

Adequacy Post-*Rose v. Council for Better Education* in Kentucky Public School Facilities: A  
Case Study

by

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## **Adequacy Post-*Rose v. Council for Better Education* in Kentucky Public School Facilities: A Case Study**

(Abstract) The decision in the 1989 landmark Kentucky case, *Rose v. Council for Better Education*, initiated many reforms to ensure that children have access to an adequate education, including funding new construction and renovations for school facilities. The purpose of this qualitative case study is to describe how the additional state and local funding for a selected Kentucky public school facility affected the provision of an adequate education in that school. The term *adequacy* is used in the study to mean the fiscal sufficiency to meet a qualitative set of achievement standards required by the state as indicated in the *Rose* decision. One recently renovated middle school was selected based on its status as a Category 5 (or “Urgent Needs”) school in Kentucky’s classification system. Five features were selected for examination: security, technological readiness, lighting, thermal comfort and air quality. Interviews and facility observations (including photographic images, archival and contemporaneous documents, and reflexive field notes) comprised the data collected. District and school administrators, teachers, and other individuals deemed knowledgeable were selected purposefully and by the snowball method for interviews. Observations focused on the five features and their relationship to teaching and learning. Classrooms were observed without students present. Document analysis was used for contextual information about the school district and the school case. Triangulated data were analyzed in an iterative and holistic process to identify common themes. Trustworthiness of the findings was established through triangulation of data, peer debriefing, disconfirming analyses, rich description, and field notes.

The findings suggest that the additional facilities funding since the *Rose* decision created a teaching and learning environment that supported the tenets of an adequate education that

previously had not been realized. Improvements that support an adequate education were found in three of the five features studied. Evidence of enhancements to three additional building features (the facility’s auditorium renovations, added disability accessibility, and classroom renovations according to content area) emerged that further added to the educational opportunities afforded to the students. The study adds to the knowledge base on outcomes of Kentucky reforms and the relationship between facility funding and opportunities for an adequate education.

## **Introduction**

### **Historical Background**

Litigation involving public school funding is a concern in many states. The issue of whether public school students are receiving an adequate education has been an issue in the Commonwealth of Kentucky since the 1980s. Kentucky’s State Supreme Court resolved this issue with the case, *Rose v. Council for Better Education* in 1989.<sup>1</sup> The court’s decision in the case was based on the Kentucky constitution’s mandate that every child receive an efficient and adequate education.<sup>2</sup> The Kentucky Supreme Court decided that students in its public schools were not receiving an adequate education at that time due to insufficient school funding. In response to the ruling, the legislature increased the funding for students through the Kentucky

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<sup>1</sup> *Rose v. Council for Better Education*, 790 S.W.2d. 186 (Ky. 1989).

<sup>2</sup> Originally, the case was filed in 1988 as *The Council for Better Education v. Wilkinson*, 85 Ky. 1759, Cir. Ct. (1988). The plaintiffs, the Council for Better Education were several local boards of education and twenty-two public school districts. Wallace Wilkinson, governor of Kentucky, the State Board of Education, and the president pro tempore of the Senate were named as defendants. Upon appeal by State Senate President, *Rose*, to the Kentucky Supreme Court, the case became *Rose v. Council for Better Education*, 790 S.W.2d. 186 (Ky. 1989). For the purposes of this study, adequacy is the focus. Section 183 stated, “The General Assembly shall, by appropriate legislation, provide for an efficient system of common schools throughout the state.” Kentucky Legislative Research Commission, “Ky Const § 183 General Assembly to Provide for School System,” Baldwin’s Kentucky Revised Statutes Annotated, September 23, 2012, Westlaw.

Education Reform Act (KERA).<sup>3</sup> Part of the increase in funding was earmarked for facility renovations of regular public elementary and middle and schools.<sup>4</sup> Therefore, outcomes of adequacy found in public school facilities are a direct result of the *Rose v. Council for Better Education* and the finance reforms. A prudent question exists in the aftermath of the funding of these renovations. Has receiving additional school facility funding improved the likelihood that students will receive an adequate education when compared to prior funding levels?

Prior to *Rose v. Council for Better Education* in Kentucky, education funding levels were perceived to be lower than needed by certain public interest groups and professional associations in the Commonwealth.<sup>5</sup> These entities argued the Commonwealth was not proportionately and equitably funding both the affluent and poor school districts of the state.<sup>6</sup> The group held that the legislature was not upholding their constitutional duty to provide the means to achieve an adequate education.

Kentucky's property tax rates were comparatively low and varied across the school districts in the 1980s. When state and local tax effort controlling for tax capacity was compared with the national average of the same, Kentucky was at 89% of the national average.<sup>7</sup> Property tax

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<sup>3</sup> The Council for Better Education v. Wilkinson, 85 Ky. 1759, Cir. Ct. (1988), 17.; For the purposes of this dissertation, adequacy, not efficiency was examined. The KERA was passed as House Bill no. 940, General Assembly, Commonwealth of Kentucky, Regular Sess. (1990). The act is codified in KY. REV. STAT. ANN. § 156.000 The University of Kentucky, "KERA Information," Education.uky.edu, last modified February 18, 2010, <http://education.uky.edu/site/KERAinformation>.

<sup>4</sup> Most K-12 public school facilities were renovated, thus these renovations were not limited to regular elementary and middle. This study focused on regular elementary and middle schools.

<sup>5</sup> A group of business and civic leaders, known as the Prichard Committee, set out to demonstrate the association between great schools and great employment. Meanwhile, a group of county and city school districts, the Council for Better Education (CBE), focused on the need for fiscal equity in the system, filing a 1985 lawsuit against the executive branch.

<sup>6</sup> Deborah A. Verstegen and Terry Whitney, "From Courthouses to Schoolhouses: Emerging Judicial Theories of Adequacy and Equity," *Educational Policy* 11, no. 3 (1997): 339.

<sup>7</sup> Hunter, *Journal of Law & Education*, 488 (citing The Prichard Committee for Academic Excellence, *The Path to a Larger Life: Creating Kentucky's Education Future*, xvii.)

revenues brought in by the districts varied from \$78 to \$3,867 per student.<sup>8</sup> The amount spent on instruction also varied from \$1,499 to \$3,709 per student.<sup>9</sup> The overall amount the state spent per student ranked 40<sup>th</sup> nationally.<sup>10</sup>

The Kentucky Supreme Court in *Rose v. Council for Better Education* declared the entire state educational finance system unconstitutional due to the legislature's failure to sanction laws that would according to the court, "provide for an efficient system of common schools throughout the state."<sup>11</sup> As a result of the case, the legislature restructured the public education funding formula and provided more revenue for public school facilities.<sup>12</sup> The court's ruling led to the creation of the Kentucky Education Reform Act (KERA). The statute called for reform of the Kentucky educational system. The law, which aimed at creating financial adequacy and an efficient educational system, became effective June 1990.<sup>13</sup> Six main areas of public education were the focus of the law: Governance, curriculum, technology, support services, assessment,

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<sup>8</sup> Hunter, *Journal of Law & Education*, 488 (citing the Office of Education Accountability (OEA), Kentucky General Assembly, Annual Report, Tables 20, 26, and 28 (December 1996) and Jacob E. Adams, Jr., "School Finance Reform and Systemic School Change: Reconstituting Kentucky's Public Schools," 18 *J. Educ. Fin.* 318, 331 (Spring 1993)).

