the measure for selecting school districts that would be included in the projected cost-savings and benefits for restructuring. Therefore, some other measure, such as an efficiency measure, should be constructed for each school district and that measure would guide the study in the determination of district inclusion.

Descriptive Overview of Arkansas School Districts, 2000-2001

In 2000-2001, Arkansas had 444,978 students in Average Daily Membership (ADM) attending 310 school districts, with total spending for net current expenditures (excluding federal funds) of over $2.3 billion. The average net current expenditure per pupil in ADM was $5,207. The school districts employed 23,982 full-time classified personnel and 31,109 full-time K-12 certified personnel. The average salary for a K-12 teacher was $34,729 and for a school district superintendent, $72,580. School district enrollment ranged from 71 pupils in ADM in Witts Springs (Searcy County) to 23,444 in Little Rock (Pulaski County). Of the 310 school districts, 196 had an enrollment of fewer than 1,000 students in ADM, which represented 63% of the districts and 23% of total ADM. Presented in Table 1 is an overview of the 310 school districts by size. For illustration purposes, note in Table 1 that district size category between 200 and 299 students records 31 school districts that represent 10% of all districts, 1.8% of all students in ADM, and an average net current expenditure of $6,189 per student.

Presented in Figure 1 and Figure 2 is expenditure per pupil by school district size as exhibited in Table 1. Shown in Figure 1 is net current expenditure per student in ADM by the smallest to the largest school district size. Current expenditure, including federal funds, is shown per student in ADM by school district size in Figure 2. A slight "U" curve is present in both figures instead of a true linear relationship between school district size and per-pupil expenditure. The smallest and largest school district enrollments have the greatest expenditures per pupil.

Review of the Literature on Arkansas School District Size and Consolidation

Arkansas Initiated Act 1 of 1948 brought about a reduction from 1,589 school districts in 1948 to 424 districts in 1949. The Act abolished all districts with fewer than 350 children but failed to include a continuing provision. By 1981, 121 school districts had a pupil count of less than 350 students[8] and by 2001, 56 of the state's 310 school districts had fewer than 350 students.[9] From 1983 to 2001, the number of school districts in the state was reduced from 369 to 310.[10] During the

Table 1
School District Size
Arkansas 2000–2001

School District Size	*# of Districts by Size*	*% of Total Districts*	*Total ADM by Size*	*% of Total ADM*	*Current Expenditure Net/ADM ($)*	*Current Expenditure with Fed/ADM ($)*
0 – 99	2	.65	159	0.04	8,397	9,477
100 –199	12	3.9	1,906	0.4	7,411	8,232
200 – 299	31	10.0	7,937	1.8	6,189	6,880
300 – 399	25	8.1	8,623	1.9	5,386	6,009
400 – 499	26	8.4	11,512	2.6	5,261	5,872
500 – 599	37	11.9	20,520	4.6	5,111	5,701
600 – 699	15	4.8	9,888	2.2	4,927	5,560
700 – 799	20	6.5	14,944	3.4	4,967	5,615
800 – 899	16	5.2	13,383	3.0	5,053	5,598
900 – 999	12	3.9	11,325	2.5	4,734	5,265
1,000 – 1,999	62	20.0	86,239	19.4	4,910	5,458
2,000 – 2,999	21	6.8	52,654	11.8	4,866	5,418
3,000 – 3,999	10	3.2	34,631	7.8	5,133	5,616
4,000 – 4,999	6	1.9	26,170	5.9	5,132	5,669
5,000 – 5,999	4	1.3	22,399	5.0	4,934	5,489
6,000 – 6,999	2	0.6	13,301	3.0	5,134	5,533
7,000 – 7,999	3	1.0	22,771	5.1	5,317	5,669
8,000 – 8,999	1	0.3	9,079	2.0	6,300	6,669
10,000 – 10,999	1	0.3	10,925	2.5	4,782	5,205
11,000 – 11,999	1	0.3	11,320	2.5	4,733	5,487
12,000 – 12,999	1	0.3	12,479	2.8	5,774	6,153
19,000 – 19,999	1	0.3	19,376	4.4	5,848	6,382
20,000 +	1	0.3	23,444	5.3	6,673	7,133

second special legislative session in 2003, Act 60, a consolidation act to improve the efficiency of public education, was passed that required administrative consolidation or annexation of school districts of fewer than 350 students with other districts. In all, 57 school districts had to merge administratively with other districts by June 1, 2004.

The report to the Arkansas Joint Committee on Education in 1978, *Educational Equity: Improving School Finance in Arkansas*, stated that the optimum school district enrollment is not absolute, that each state should establish its own optimum enrollment size to allow each district to function at the most effective and efficient level possible.[11] The report indicated that districts with enrollments of 1,000-1,499 were the most efficient, based on the average expense per Average Daily Attendance (ADA), and administrative costs were most efficient in districts with enrollments of 1,500 to 4,499. Also, the report noted that very small and very large districts were operating inefficiently.[12] Recommendation No. 6 of the report was School District Reorganization with part (a) stating: "Immediate steps should be taken to alter state funding procedures so as not to encourage the perpetuation of small inefficient school districts."[13] In the explanation of this recommendation, the report went on to say that state finance policy has tended to encourage the maintenance of small units rather than serving as an incentive to reduce their number and concluded: "In viewing alternative organizational arrangements, more intensive study of the issue should include overall educational, geographical, and economic considerations before recommendation of a specific revised organization."[14]

The Advisory Committee to the Arkansas Board of Education also proposed school reforms after the May 2001 court decision.[15] The August 2002 report by the Advisory Committee discussed improving the efficiency of elementary and secondary education by asking the question: "Does the system accomplish the purposes for which it was created with the least consumption of resources (economic efficiency or efficient use of resources)?"[16] A study produced for the committee by the Education Commission of the States on Arkansas school districts found low pupil-to-teacher ratio as an indicator of economic inefficiency because the low ratio increased the consumption of resources while decreasing the likelihood of achieving the system's purpose.

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Figure 1
Net Current Expenditure per ADM by School District Size
(Average Net Current Expenditure/ADM – $5,207)
Arkansas 2000–2001

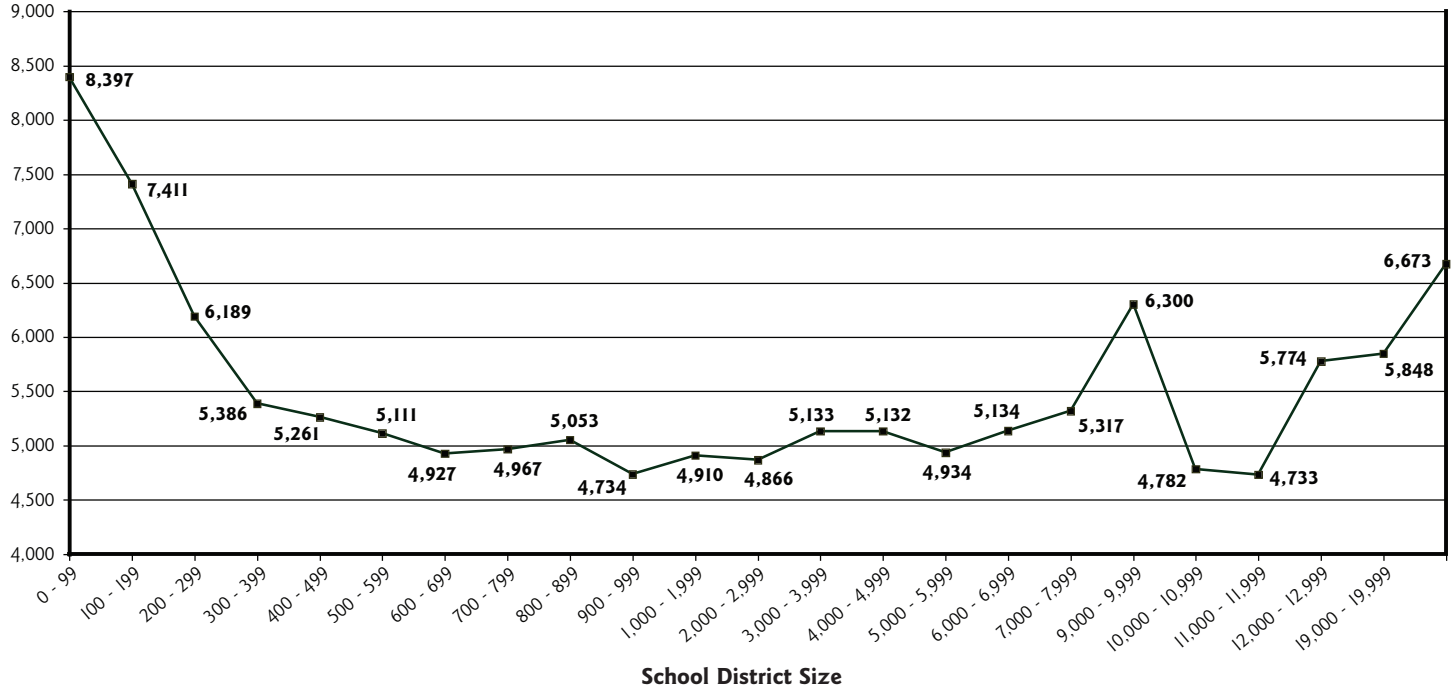
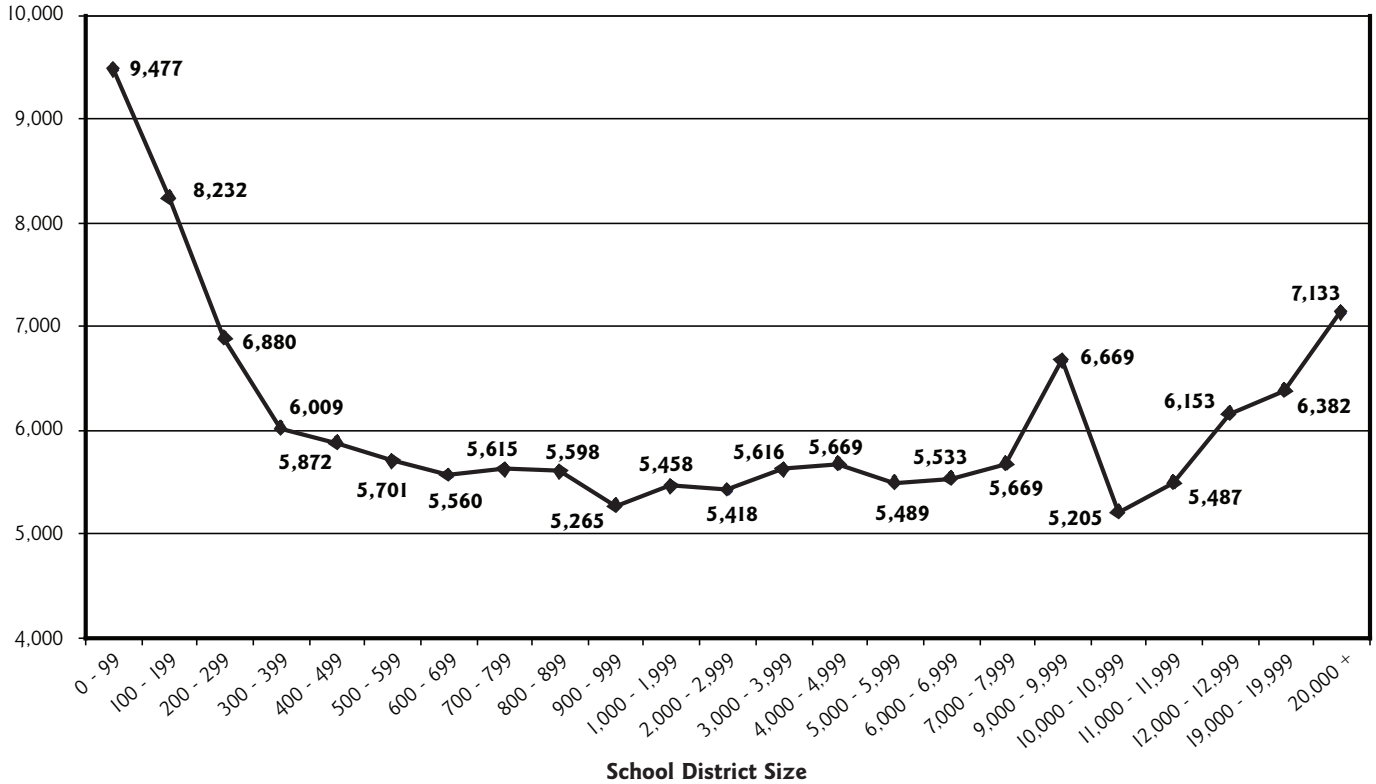