<sup>9</sup> *Ibid.*

<sup>10</sup> *Rose v. Council for Better Education*, 790 S.W.2d. 186 (Ky. 1989).

<sup>11</sup> *Rose v. Council for Better Education*, 790 S.W.2d. 186 (Ky. 1989).

<sup>12</sup> Kentucky Revised State Statute 157.310, "Declaration of Legislative Intent" stated, "It is the intention of the General Assembly to assure substantially equal public school educational opportunities for those in attendance in the public schools of the Commonwealth, but not to limit nor to prevent any school district from providing educational services and facilities beyond those assured by the state supported program. The program shall provide for an efficient system of public schools throughout the Commonwealth, as prescribed by Section 183 of the Constitution of Kentucky, and for the manner of distribution of the public school fund among the districts and its use for public school purposes, as prescribed by Section 186 of the Constitution." Kentucky Legislative Research Commission, "Kentucky Revised State Statute, 157.310," *Declaration of Legislative Intent*, accessed January 10, 2013, <http://www.lrc.ky.gov/KRS/157-00/310.PDF>.

<sup>13</sup> *Ibid.*

and finance.<sup>14</sup> Provisions put in place under KERA called for additional facility space and funding.

Revised education finance formulas and funding regulations were part of the KERA Act.<sup>15</sup> Various methods of tax collection were required in the state to raise revenue for education.<sup>16</sup> The Support Education Excellence in Kentucky (SEEK) fund was established under the law.<sup>17</sup> SEEK assured a set sum of money per pupil as a minimum amount in every district in the state of Kentucky by elevating the state's base grant, altered balancing grants and property valuations.<sup>18</sup> The reason for the adjustment was so that less wealthy public school districts receive a greater portion of state assistance.<sup>19</sup> The funding formula was transformed and state funding became calculated on a per-pupil basis.<sup>20</sup>

Provisions put in place under KERA called for additional facility space and funding. However, when developing the legislation, it was unclear what these additions would cost. Therefore, finance formulas generated by the new law would be tailored to include funding for future facility projects as required by KERA. Specifically, the new funding formula for facilities is called the Facilities Support Program of Kentucky (FSPK).<sup>21</sup>

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<sup>14</sup> Ibid.

<sup>15</sup> Verstegen, "Kentucky," In A Quick Glance at School Finance: A 50 State Survey of School Finance Policies and Programs Vol. I: State by State Descriptions.

<sup>16</sup> Ibid.

<sup>17</sup> Ibid.

<sup>18</sup> Ibid.

<sup>19</sup> Ibid.

<sup>20</sup> Ibid.

<sup>21</sup> Ibid.

The Kentucky General Assembly passed legislation in 1994 to assist in funding facilities for public school districts expecting student population growth. Local districts were permitted to levy a \$0.05 tax known as the first growth nickel.<sup>22</sup> The tax was used to pay for debt service and new facilities.<sup>23</sup> Under the law in order to qualify, districts were required to meet the following criteria: 1) Growth of at least 150 students in average daily attendance and 3% overall growth for the previous five years; 2) Possess mortgage responsibility equal to 80% of SEEK capital outlay, FSPK district \$0.05 equivalent tax and FSPK state equalization; and 3) Student enrollment in excess of classroom space; and 4) Possess an accepted and qualified local school facility plan.<sup>24</sup>

In order to assist school districts to meet their capital construction needs, legislatures set up the Kentucky School Facility Construction Commission (KSFCC) in 1985.<sup>25</sup> The commission was designed for various purposes including delivering additional support for facility construction, a more balanced distribution of school buildings between districts, and supplying a share of debt service.<sup>26</sup> The criteria for a district to participate in the program include having unmet needs based on an approved facility plan minus available local revenue.<sup>27</sup> The mandate also holds a provision requiring the FSPK local \$0.05 equivalent tax revenue be budgeted for facility mortgage responsibility, new construction, facility additions, and renovations.<sup>28</sup>

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<sup>22</sup> Legislative Research Commission, "A Review of the School Facilities Construction Commission," 4.

<sup>23</sup> *Ibid.*, 3.

<sup>24</sup> *Ibid.*, 3-4.

<sup>25</sup> *Ibid.*, 5.

<sup>26</sup> *Ibid.*, 1.

<sup>27</sup> *Ibid.*

<sup>28</sup> *Ibid.*

KSFCC became a pathway for districts to generate the needed amount for building funding. The commission's existence provided for an increase in the yearly average of construction or renovation projects from \$50 million to more than \$300 million during the 1990-91 fiscal year.<sup>29</sup> Since the legislation, the state has spent more than \$2 billion in state revenue on the replacement and remodeling of school facilities.<sup>30</sup>

In order to address specific needs of local school districts, the General Assembly of Kentucky created a non-KSFCC funding resource.<sup>31</sup> Districts that met quantified criteria were allowed to raise local tax rates.<sup>32</sup> The General Assembly in some situations matched the locally generated revenue.<sup>33</sup> In 2003 and 2005 through budget bills, the General Assembly referred funding to designated districts with Category 5 (poorest condition) schools.<sup>34</sup> It was during this period that the decision was made to renovate the study school, using the same rating system that would later become part of the 2010 *Kentucky School Score Report*. Kentucky's public schools are classified on a scale of 1 to 5 indicating excellent to poor school facilities condition, respectively. This type of school funding was recognized as the Urgent Need School Trust Fund and "Category 5 funding."<sup>35</sup> The method provided districts meeting certain criteria the funding to

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<sup>29</sup> Adams, *J. Educ. Fin.*, 335.

<sup>30</sup> Prichard Committee, "Ten Steps Forward, Sources, Details, and Trends to Support Kentucky Schools: Achieving the Top 20 by 2020."

<sup>31</sup> Legislative Research Commission, *Kentucky Facilities Planning Manual*, 702 KAR 1:00.; "A Review of the School Facilities Construction Commission," viii.

<sup>32</sup> *Ibid.*

<sup>33</sup> *Ibid.*

<sup>34</sup> *Ibid.* According to Mr. Tim Lucas (Kentucky Department of Education), Category 5 school facilities were in "very poor condition, had not had significant renovation in the building's life, had a student population that exceeded KSFCC minimum requirements and were in districts that could not reasonably afford to replace the schools." Tim Lucas, *Urgent-Needs Grant*, e-mail message to author, April 29, 2013.