Figure 2
Current Expenditure with Federal Funds per ADM by School District Size
(Average Net Current Expenditure/ADM – $5,738)
Arkansas 2000–2001



A 1990 study on Arkansas school consolidation explained that certain costs such as capital outlay, staff salaries, utilities, and the like, remain for all school districts regardless of size, but that smaller schools were unable to realize any significant economies as fixed expenses are divided among a limited student population, thereby increasing per student production costs.[17] This study also noted that school districts could be either too small or too large to achieve maximum operating efficiency and that studies on school size have suggested that when a district lies within a range of 600 to 1,600 students, optimum economies of scale can be expected. However, the study pointed out, the scale was subject to circumstances of geographic location, transportation, and capital outlay expenditures. The study cautioned that consolidation of school districts must be considered on an individual basis, weighing the advantages and disadvantages of each particular case, that low pupil-to-teacher ratios in Arkansas school districts were primarily, though not exclusively, the result of operating small high schools.

In past and present studies on Arkansas school district consolidation, economies of scale and efficiency have shown that an optimum enrollment size to allow each district to function at the most effective and efficient level possible is not absolute and that all school districts regardless of size have certain costs; and because of these costs, smaller schools are not able to realize significant economies because the fixed expenses are divided among a smaller student population. Also, a lower student-to-teacher ratio contributes to the consumption of resources. Several of the studies cautioned that consolidation of school districts must be considered on an individual basis.

From past studies on economies of scale and efficiency, the author found that an optimum enrollment size to allow each district to function at the most effective and efficient level was not absolute. After a review of 2000-2001 school district size and expenditure per pupil, and past studies, the conclusion was that this study must look at each school district individually over many variables if a defensible determination was to be made about the projected cost of restructuring. Therefore, the study sought to identify effective and efficient school districts.

Use of Standardized or Z-Scores

The question posed by the study was: If the state educational system were restructured, what amount of cost-savings might be available for educational improvements? The first step in determining the cost-savings of restructuring was to create a plan for identifying school districts that were operating efficiently or that were producing the desired effect with desired costs relative to the state average. Another influence on the construction of the study came from the Town Meetings of the Blue Ribbon Commission[18] that were held across the state in the spring of 2002. Many citizens voiced their concern that school districts should not be judged "just by size" on school district reorganization but that all components of the district should be examined, especially achievement outcomes.

After much reflection, a set of criteria for examining each school district was devised. The criteria were "indicators of efficiency". In all, 28 indicators of operational and academic efficiency were examined, including nine indicators of achievement outcomes. These indicators were selected through four categories that were determined to be instrumental to a school district's operation as an educational institution. The four categories and their indicators of efficiency were: (1) Fiscal efficiency (8 indicators); (2) academic achievement efficiency (9 indicators); (3) size efficiency (5 indicators); and (4) administration efficiency (6 indicators).

An operational and academic efficiency score was developed for each of the 310 school districts in Arkansas for the purpose of determining the cost and benefits of restructuring. For each district, 19 operational measures and 9 achievement measures were converted to a standardized score.

Each of the 28 operational and academic indicators was converted to a standardized score so that each school district could be compared to the other school districts in the state on each measure. The standardized score or "Z" score would have a mean of zero and a standard deviation of one. The relative position of each school district on each indicator would be the number of standard deviations above or below the mean of zero. The total score of the 28 standardized indicators for each school district would indicate an efficient or inefficient school district relative to the other school districts, as measured by these indicators. It should be noted that free and reduced price lunch status and student race were not included as indicators of operational and academic efficiency as neither are a cost item or an outcome measure. Federal funds and students per square mile were also not included as efficiency measures. Student race, free and reduced price lunch status, and students per square mile were presented in the study only to describe the demographics of each school district.

Standardized scores or Z-scores are used to compare scores from different distributions even when the scores are measuring different things (the same concept as percentage). The Z-score is a relative position of a raw score in a distribution relative to the mean and standard deviation of that distribution. The Z-score depends upon the distribution. The highest Z-score in one distribution may be +3 and +1 in another. The Z-score distribution will have a mean of zero and a standard deviation of one. A particular raw score, changed to a Z-score, will show how many standard deviations the raw score is above or below the mean. The formula for deriving a Z-score is: Z = (raw score - mean) divided by the standard deviation. By using Z-scores, this study positioned each school district relative to all the school districts in the state on the 28 school district measures. The reliability or internal consistency of the 28 indicators of efficiency used in this study was r = .86. A good indicator of reliability is r = .80.

The actual costs and performance level of each school district were measured by their relative position above or below the state average. The sum of the costs and performance level scores or Z-scores depicted a school district's ability to produce desired performance outcomes with desired costs relative to the state average. A school district that had high costs or moderately high costs and low student performance was termed inefficient. Data and definitions from the 1999-2000 and 2000-2001 *Annual Statistical Report of the Public Schools of Arkansas* (ASR) were used in this study. The data used for the ASR were self-reported by the individual school districts and were not audited prior to submission to the Arkansas Department of Education.

School Districts by Efficiency Score

After the 28 indicators of efficiency for each school district were converted to a standardized score, the 28 standardized scores were totaled, and the 310 school districts were ranked on the total efficiency score. The total standardized efficiency score for the districts ranged from -3.029 to +2.1903. This indicates that the least efficient school

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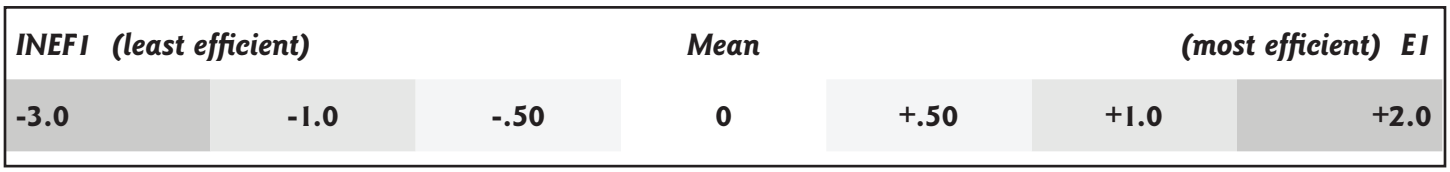
Graph 1



district, as measured by the 28 indicators, was three standard deviations below the mean and the most efficient school district was two standard deviations above the mean. Overall, 135 school districts had a negative score, or an indication of being inefficient, and 175 had a positive or efficient score.[19]

Because there were different degrees efficiency, as measured by the 310 standardized scores, the school districts were placed in eight categories based on their total standardized score ranging from the least efficient to the most efficient. School districts with a standardized score between -3.0 and -1.04 were labeled INEF1, indicating the least efficient school districts. Standardized scores between +1.01 and +2.19 were labeled E1, the most efficient districts. The line graph (See Graph 1) depicts the continuum of standardized scores, with zero as the mean, negative scores to the left of the mean, and positive scores to the right.

Cost-savings to Restructure

Several scenarios were used to compute the cost-savings of school district restructuring. In each of the scenarios, some school districts had to receive extra funding to bring them up to the expected cost level while other districts recorded a savings. The first scenario involved the average cost per student of the 101 most efficient school districts (E1 and E2) as the measure of what an efficient school district's cost per student should be if that school district had an average ADM of 2,000. The current expenditure per student of the 101 most efficient school districts was $4,958, and the average enrollment in ADM was 2,000.

To arrive at the cost-savings for this first scenario, ADM for each of the 131 least efficient school districts with less than 2,000 students was multiplied by $4,958. Each product was subtracted from the district's total net current expenditure, resulting in the cost-savings for restructuring to a 2,000 ADM district. Twenty-two of the 131 least efficient school districts had expenditure per student of less than $4,958; so the cost to level up for those school districts was $2,847,117. The cost-savings for the remaining districts was $38,131,904, resulting in a net cost-savings of $35,284,787.

The second scenario was to apply the average state cost per student of $5,207 to the 131 least efficient school districts with an ADM of less than 2,000. The net cost-savings was $18,310,955. The third and fourth scenarios were to apply the average cost per student of the most efficient school districts with an average enrollment of 900 students in ADM to the least efficient school districts with the same or lower ADM. The average cost per student for the most efficient school districts with an average enrollment of 900 students in ADM was $4,722. Applying this cost to the 117 inefficient school districts with less than 900 students equated to a total net savings of $40,097,655. Applying the same average cost to the 106 inefficient school districts with less than 600 students resulted in a net savings of $34,471,410.

From combining school district size and the most efficient school district categories (E1 and E2), the data indicated that the most efficient K-12 Arkansas school districts were those with a student enrollment of at least 900 up to 12,000 students in ADM. The data also indicated that 26 school districts with less than 900 ADM recorded an efficiency score that placed them in the E1 or E2 category, the most efficient category ranks.

Presented in Table 2 is a summary of the cost-savings under different scenarios. The data indicate that the greatest cost-savings of restructuring would occur when the 117 least efficient school districts with less than 900 students would reorganize to form school districts of 900 or greater, creating an annual cost-savings of $40,097,655. In addition to the cost-savings, the major benefits or restructuring would be higher teacher salaries and educational improvements for 47,500 students. Both efficient and inefficient school districts were found in most school district size categories.