<sup>35</sup> *Ibid.*

replace or renovate Category 5 schools.<sup>36</sup> In addition to meeting Category 5 standards, those schools meeting the urgent needs requirement must meet the Kentucky Department of Education’s best practice minimums of 300, 400, and 500 students for elementary, middle, and high schools, respectively.<sup>37</sup>

In 2010 the Kentucky Facilities Inventory and Classification System (KFICS) commenced as part of the Kentucky Revised Statute 157. The statute declared there are criteria the state must meet to support the construction and renovation of public school facilities.<sup>38</sup> In accordance with the law, the Kentucky Department of Education was required to evaluate the (1) physical condition, (2) educational suitability, and (3) technological preparedness of the state’s public schools as they related to state standards and guidelines.<sup>39</sup> Scored evaluations of public school facilities in Kentucky based on these measurements resulted in a number of schools receiving relatively low scores, leading to renovations and the rebuilding of public schools facilities.<sup>40</sup> There were 276 schools in Category 1 (best condition), 336 schools in Category 2, 368 schools in

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<sup>36</sup> Ibid.

<sup>37</sup> Ibid., 7.

<sup>38</sup> Kentucky Legislative Research Commission, “Kentucky Legislature: KRS 157.420.” states, “(9) Beginning in fiscal year 2011-2012, the Kentucky Department of Education shall standardize the process for evaluating the overall quality and condition of all school buildings across the state. The evaluation process shall: (a) Result in consistent categorization of buildings for local planning purposes and for the distribution of state general fund moneys designated for capital construction; (b) Be based on measurable, objective criteria; (c) Include numerical scoring with weights to recognize building components and characteristics that address: 1. Life safety issues; 2. Compliance with state and federal codes; 3. Compliance with requirements under the Americans with Disabilities Act; 4. Community spaces; 5. Instructional areas; 6. Mechanical, electrical, plumbing, and other technology systems; 7. Site and exterior building conditions; 8. Age of the buildings; 9. Feasibility of building additions or major renovations; 10. The districts' facility capacities; 11. Current use of temporary facilities; and 12. Projected enrollment growth; and (d) Use of a third-party evaluator that utilizes an already established software-based system to perform the first, base-line evaluation.

<sup>39</sup> Kentucky Department of Education, “Facilities Assessment Project.”

<sup>40</sup> Kentucky Department of Education, “Facilities Inventory & Classification System Kentucky School Score Report,” accessed October 22, 2012, <http://education.ky.gov/districts/fac/Documents/KFICS%20State%20Report%20School%20List%20by%20District%20School%202.pdf>.

Category 3, 190 schools in Category 4, and 33 schools in Category 5 (poorest condition).<sup>41</sup> How fiscal adequacy is expressed in the public school facilities was determined by physical examination of five features found in the public school facilities of regular elementary or middle schools in one representative Kentucky school district. To date, these findings are largely quantitative, focused on an economic model of decision-making, and, therefore, narrowly focused on architectural features. Often the information is gathered in checklist format.

The 2010 Amended Kentucky State Statute 157 mandating the evaluations of public school facilities statewide resulted in the scoring of the schools in the Commonwealth. As a result of the scoring process, low-scoring schools were renovated or rebuilt new, continuing the process begun in 2003 to 2005, when the rebuilding process on the worst-scoring schools had begun. An unresolved question is how has the additional funding for Kentucky public school facilities scoring relatively low on the *Kentucky School Score Report* affected the provision of an adequate education?

### **Federal Funding for Kentucky Public School Facilities**

The Works Project Administration (WPA) was a federal program that was part of the New Deal under President Franklin D. Roosevelt. This agency employed approximately 8 million people in the United States from 1935 to 1943 to construct public works projects.<sup>42</sup> Construction included public schools, public buildings, and roads.<sup>43</sup> In Kentucky, from the years 1930 to 1939,

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<sup>41</sup> Kentucky Legislative Research Commission, "Kentucky Department of Education Division of Facilities Management.," "Review of the School Facilities Construction Commission," 10.

<sup>42</sup> Mary Meehan, "University of Kentucky Celebrates Historic WPA Collection," *Lexington Herald-Leader* (Lexington, KY), Sept. 3, 2012.

<sup>43</sup> The Kentucky Heritage Council, "Kentucky Historic Schools Survey: An Examination of the History and Condition of Kentucky's Older School Buildings," accessed June 14, 2013, <http://www.heritage.ky.gov/NR/rdonlyres/186485D6-1783-488E-ACBC-F6E18166F284/0/KYHistoricSchoolsSurvey.pdf>.

a total of 1758 WPA school building projects were constructed.<sup>44</sup> These structures were also meant to function as community centers.<sup>45</sup> The cost of the projects was \$24,780,627 with the federal government paying \$9,708,921 of the total.<sup>46</sup>

Since *Rose v. Council for Better Education*, the significance of adequate public school facilities has been recognized nationally and additional federal funding has been allocated, through a detailed discussion of this development is beyond the scope of this study.

Congressional leaders passed the American Recovery and Reinvestment Act of 2009 (ARRA) as a way to stimulate the economy, protect jobs, and invest in education and the economic stability of the country.<sup>47</sup> Under the ARRA, the State Fiscal Stabilization Fund (SFSF) was created in order to distribute \$48.6 billion from the United States Department of Education to state governors for local educational agency (LEA) distribution.<sup>48</sup> LEAs could use the funds to assist in modernizing, renovating, and repairing public school facilities.<sup>49</sup>

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<sup>44</sup> Ibid.

<sup>45</sup> Ibid.

<sup>46</sup> Ibid.

<sup>47</sup> 111<sup>th</sup> U.S. Congress, “American Recovery and Reinvestment Act of 2009,” 123 STAT. 115.

<sup>48</sup> U.S. Department of Education, “General: State Fiscal Stabilization Fund,” *Ed.gov*; According to the U.S. Department of Education, a local educational agency (LEA) is “a public board of education or other public authority legally constituted within a State for either administrative control or direction of, or to perform a service function for, public elementary schools or secondary schools in a city, county, township, school district, or other political subdivision of a State, or for a combination of school districts or counties that is recognized in a State as an administrative agency for its public elementary schools or secondary schools.” U.S. Department of Education, “Definitions.”

<sup>49</sup> Ibid.; Nationwide, public school facilities are in need of repair. The U.S. Government Accounting Office released a report in 1995 explaining one-third of all school buildings in the country were in poor condition. “U.S. General Accounting Office,” “*School Facilities: Conditions of America's Schools*.”