In general, the least efficient school districts had high expenditures per pupil, low K-12 teacher salaries, low pupil-to-teacher ratios, low pupil-to-classified personnel ratios, low pupil-to-administration ratios, declining enrollment, and below average test scores. On all nine measures of academic efficiency, the inefficient school districts recorded the lowest test scores and the most efficient districts recorded the highest test scores. With regard to demographics, school districts in three of the four least efficient categories (INEF1, INEF2, INEF3) recorded

Table 2
Cost-Savings
Cost per Student by Most Efficient School Districts Applied to Least Efficient School Districts

Suggested School District Size in ADM	*Average Current Expenditure/ADM of Efficient Districts ($)*	*# Least Efficient School Districts with Less Than Suggested ADM*	*Total ADM of Inefficient School Districts*	*Net Savings ($)*
600	4,722	106	38,903	34,471,410
900	4,722	117	47,488	40,097,655
1,000	4,736	118	48,934	38,617,996
2,000	4,958	131	68,168	35,284,787
State Average	5,207	135	87,751	23,356,931

Table 3
Race, Free & Reduced Lunch, Square Miles by School District Efficiency Rank
Arkansas

Efficiency Rank	*# Districts*	*2001–2002 % White*	*2001–2002 % Black*	*2001–2002 % Hispanic*	*2001–2002 % Free & Reduced Lunch*	*ADM/ Square Mile*
INEF1	43	53	45	2	71.8	2.8
INEF2	35	70	27	2	61.7	3.7
INEF3	27	68	29	2	60.3	7.3
INEF4	30	84	13	3	53.6	5.8
E4	36	81	16	3	47.7	24.1
E3	40	83	14	3	46.9	10.1
E2	51	93	4	2	42.3	11.2
E1	48	90	5	4	35.7	26.1
State	310	71	23	4	51.4	12.0

Note: INEF1 = Lowest efficiency rank; E1 = Highest efficiency rank.

the highest percentage of students receiving free and reduced price lunch, the highest percentage of African American students, and the lowest number of students per square mile among the eight categories of efficiency. (See Table 3.)

Measuring Adequacy

It would seem that the cost of an adequate education could be determined from the data on the 48 most efficient school districts in the state. After all, these school districts recorded the highest student achievement, the highest teacher salaries, and some of the lowest per student costs for operations and maintenance and administration. This would be in line with the "Successful School Approach" for finding a target base cost. [20]

The "Successful School Approach" relies upon school districts already achieving state standards to establish the cost of an adequate education. One of the benefits of the successful schools approach is that it allows for development of an efficiency factor. Schools spending a significant amount more per pupil than the average successful school may not be considered when determining a base cost. The average cost of the successful schools to provide an adequate education yields the base cost. The base is then adjusted for students with special needs or students considered at risk. The successful school approach has produced base cost targets currently in use in several states.[21]

The average teacher salary for the 48 most efficient Arkansas school districts was $37,422 compared to $34,729 for the state, and the student-to-teacher ratio was 15.5 compared to 13.3 for the state. The cost per student for operations and maintenance was $512 compared to $587 for the state, and the cost of a superintendent per student was $45 compared to the state average of $116. Total school administration cost per student was $288 compared to $328 for the state average. On eight of the nine test score measures, the 48 most efficient school districts scored the highest in the state. The combined enrollment within the 48 districts was 156,666, ranging from enrollment size of 600 to 12,000.

As stated earlier, student race and the percentage of students receiving free and reduced price lunch were not measures of efficiency, nor was the number of students per square mile. To help present an overall view of the school districts located within the eight categories of efficiency, these demographic measures are presented in Table 3. The 48 school districts in E1, the most efficient school district category, have the highest percentage of Hispanic students and the greatest number of students per square mile. School districts in three of the four least efficient categories, INEF1, INEF2, and INEF3, record the highest percentage of African American students and students receiving free and reduced price lunch. On average, the 48 most efficient school districts have a student population that is 90% white, 4.5% African American, and 4.1% Hispanic, with 63% of the students paying for their school lunch. The state average student enrollment is 78.5% white, 18% African American, and 2.5% Hispanic, with 48.6% of the students paying for their school lunch. Because of the wide student diversity found across the state, the needs of the individual students would have to be considered in addition to this method of determining the cost of an adequate education.

Fiscal and Academic Efficiency Index Construction: Factor Analysis

During the summer of 2003, the Arkansas Association of School Administrators asked for input on an efficiency index that could be used in their education reform model in response to the 2002 *Lake View* case. The basic premise of the previous study on the cost of school district reorganization was used to develop this index. The purpose of the Fiscal and Academic Efficiency Index was to provide a relative measure of school district efficiency that included instructional and non-instructional costs and academic outcomes. The index was defined as a composite measure that indicated a school district's ability to produce desired performance outcomes with desired costs relative to the state average. Instead of using standardized or Z-scores, this index incorporated factor analysis to determine individual school district rankings and composite scores.

The Fiscal and Academic Efficiency Index was constructed by using the statistical procedure of factor analysis. The Index included a three-year average of the most recent available public school district data

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for instructional and non-instructional costs and student achievement measures including norm-referenced and criterion-referenced tests. Also, a separate Fiscal Efficiency Index and Academic Efficiency Index were computed using the same method and appropriate variables. (See Appendix for a complete list and definition of variables.) The purpose of the two separate indexes was to better explain and evaluate the results of a school district's composite Fiscal and Academic Efficiency Index score.

Factor analysis is a general scientific method of reducing a large number of variables to a few factors by combining variables that are moderately or highly correlated with each other. Each combined set of variables forms a factor, which is a mathematical expression of the common element in the combined variables. With the process of factor analysis, different investigators using the same research design and factor technique on the same data will arrive at the same results, as follows:[22]

(1) Factor technique for this design using SPSS: Principal Component Analysis with Varimax Rotation, Eigen value over one;
(2) Missing Values: Exclude cases listwise;
(3) Factor weights: Computed by taking the percentage of variance attributed to each factor divided by the total explained variance;
(4) Index scores: The standardized score of the sum of the weighted factor scores. The standardized scores have a mean of zero and a standard deviation of one;
(5) School District Rating: Through this method a large number of variables are reduced to a scale or an index on which school districts can be rated. The process generates an index or standard score for each public school district;
(6) Variables included in the factor analysis are instructional and non-instructional cost related variables and student achievement measures for each public school district in Arkansas;
(7) Descriptive Statistics: Factor Score: -3.53 to +2.15.