By 2004 more than 12,000 public school facilities were built and 130,000 were renovated. Conversely, the wealthiest public school districts spent the most on public school facilities at an average rate of \$9,361 per student in relation to the least wealthy public school districts which spent an average of \$4,800 per student. Filardo, et al., “Growth and Disparity: A Decade of U.S. Public School Construction.”

In 2000, to determine the need for public school building structures, the National Education Association found that \$322 billion was necessary to repair existing schools and build new schools in efforts to make them suit student’s educational needs. National Education Association, “Modernizing Our Schools: What Will It Cost?”

## **Purpose of the Study**

To this researcher's knowledge, a physical examination of a public school facility in a selected Kentucky elementary or middle school along with the collection of observations, interviews, and contemporaneous and archival documents has not been conducted in order to decide how the additional funding after *Rose* affected adequacy in Kentucky. What was needed was an in-depth, qualitative investigation of *how* certain public school facility features such as security, thermal comfort, lighting, technological readiness, and air quality relate to adequacy when compared to those facilities prior to renovation. This study offers a specific and detailed examination of the experiences and impressions of educators working in the school (Figure 1). This case study provides a description of how a specific school has been renovated and to what extent these renovations address the opportunity for an adequate education.

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Therefore, the topic of public school facility renovation has national interest. This instrumental case study is bounded by a single school and its school district and community and will describe how the public school facility funding influence (from the *Rose* case) on renovations in a purposefully selected Kentucky middle school affect the provision of educational adequacy.

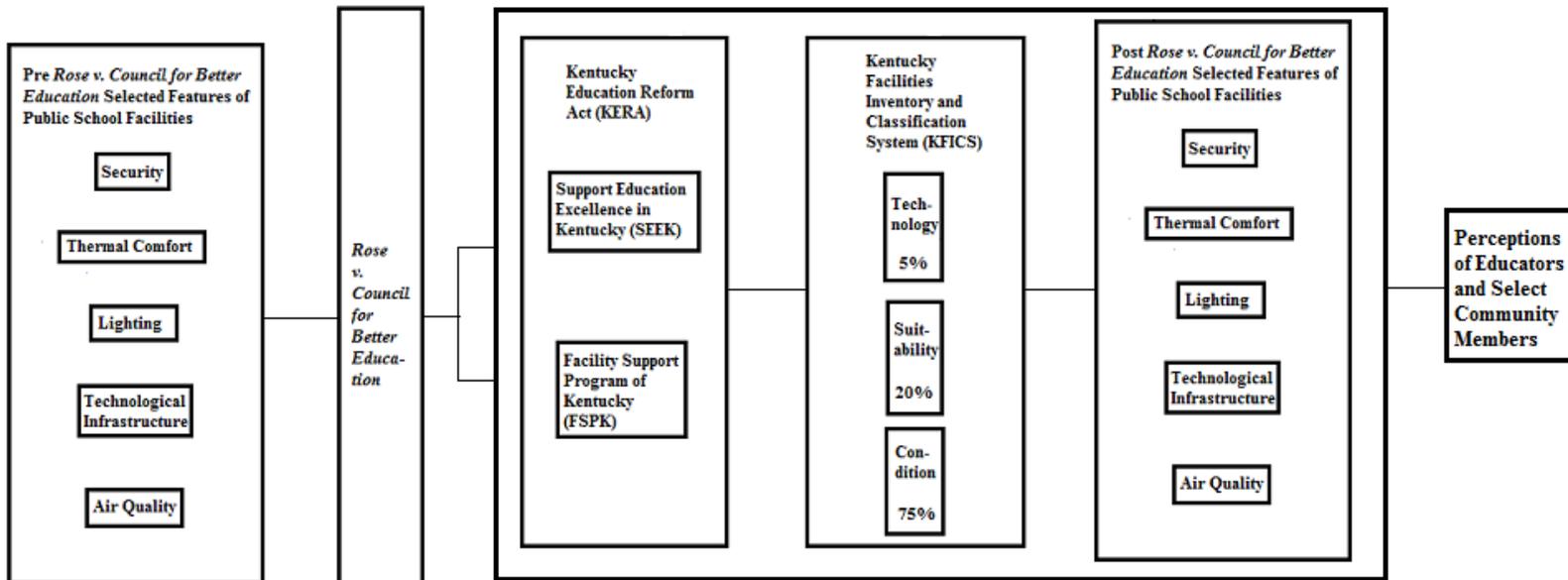


Figure 1. Conceptual framework for the study plan

## Research Question

This qualitative case study has one overall research question and three sub-questions:

### Overall research question:

How did the additional facilities funding since the *Rose* decision for a Kentucky public school affect the provision of an adequate education?

### Subquestions:

- 1) What is the history of the school facility and its community?
- 2) How did the security, technological readiness, lighting, thermal comfort and air quality change from prior to the *Rose* decision and after in this school?
- 3) How has the opportunity for an adequate education been diminished, stayed the same, or improved on the basis of facilities renovation prior to and since the *Rose* decision?

## Definition of Terms

### **Fiscal Equity**

Fiscal equity is a concept that encompasses many definitions across the states. Broadly speaking, fiscal equity rests on the premise that equal opportunity for access to public education regardless of a person's geographical location within a state is necessary and fair.<sup>50</sup>

### **Fiscal Adequacy**

Closely related to fiscal equity, the concept of fiscal adequacy of public school funding addresses the equity assumption that per pupil revenue or expenditures not be disparate. Rather, fiscal adequacy as related to per pupil funding suggests that the amount of funding needed for the student to reach some qualitative standard of achievement be provided. Thus, the amount of funding needed to reach a standard is the salient threshold rather than equitable amounts of funding.

For the conduct of this study, the term *adequacy* is used to mean the fiscal sufficiency to meet a qualitative achievement standard required by the state, either by policy promulgated by its state

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<sup>50</sup> Robert Berne and Leanna Stiefel, *The Measurement of Equity in School Finance: Conceptual, Methodological, and Empirical Dimensions* (Baltimore: Johns Hopkins University Press, 1984), 11.

board of education, or in state statute. Although these are instances in which “adequacy” is applied to a physical, suitable or technological standard in a public school facility, that was not the context applied in this study.

### **Defining the Five Public School Facility Features**

To produce the three sub-scores for the *Kentucky School Score Report*, specific categories of the school building were assessed to evaluate the three categories of physical condition, suitability, and technological preparedness. This study does not seek to replicate these facilities assessments, but rather the intent was to examine five composite features that derive from the three categories. The five features are (1) security, (2) technological infrastructure, (3) lighting, (4) thermal comfort, and (5) air quality.