Each school district was ranked on the Composite Efficiency Index with accompanying Fiscal Efficiency Index and Academic Efficiency Index. By separating out the Fiscal Efficiency Index and the Academic Efficiency Index, a school district could see in which areas they were high or low in and how the Composite Index was constructed. School districts could have a high Fiscal Efficiency Index score, a low Academic Efficiency Index score or the reverse and still have a positive composite score. This is one of the challenges of a combined fiscal and academic composite score. To address this problem, each of the separate index scores might be assigned a grade ranking of A, B, C, D, F to visually represent how a school district was doing in each category.

The Fiscal and Academic Efficiency Index could be used for ranking, comparative evaluation, assistance identification, and fiscal and academic accountability of the public school districts, as follows:

(1) Evaluation between cost and effectiveness;
(2) Accountability of how local and state tax money is being spent relative to all districts in the state and districts with similar demographics;
(3) Accountability to students and their educational achievement;
(4) Ranking of the public school districts on fiscal efficiency, academic efficiency and the composite Efficiency Index;
(5) Comparative evaluation of costs and outcomes by individual public school districts relative to districts with similar demographics, and relative to the state average on component measures;
(6) Identification of public school districts that may be in need of assistance;
(7) Evaluation of costs and outcomes relative to the district's educational philosophy and goals.

Conclusion

Overall, the school district superintendents considered the Fiscal and Academic Efficiency Index a good representation of the school districts in Arkansas and adopted the method as part of their reform proposal in answer to *Lake View*. Even though the indexes were constructed from school district data with no intended bias presented in the formulation of the indexes, some districts felt the index was not fair. The 43 least efficient school districts were small districts with high rates of poverty and in some cases, high percentages of African American students. Also, they had relatively high expenditures, high administrative costs, high operation and maintenance costs, low teacher salaries, low pupil-to-teacher ratios, and very low-test scores on nine achievement measures. Here the index could serve as a basis of need with regard to the adequacy study. Of interest is the finding that many small, high poverty school districts had efficient scores, and some large school districts had inefficient scores.

The fiscal and academic efficiency index was not constructed for determining school consolidation but for determining how school districts were operating relative to other school districts in the state. Many districts used the data to improve their fiscal operations relative to districts similar in size and to note their achievement levels relative to school districts with similar students. The utility of the indexes are many, as noted above. A spreadsheet with three year averages of instructional, non-instructional, and achievement measures; and demographic data, composite efficiency index, fiscal efficiency index, and academic achievement index of the 310 school districts was available for each school district to download. Many school districts across the state used the information for internal analysis.

The two methods used for measuring fiscal and academic efficiency, the standardized or Z-score method and the factor analysis method, resulted in similar school district rankings. Both methods measured school districts relative to each other and presented each school district with a standard deviation score that was above or below the mean. From the analysis of the data, the best method for complete disclosure was the presentation of both the Fiscal Efficiency Index score and the Academic Efficiency Index score with a composite index score. This provided a comprehensive view of a district's fiscal operations and academic outcomes relative to the state average. As noted in the Introduction, the state, not the General Assembly, has the legal responsibility to maintain a general, suitable, and efficient system of free public schools in Arkansas. The Fiscal and Academic Efficiency Index was one proposed way to address the constitutional demand for an efficient system of free public schools.

Appendix
Variables in Factor Analysis

Instructional and non-instructional cost-related variables and student achievement measures could include but might not be limited to:

Student Achievement Measures

ACT – Composite: Three-year average of the American College Testing(ACT) Assessment, a norm-referenced skill level test over English, mathematics, reading, and science reasoning. The assessment is designed to assess high school students' general educational development and their ability to complete college-level work. ACT scores range from 1 (low) to 36 (high).

Algebra I - End of Course: Three-year average of the percentage of students scoring at the "advanced" and "proficient" levels, combined population. The Algebra I Spring End of Course Examination, a criterion-referenced test, is based on the Arkansas Curriculum Frameworks and the Algebra I Course Goals as part of the Arkansas Comprehensive Testing Assessment and Accountability Program (ACTAAP) in response to Arkansas Legislative Act 1172.

Geometry – End of Course: Three-year average of the percentage of students scoring at the "advanced" and "proficient" levels, combined population. The Geometry Spring End of Course Examination, a criterion-referenced test, is based on the Arkansas Curriculum Frameworks and the Geometry Course Goals as part of the Arkansas Comprehensive Testing Assessment and Accountability Program (ACTAAP) in response to Arkansas Legislative Act 1172.

Literacy (Grade 11) End of Course: Three-year average of the percentage of students scoring at the "advanced" and "proficient" levels, combined population. The Literacy (Grade 11) Spring End of Course Examination, a criterion-referenced test, is based on the Arkansas English Language Arts Curriculum Framework as part of the Arkansas Comprehensive Testing Assessment and Accountability Program (ACTAAP) in response to Arkansas Legislative Act 1172.

Benchmark 4th Grade – Math: Three-year average of the percentage of students scoring at the "advanced" and "proficient" levels, combined population. The Benchmark exams are criterion-referenced tests aligned to the Frameworks developed by Arkansas teachers and the Arkansas Department of Education. Students scoring at the "advanced' level demonstrate superior performance well beyond "proficient" grade level performance, and students scoring at the "proficient" level demonstrate solid academic performance for the grade tested and are well prepared for the next level of schooling. Other levels of student achievement on the Benchmark exams are "basic", and "below basic".