When examined together, I made the assumption that these five features are indicators of adequacy. Each of these features is found in contemporary public school facilities and has been identified by architects, builders and educators as contributing to a sound educational environment that supports learning in the 21st century; they promote an adequate education. The features are open to perception by students and their teachers as they engage in the teaching and learning process in school buildings. This study assumed that physical features of the school affects the learning climate for the students. Though this would seem to be obvious, teachers and students are rarely asked to provide input based on their experiences. One consequence of this oversight is that data pertaining to facility characteristics are almost never linked to data on either student achievement or barriers to teaching and learning in the spaces. For example, the feature of lighting could be expressed by foot-candles<sup>51</sup> of electric lighting, solar lighting, natural light emitted from windows, and/or to an extent, the color of and reflection from walls and

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<sup>51</sup> The light shed on a surface by a light source twelve inches in distance.

ceilings. However, these indicators are of limited value if we do not know that during science activities students may accidentally drop small gray pins on the floor and cannot see well enough to retrieve them. The actual experiences and perceptions of the students provide an important and unique picture of the facilities in real educational process.

## **Security**

Tragic incidents of violence and trespassing on public school campuses nationwide have elevated the urgency for public school facility safety and security measures. Security implies freedom from harm and distress.<sup>52</sup> The term also encompasses measures taken to prevent and respond to harmful or disruptive activities that are dangerous or threatening.<sup>53</sup> Public school security has become a recent and critical expectation for school facilities.

There is a growing literature concerning security processes and facilities in schools; however, to date, there have been only a few empirical studies. Many state departments of education and the federal government offer school facilities manuals published online.<sup>54</sup> The Kentucky Department of Education's *Building Assessment System* list *security* as one of its main elements. Therefore, this feature is recognized by the state as an important part of the learning environment.<sup>55</sup>

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<sup>52</sup> National Center for Education Statistics and the National Cooperative Education Statistics System, "Planning Guide for Maintaining School Facilities," 2003, accessed January 20, 2013, <http://nces.ed.gov/pubs2003/2003347.pdf>.

<sup>53</sup> U.S. Department of Homeland Security, "Primer: To Design Safe School Projects in Case of Terrorist Attacks and School Shootings," 2012, accessed January 17, 2013, [http://www.dhs.gov/xlibrary/assets/st/bips07\\_428\\_schools.pdf](http://www.dhs.gov/xlibrary/assets/st/bips07_428_schools.pdf).

<sup>54</sup> These manuals offer information pertaining to planning, financing, and structural design elements.

<sup>55</sup> Kentucky Legislative Research Commission, "Kentucky Legislature: KRS 157.420." Paige Patterson-Grant, *Building Assessment System*, e-mail message to author, January 16, 2013.

## Technological Infrastructure

In the current digital age, public school facilities are expected to have an up-to-date technological infrastructure. The term *infrastructure* refers to both the technological device and the cabling needed for the device.<sup>56</sup> As part of the technological preparedness, public school facilities must have systems in place allowing for broad internet connectivity. An adequate amount of internet availability is that which allows simultaneous usage by students and educators anywhere in the school building.<sup>57</sup> The public school facilities' ability to provide timely and widespread internet connectivity at sufficient data transfer speeds is necessary in 21<sup>st</sup> century school learning environments.<sup>58</sup>

## Lighting

Lighting is a significant in public school facility design. Barrett et al. (2013) found it to impact the learning rates of primary school students.<sup>59</sup> The quantity of light needed by students in schools is not in question, however, the type and quality of light is debated.<sup>60</sup> Researchers link

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<sup>56</sup> National Center for Education Statistics, "Technology in Schools: Suggestions, Tools, and Guidelines for Assessing Technology in Elementary and Secondary Education," accessed January 20, 2013, <http://nces.ed.gov/pubs2003/2003313.pdf>; According to the National Center for Education Statistics, "Devices supporting technology in schools include specialized equipment (such as switches, routers, modems, or codecs) that link computers or video hardware to networks. Infrastructure also refers to cabling, whether wire, fiber optic, or coaxial. In newer systems, links between computers are wireless, in which case infrastructure refers to receivers and transmitters."

<sup>57</sup> U.S. Department of Education, "Infrastructure: Access and Enable," accessed November 18, 2012, <http://www.nrdc.org/health/kids/ocar/chap4.asp>.

<sup>58</sup> International Society for Technology in Education, "Maximizing the Impact: The Pivotal Role of Technology in a 21<sup>st</sup> Century Education System," 2007, accessed January 20, 2013. [http://www.setda.org/c/document\\_library/get\\_file?folderId=191&name=P21Book\\_complete.pdf](http://www.setda.org/c/document_library/get_file?folderId=191&name=P21Book_complete.pdf).

<sup>59</sup> Peter Barrett, et al., "A Holistic, Multi-level Analysis Identifying the Impact of Classroom Design on Pupils' Learning," *Building and Environment*, 59 (2013): 678-689.

<sup>60</sup> Lindsay Baker and Harvey Bernstein, "The Impact of School Buildings on Student Health and Performance: A Call for Research," *McGraw-Hill Construction Research Foundation and the Center for Green*

sufficient lighting to student performance: for example, Kuller and Lindsten's (1992) study found that students lacking access to natural light demonstrated diminished cortisol levels, potentially leading to decreased concentration abilities.<sup>61</sup>

### **Thermal Comfort**

Thermal comfort pertains to the adequate heating or cooling of the public school facility. Revision of the Kentucky State Statute outlining the process for evaluating the public school facilities as a result of the *Rose* case prompted the development of the Kentucky Department of Education's Building Assessment System. Temperature evaluation is included in the assessment system. Exploration of this feature is acknowledged by the state as an important part of the learning environment.<sup>62</sup>

### **Air Quality**

The quality of air is another important factor to examine when assessing the condition of a public school facility. The statute revision outlining the process for evaluating the public school facilities in Kentucky as a result of the decision in *Rose v. Council for Better Education* led to the creation of the Kentucky Department of Education's *Building Assessment System*. The

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*Schools*, accessed November 18, 2012. <http://mcgraw-hillresearchfoundation.org/wp-content/uploads/2012/02/GreenSchoolsWP-2012.pdf>.

<sup>61</sup> Rikard Küller and Carin Lindsten, "Health and Behavior of Children in Classrooms With and Without Windows," *Journal Of Environmental Psychology* 12, no. 4 (1992): 305-317.

<sup>62</sup> Kentucky Legislative Research Commission, "Kentucky Legislature: KRS 157.420." Paige Patterson-Grant, *Building Assessment System*, e-mail message to author, January 16, 2013.

assessment includes air quality as an element, and examining it is recognized by the state as a vital component of assessing the learning environment.<sup>63</sup>

### **Methodology**

The purpose of this instrumental case study is to describe *how* the additional funding for a purposefully selected Kentucky public school facility affected the provision of an adequate education.