Benchmark 4th Grade – Literacy: Three-year average of the percentage of students scoring at the "advanced" and "proficient" levels, combined population.

Benchmark 6th Grade – Math: Three-year average of the percentage of students scoring at the "advanced" and "proficient" levels, combined population.

Benchmark 6th Grade – Literacy: Three-year average of the percentage of students scoring at the "advanced" and "proficient" levels, combined population.

Benchmark 8th Grade – Math: Three-year average of the percentage of students scoring at the "advanced" and "proficient" levels, combined population.

Benchmark 8th Grade – Literacy: Three-year average of the percentage of students scoring at the "advanced" and "proficient" levels, combined population.

SAT Grade 5: Stanford Achievement Test, Ninth Edition, (SAT 9) norm-referenced test. Basic Battery includes a composite score for mathematics, vocabulary, and reading comprehension.

SAT Grade 7: SAT 9 norm-referenced test. Basic Battery includes a composite score for mathematics, vocabulary, and reading comprehension.

SAT Grade 10: SAT 9 norm-referenced test. Basic Battery includes a composite score for mathematics, vocabulary, and reading comprehension.

Instructional and Non-Instructional Cost-Related Measures

Administrative Salary as a Percentage of Net Current Expenditure: Three-year average of the amount paid certified full-time equivalency employees less K-12 certified full-time equivalency teachers divided by net current expenditure, excluding federal funds. This includes the salary of administrative employees including superintendents, assistant superintendents, principals, and supervisors employed by the district and paid from the Teacher Salary Fund. Certified employees paid from federal funds are not included. Benefits paid by the districts such as teacher retirement, FICA/Med, and state-mandated insurance payments are not included.

Administrative Salary per Student in Average Daily Membership (ADM): Three-year average of the amount paid certified full-time equivalency employees less K-12 certified full-time equivalency teachers divided by ADM. This would equal administrative employees including superintendents, assistant superintendents, principals, and supervisors employed by the district and paid from the Teacher Salary Fund. Certified employees paid from federal funds are not included. Benefits paid by the districts such as teacher retirement, FICA/Med, and state mandated insurance payments are not included.

Average Administrative Salary: Three-year average of the amount paid certified full-time equivalency employees less K-12 certified full-time equivalency teachers divided by the number of certified K-12 employees less the number of certified K-12 teachers. Included are administrative employees including superintendents, assistant superintendents, principals, and supervisors employed by the district and paid from the Teacher Salary Fund. Certified employees paid from federal funds are not included. Benefits paid by the districts such as teacher retirement, FICA/Med, and state-mandated insurance payments are not included.

Average K-12 Teacher Salary: Three-year average of K-12 Certified Full-time Equivalency (FTE). Included are K-12 classroom teachers, librarians, counselors, psychologists, and other K-12 certified, non-administrative employees, paid from the Teacher Salary Fund. Certified employees paid from federal funds are not included. Benefits paid by the districts, such as teacher retirement, FICA/Med, and state-mandated insurance payments are not included. In 2000-2001, the amount paid to substitute teachers was excluded in the Annual Statistical Report (ASR). The 1999-2000 ASR included the amount paid to substitute teachers.

Average K-12 Teacher Salary as Percentage of Net Current Expenditure: Three-year average.

Instructional Costs as a Percentage of Current Expenditure: (includes federal funds) Three-year average of Instructional Costs, including: Salaries for instruction; employee benefits for instruction; purchased services for instruction which includes the services of teachers or others who provide instruction to students; computer-assisted instruction expenditures; travel for instructional staff and per diem expenses; tuition; instructional supplies; instructional property; and

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other instructional expenditures. It does not include salaries, benefits, or other expenditures for principals or principals' offices, head teachers serving as principals, full-time department chairpersons, supervisors of instruction, teaching school nurses, or librarians. Source: Common Core of Data (CCD),), http://nces.ed.gov/ccd/ccresources.asp. Current expenditures include: (a) Tuition paid by individuals; (b) transportation fees paid by individuals; (c) Title I expenditures; (d) Title I carryover funds; (e) Title VI expenditures; (f) Title VI carryover funds; (g) food service revenues; (h) student activities revenues; (I) textbook revenues; (j) summer school revenues; and (k) instruction, support services, and non-instructional services except for community services, direct program support. Property expenditures are not included.

Maintenance and Operation (M&O) per Student in ADM: Three-year average of CCD Operations and Maintenance Expenditures by district, including salaries, benefits, purchased services, supplies, property, other, and total, Cycle 1.

Net Current Expenditure per Student in ADM: Three-year average of Net Current Expenditures are current expenditures less exclusions which include: (a) Tuition paid by individuals; (b) transportation fees paid by individuals; (c) Title I expenditures; (d) Title I carryover funds; (e) Title VI expenditures; (f) Title VI carryover funds; (g) food service revenues; (h) student activities revenues; (I) textbook revenues; and (j) summer school revenues. Property expenditures are not included.

Non-Instructional Costs as Percentage of Current Expenditure: Three-year average of Non-instructional services, including food services for students and staff in a school and Enterprise Operations. (1999-2000, 2000-2001). Source: CCD. Includes federal funds.

Pupil-to-Administration Ratio: Three-year average of the number of students in ADM divided by the number of certified full-time equivalent employees less K-12 teachers. Included are superintendents, assistant superintendents, principals, and supervisors employed by the district, and paid from the Teacher Salary Fund. Certified employees paid from federal funds are not included.

Pupil-to-Classified Personnel Ratio: Three-year average of the number of students in ADM divided by the number of classified personnel.