#### **Site Selection**

For this case study a Kentucky public elementary or middle school was the unit of analysis. Overall, the site selection process of an appropriate school had two parts: (1) A systematic approach of selecting regular public middle schools based on the *Kentucky School Score Report* and previously mentioned criteria; and (2) Contacting the Kentucky Department of Education for regular public school recommendations.

Review of the 2010 *Kentucky School Score Report* identified public middle school facilities that earned a relatively low composite score.<sup>64</sup> To establish a pool of districts that may qualify for the case study, districts were identified that contained at least one relatively low-scoring regular public middle school facility that has been renovated or rebuilt. The school was in a historically stable school in the community, built between 1920-1965 with a current student enrollment of at least 400 students.<sup>65</sup> Recruitment occurred at the district level through the

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<sup>63</sup> Ibid.

<sup>64</sup> Regular public middle schools used are those that are not alternative schools.

<sup>65</sup> Public schools built in the 1950s and 1960s were built to accommodate the “Baby-Boomer” generation. The United States witnessed an abundance of public school facilities built during this period of time. See also, National Center for Education Statistics, “How Old Are America’s Public Schools?” 1999, <http://nces.ed.gov/surveys/frss/publications/1999048/>. A school with a larger student body population will yield a

district superintendent and not the school level, although with permission from the superintendent, specific schools were contacted.

All school districts assessed in the report were sorted into a final grouping of ten districts according to the following rules (Table 1): (a) The school district had at least one and less than five regular public middle schools; (b) The school to be studied was built between 1920-1965; (c) The school had student enrollment of at least 400 at the time of the *Kentucky School Score Report*. A district containing more than one of the relatively lowest scored schools was counted only once in the compilation of the 10 districts.

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higher number of staff. The greater the number of staff members in the facility, the greater the likelihood they will be familiar with the facility status prior to the *Rose* case.

Table 1. Case study site selection for ten relatively low-scoring school districts

Rank	District	School Name <sup>1</sup>	Year Built	Gross Area <sup>2</sup> (GSF)	SAAR Enrollment <sup>3</sup> 2010-2011	Kentucky School Score	Condition Score <sup>4</sup> weight = 75%	Suitability Score <sup>5</sup> weight = 20%	Technology Score <sup>6</sup> weight = 5%
114	Clark Co	Conkwright MS	1969	60,166	568	50.82	42.31	71.65	95.00
175	McCracken Co	Lone Oak MS	1966	98,403	748	57.59	51.45	74.13	83.45
180	McCracken Co	Reidland MS	1966	76,748	422	58.10	54.05	67.37	81.65
198	Scott Co	Scott Co MS	1954	110,756	753	59.85	54.49	75.96	75.95
312	McCracken Co	Heath MS	1968	82,993	448	68.08	65.87	72.97	81.75
360	Knox Co	Knox Co MS	1950	85,038	517	72.05	72.19	71.63	71.70
365	Russell Ind	Russell MS	1965	51,507	523	72.38	72.51	70.43	78.30
389	Garrard Co	Garrard Co MS	1964	102,838	600	74.61	75.04	72.08	78.30
392	Owensboro Ind	Owensboro MS South	1964	72,980	1204	74.83	77.01	69.94	61.70
402	Erlanger Elsmere Ind	Tichenor MS	1962	115,751	492	75.86	73.93	80.79	85.00
444	Hopkins Co	South Hopkins MS	1955	69,545	472	83.60	84.32	79.30	90.00
458	Larue Co	Larue Co MS	1958	111,045	557	85.86	91.56	68.45	69.95

Source: As adapted from Kentucky Department of Education, "Facilities Inventory & Classification System Kentucky School Score Report," accessed October 22, 2012, <http://education.ky.gov/districts/fac/Documents/KFICS%20State%20Report%20School%20List%20by%20District%20School%20.pdf>.

<sup>1</sup> Regular Public Middle Schools

<sup>2</sup> Gross Area (GSF) = Square Footage

<sup>3</sup> SAAR Enrollment= Superintendent's Annual Attendance Report

<sup>4</sup> Condition Score= The physical condition of the building which includes building systems and outside mechanisms.

<sup>5</sup> Suitability Score= The sum of the values for each individual educational suitability standard question addressed. Questions were based on the purpose of the facility evaluated.

<sup>6</sup> Technology Score= The sum of the values for each individual technology readiness standard question addressed. Questions were based on the purpose of the facility evaluated.

Calculations do not always tell the entire story in public school facility renovations; therefore, in addition to utilizing the *Kentucky School Score Report* for site selection, the input of the Kentucky Department of Instruction was considered. Five additional regular public elementary school were suggested for the study by the Kentucky Department of Instruction.<sup>66</sup> These schools were located in the following counties: Woodford, East Bernstadt Independent, Owsley, Boyle, and Laurel. Therefore, these counties are included in the site selection process. A wide geographical dispersion of all of the school districts in the selection process was evident. The fact that these districts did not include the most fiscally stressed districts in the state and also excluded districts in counties and cities comprising the historically poor region of Appalachia is counterintuitive and unexpected. Perhaps because this district selection process is based on 2010 data collections 21 years after the legislature acted on the *Rose* decision, many schools in this region have already been rebuilt new or renovated and thus would not be included in the report. After identifying all potential school districts, appropriate schools within them were selected. Further discussion with the Kentucky Department of Education Facilities Administrator, Mr. Tim Lucas, identified an ideal district and school from this group. The superintendent of the district was contacted and was willing to participate.

### **Relating the Research Questions to the Study Focus**

According to the conceptual framework noted in Figure 1, the school examined in the case study was renovated subsequent to the 1989 decision in the *Rose v. Council for Better Education* case. Following the *Rose v. Council for Better Education* case, the legislature put in place school funding practices that financed facility construction through a state and local contribution based

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<sup>66</sup> Suggested site selections were provided by Mr. Tim Lucas, Kentucky Department of Education.

on district fiscal capacity.<sup>67</sup> Numerous facilities were built and renovated under this measure based on fiscal need, the quality of the existing structure, and the urgency of the situation.<sup>68</sup> Details surrounding the original structure and its construction efforts and building design are important to document for comparing the former facilities' status to the renovated facility including school security, technological infrastructure, lighting, thermal comfort, and air quality.

While focusing on the five above mentioned features, I conducted an on and off-site collection of data pertaining to the new building design, new structures, and any additions or changes to the classrooms and school facility. School photographs, interviews, observations, field notes, and archival documents are used to demonstrate the presence of facility modification and its relationship to adequacy in educational opportunity.

### **Data Collection**

As in most qualitative case studies, data collection for this research study included data from interviews, observations, documents, and field notes, some of which will be reflexive.

### **Interviews**

In consultation with the district superintendent and the school principal, potential interview participants were identified and recruited. All identified individuals elected to participate.