Pupil to K-12 Teacher Ratio (Pupil-Teacher Ratio): Three-year average of the number of students in ADM divided by the number of K-12 certified full-time equivalent (FTE) teachers. The FTE of K-12 certified employees of the district include K-12 classroom teachers, librarians, counselors, psychologists, and other K-12 certified, non-administrative employees paid from the Teacher Salary Fund. Certified employees paid from federal funds are not included.

Superintendent Salary per Student in ADM: Three-year average of Superintendent Salary divided by ADM.

Support Services as a Percentage of Current Expenditure: Three-year average of support services to provide administrative, technical (e.g., guidance and health), and logistical support to facilitate and enhance instruction. Support Services include: (1) Student Support (attendance and social work, guidance, health, psychological services, speech pathology, audiology, and other student support services); and (2) Instructional Staff Support Services, General Administration Support Services, School Administration Support Services, Business Support Services, Operation and Maintenance Services, Student Transportation Support Services, Central Support Services, and Other. Source: CCD.

Demographic Data

Percentage of Students Receiving Free and Reduced Lunch: Total Free and Reduced Lunch count divided by total K-12 grade count.

Percentage of African American Students.

Percentage of Hispanic Students.

Percentage of Students with English as a Second Language.

Public School District Size as measured by average daily membership (ADM).

Data Source

Annual Statistical Report of the Public Schools of Arkansas (ASR) and Arkansas Department of Education "AS-IS." The data used for the *Annual Statistical Reports* are self-reported by the individual school districts. The data are not audited prior to submission to the Arkansas Department of Education. Data definitions are from the 1999-2000, 2000-2001, and 2001-2002 *Annual Statistical Report* (ASR). See Arkansas Department of Education "AS-IS" at http://www.as-is.org and *Annual Statistical Report* at http://165.29.215.34.

Endnotes

[1] *Lake View School District No. 25 of Phillips County, Arkansas, et al., v. Mike Huckabee*, Governor of the State of Arkansas, et al., 351 Ark. 31, 91 S.W.3d 472, 2002 WL 31618995 (Ark, Nov. 21, 2002).

[2] Article 14, Section 1, of the Constitution of the State of Arkansas states: "Intelligence and virtue being the safeguards of liberty and the bulwark of a free and good government, the State shall ever maintain a general, suitable and efficient system of free public schools and shall adopt all suitable means to secure to the people the advantages and opportunities of education."

[3] Arkansas Constitution, Article 2, Sections 2, 3, 18.

[4] Lawrence Picus and Alan Odden, *An Evidenced-Based Approach to School Finance Adequacy in Arkansas*, A study prepared for the Arkansas Joint Committee on Educational Adequacy (Little Rock, Arkansas: September 2003).

[5] Arkansas Department of Education, *Statewide Information System* (2002-2003).

[6] Arkansas Association of School Administrators (AASA), *A Resolution on Behalf of the Public School Students in Arkansas for the Purpose of Providing Them a Quality Education* (Little Rock, Arkansas: AASA, August 2003).

[7] *Lake View School District No. 25 v. Huckabee*, 340 Ark. 481, 10 S.W.3d 892 (Pulaski County Chancery Court, May 25, 2001). The first litigation started in 1992 when Lake View School District No. 25 sued the Governor of the State of Arkansas and other state officials declaring that the school-funding system was unconstitutional. It was not until 2001 that the Chancery Court concluded the current system unconstitutional under both the Education Article and the Equality Article of the Arkansas Constitution.

[8] Ronald Herman Bradshaw, "The Financial Feasibility and Desirability of Establishing a County School System in Arkansas" (Ed.D. diss., University of Arkansas, 1984), 9.

[9] Arkansas Department of Education, *Arkansas Statistical Report 2000-2001* (Little Rock, Arkansas: 2002).

[10] Mary F. Hughes and James E. Metzger, *Restructuring: Cost-savings and Benefits, Arkansas Public School Districts*, February 2003, http://www.uark.edu/depts/coehp/EDAD.htm (under Efficiency).

[11] Kern Alexander, James Hale, et al., *Educational Equity: Improving School Finance in Arkansas* (Little Rock, Arkansas: Report to the Advisory Committee of the Special School Formula Project of the Joint Interim Committee on Education, 1978).

[12] Bradshaw, 25.

[13] Alexander et al., 243-244.

[14] Ibid.

[15] Arkansas Department of Education, *Advisory Committee Report to the State Board of Education* (Little Rock, Arkansas: August 2002).

[16] Ibid., 64.

[17] Richard Patrick Paul, "The Arkansas School Consolidation Issue: A Study of the Relationship of Certain Input Variables on School Effectiveness" (Ed.D. diss., University of Arkansas, 1990), 70-72.

[18] Arkansas Act 1398 in 2001 established the Blue Ribbon Commission on Public Education with membership of 25 Arkansas citizens and six legislators to address educational problems and solutions.

[19] For a ranking of the 310 school districts on the 28 indicators of efficiency see, Spreadsheet: Data Restructuring, Sheet – DataEfficSort (prints 70 pages, 88 columns).

[20] Janet D. McDonald, Mary F. Hughes, and Gary W. Ritter, "School Finance Litigation and Adequacy Studies," *University of Arkansas Law Review* (under review).

[21] John Augenblick, John Myers, Justin Silverstein and Anne Barkis, *Calculation of the Cost of a Suitable Education in Kansas in 2001-2002 Using Two Different Analytic Approaches* (Denver, Colorado: Augenblick & Meyers, Inc., 2002), II-2.

[22] Rudolf J. Rummel, Applied Factor Analysis (Evanston, Illinois: Northwestern University Press, 1970). Also see Meredith D. Gall, Walter R. Borg, and Joyce P. Gall, *Educational Research*, 6th ed. (White Plains, New York: Longman, 1996).

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