I conducted interviews with the district superintendent, the school principal, multiple teachers and other individuals as indicated. Other individuals included retired educators and persons who may possess unique insights into the historical aspects of the school and community. In total, 19

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<sup>67</sup> Kentucky Department of Education, Office for State Budget Director, "Department of Education: Support Education Excellence in Kentucky (SEEK)."

<sup>68</sup> Kentucky Department of Education, "Facilities Inventory & Classification System Kentucky School Score Report."

audio recorded interviews were completed. The participants were males and females between the ages of 35-80 who had knowledge of the school facility and the changes in the education process that may have been affected prior to the renovation and since. There were multiple respondents to ensure multiple viewpoints and the saturation of data. No current students or children were interviewed.

## **Observations**

One of the hallmarks of a qualitative case study is the researcher's observations of participants and the school itself. There is a continuum of engagement for the observer that ranges from being a complete participant to being a complete observer.<sup>69</sup> I was a complete observer with no participation in the activities of the school, district, or community.

The on-site observations included an exploration of security, technological infrastructure, lighting, thermal comfort, and air quality in the studied school. The current status of these five features is described. The physical environment of the public school facility has been taken into account with respect to how the space is utilized and the interaction with the specific features.

Permission to observe (including photographing) classrooms, hallways, and other aspects of the facility when students were not present was obtained. The school, including empty classrooms, was then observed by the author over a five day period. From these observations of many individual details a composite picture emerged describing how the school's approach to education relates to adequacy.

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<sup>69</sup> John W. Creswell, *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*, (Thousand Oaks: Sage, 2013).

## **Documents and Archives**

Information was sought on the facility's geographical location within the state and its community, the overall facility construction, the changes in the floor plans of the facility past and present, the number of students attending the school in the past, the grades included in the school, the surrounding community demographics, basic information about students with special needs attending the schools, and the academic offerings of the school. Archival materials and folders on the renovation of the facility were located at the school district central office, which provided complete access to the documents. Every document regarding the renovation process of the school in the case study the district possessed was reviewed.

State and local government documents outlining school facility conditions prior to the *Rose v. Council for Better Education* case, photographs, participant interviews, site-specific inspection, and field notes were also reviewed.

## **Analysis of Data**

This case study was performed in accordance with the qualitative tradition. Data collected included interviews and observations, including photographic images, documents, and field notes. Coding data from these sources with triangulation among similar codes facilitated data interpretation.

## **Results**

### **Research Question**

*How did the additional facilities funding since the Rose decision for a Kentucky public school affect the provision of an adequate education?*

## **Research Sub-Question #1**

*What is the history of the school facility and its community?*

Data gathered during this phase of the research process was drawn from participant interviews, on-site observations, documentation, and field notes. Nineteen participants were interviewed, including administrators, teachers, and school staff. On-site observations were made by the researcher and included classrooms without students present, the facility interior, and the facility exterior. Photographs were taken of the facility and contemporaneous documents were examined.

### **History of the School Facility**

The school selected for the case study was originally built in 1937, during the era of the Works Progress Administration (WPA), as a high school.<sup>70</sup> An additional wing was added to the facility in 1962.<sup>71</sup> According to school district administrators, in 1967 it was converted to a middle school for 7th, 8th, and 9th graders.<sup>72</sup> In the late 1980s grade six was added to the middle school and grade nine was moved to the local high school. Increasing local student population led the district to build a new middle school on the other side of town in 1994.<sup>73</sup> The student population went from approximately 1,000 students at that time to approximately 500.<sup>74</sup>

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<sup>70</sup> Works Project Administration (WPA) was part of the New Deal under President Franklin D. Roosevelt. It was an agency that employed millions of people to construct public works projects. These projects included public schools, public buildings, and roads. The Kentucky Heritage Council, "Kentucky Historic Schools Survey: An Examination of the History and Condition of Kentucky's Older School Buildings."

<sup>71</sup> Tim Lucas, *School Building Inventory Sheet*, e-mail message to author, April 29, 2013.

<sup>72</sup> Interview with administrator.

<sup>73</sup> Ibid.

<sup>74</sup> Ibid.

In 2003 this school was determined by the Kentucky Department of Education to be a Category 5, or Urgent Needs School,<sup>75</sup> meaning that it was to be torn down and replaced due to poor conditions. According to many teachers, the condition of the school was deplorable.<sup>76</sup>

Upon learning the school was to be torn down and replaced, the school district solicited community feedback, holding a meeting for community members to voice viewpoints.<sup>77</sup> When given the choice, the majority of the community favored preserving the school and renovating it instead of building a new facility.<sup>78</sup> Community leaders felt the school's auditorium and the central location could not be easily replicated. Additionally, many community members felt nostalgia for the old school as an integral part of their community.<sup>79</sup> The school district in turn asked the Kentucky Department of Education for a waiver to renovate the existing structure instead of constructing a completely new middle school facility,<sup>80</sup> and they agreed. The renovations were completed in 2007,<sup>81</sup> at a cost of \$12,350,648.<sup>82</sup>

During the renovation process, the 1962 addition was torn down and two additional classroom wings were added.<sup>83</sup> The original WPA auditorium and gymnasium remained and were

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<sup>75</sup> Tim Lucas, *Kentucky Department of Education*, phone conversation with author, April 29, 2013.

<sup>76</sup> Interview with teachers.

<sup>77</sup> *Ibid.*

<sup>78</sup> Interview with administrator.

<sup>79</sup> *Ibid.*

<sup>80</sup> *Ibid.*

<sup>81</sup> Kentucky School Designs, "Home," *KYschooldesigns.org*, accessed on May 21, 2013, <http://www.kyschooldesigns.org/index.php>.

<sup>82</sup> Tim Lucas, *BG-1 Project Application*, e-mail message to author, April 29, 2013.

<sup>83</sup> *Ibid.*; Kentucky Department of Education, "Kentucky Department of Education: Division of Facilities Management, Project Application."

updated.<sup>84</sup> The facility interior, including the front and administrative offices underwent renovation.<sup>85</sup>

### **Demographics of the School Facility Inhabitants**

The current demographics of the student population is diverse when compared to the school district of the facility studied and Kentucky as a whole as noted in Table 2. Fewer males attend the school when compared to the district and state percentages. Comparatively, there are a higher percentage of students on free or reduced lunch at the school in the case study than in the district and the state. This is further evidence that the school in the case study has a financially disadvantaged student population. The student to teacher ratio is greater than the district average and the same as the state's. There are 31 full time teachers and sixty staff members total.<sup>86</sup>

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<sup>84</sup> Ibid.

<sup>85</sup> Ibid.

<sup>86</sup> Interview with administrator. This number does not include administrators, guidance counselors, or media specialist.

Table 2. Demographics of the school facility inhabitants

	Case Study School	Case Study School District	Kentucky
Student Enrollment	434 <sup>87</sup>	6,785	649,688
Percent Race-Ethnicity			
Caucasian	70.8%	82.9%	81.4%
African-American	18.7%	10.2%	10.7%
Hispanic	3.2%	2.9%	4.2%
Asian	0.2%	0.7%	1.4%
Alaska Native	0.2%	0.1%	0.1%
Native Hawaiian/ Pacific Islander	0.0%	0.1%	0.1%
Two or More	6.9%	3.1%	2.1%
Percent Male	49.1%	50.9%	51.4%
Percent Students on Free/ Reduced Lunch	64%	59%	57%
Student/Teacher Ratio	15:1	14:1	15:1

Source: Kentucky Department of Education, Kentucky School Report Card,” accessed May 21, 2013, <http://applications.education.ky.gov/SRC/Default.aspx>. These data are from the 2011-12 school year.

### History of the Community Surrounding the School Facility

The town where the case study took place is the county seat. The population of this small town was 6,908 in the 1930s (when the school was built).<sup>88</sup> Historically, the town’s economy has been dependent on the railroad, coal, and tobacco, which were important in maintaining the economic health and the tax base of the community and therefore the school system.

In the 1950s the increased mechanization of the coal industry affected jobs in a negative way. Machines replaced workers; therefore, the workforce dwindled.<sup>89</sup> The towns where citizens once depended on the coal mines for work found themselves with high rates of unemployment. After

<sup>87</sup> Ibid.

<sup>88</sup> U.S. Census Bureau, *Census.gov*, accessed June 28, 2013, <http://www.census.gov/>.

<sup>89</sup> Christopher Price, “The Impact of the Mechanization of the Coal Mining Industry on the Population and Economy of Twentieth Century West Virginia,” *West Virginia Historical Society*, accessed on July 10, 2013, <http://www.wvculture.org/history/wvhs2203.pdf>.

experiencing a loss of prosperity in the community due to these factors, the economy of the town of the case study school became reliant on manufacturing and service industries. Local industries that are big employers today include those that produce chicken, automotive parts, mechanical tools, and aviation equipment.<sup>90</sup>

The current demographics of the town of the case study school is more diverse in comparison to the county and the state as noted in Table 3. In addition, when compared to state averages the population and property values are lower. The town's current economic situation made the school a good example as a case study, since the county did not have the money to renovate the school independently without the assistance of the state. Therefore, it was an appropriate example of how state funds can assist and make a difference in public school renovations when a community's economic means are insufficient.

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<sup>90</sup> Interview with Administrator.

Table 3. Background of the community surrounding the school facility

	Case Study Site Town	Case Study Site County	Kentucky
Population <sup>1</sup>	19,798	46,718	4,380,415
Percent Race/Ethnicity <sup>2</sup>			
Caucasian	83.3%	90.8%	87.8%
African-American	12.2%	6.7%	7.8%
Hispanic	2.2%	1.6%	3.1%
Asian	0.9%	0.5%	1.1%
American Indian and Alaska Native	0.1%	0.2%	0.2%
Native Hawaiian/Other Pacific Islander	0.1%	0.1%	0.1%
Percent High School <sup>3</sup> Completion or Percent Higher Level of Education	81.8%	79.9%	81.7%
Percent Hold a Bachelor's Degree or Higher <sup>4</sup>	15.8%	13.4%	20.6%
Median Household Income <sup>5</sup>	\$37,746	\$39,187	\$42,248
Median Value of Owner- Occupied Housing Units <sup>6</sup>	\$89,700	\$79,700	\$118,700
Percent Living Below the Poverty Line <sup>7</sup>	19.8%	19.6%	18.1%

Source: U.S. Census Bureau, *Census.gov*, Accessed June 28, 2013, <http://www.census.gov/>.

<sup>1</sup> 2012 Estimate.; <sup>2</sup> 2010 Estimate.; <sup>3</sup> 2007-2011 Data.; <sup>4</sup> 2007-2011 Data.; <sup>5</sup> 2007-2011 Data.; <sup>6</sup> 2007-2011 Data.; <sup>7</sup> 2007-2011 Data.

The study school site and its community are not unlike many other rural areas across the country that have experienced substantial economic shifts, especially where mineral extraction and industry were once prominent. As an example, consider the coal mine industry, once a thriving economic engine in many small American towns similar to the one studied.

As the number of coal miner workers and job opportunities decreased in the United States, small towns across America similar to the one in the school site case study experienced many

financial hardships. As employment in the coal industry slowed, lower paying light manufacturing and service industry jobs became the replacement. In response, both Pre K-12 schools and community colleges had to develop programs to educate youth to be competitive in the technologically advanced global economy. The school site of the case study, school district, and community are similar to many other rural towns and could be “Small Town, U.S.A” in any state.

Teachers spoke of the reputation of the school prior to renovations. One teacher who coached sports mentioned when students would play at away games, the other players would yell out, “ghetto school.” The school was thought to be a poor, troubled place to send your kids.<sup>91</sup> This image of the school changed after the renovations. About four years after the renovations, the coach/teacher noticed when playing at away games, the students from other schools no longer referred to them as coming from the “ghetto school.”<sup>92</sup>

### **Summary of Results for Research Question #1**

The school facility in this case study has a long history. The building was built in 1937, added onto in 1962, and extensively renovated in 2007. The original WPA auditorium and gymnasium remain in renovated form. The student population that the school serves is diverse, with five ethnicities represented.

The community surrounding the school has experienced changes since the 1930s when the building was first built. It is no longer the center of population in the town. However, it has remained a community-centered school with students living in close proximity. The community

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<sup>91</sup> Ibid.

<sup>92</sup> Ibid.

also utilizes the school facilities, particularly the auditorium, and has a sense of pride for the school.

## **Research Sub-Question #2**

*How did the security, technological readiness, lighting, thermal comfort and air quality change from prior to the Rose decision and after in this school?*

When answering this research sub-question, participant interviews were conducted, documents collected, and on-site observations made. Nineteen participants were interviewed, including administrators, teachers, and school staff. Documents pertaining to the renovation were reviewed at the school district's facilities administration department.

## **Security**

### **Interviews and Observations**

Administrators, teachers, and school staff all reported security had vastly changed from prior to the renovations and after in the school. Before the renovations there were many uncontrolled access points into the building.<sup>93</sup> Visitors could walk into the building undetected by the school receptionists and administration.<sup>94</sup> Administrative offices had one small window that looked out into the hallway. During the school day the only way to lock the building doors was by chain.<sup>95</sup> Individual classroom doors locked; however, the locking mechanisms would often become jammed and unreliable.<sup>96</sup> Not all classrooms had access to telephone lines. School surveillance outside of the building depended on the watchful eye of school staff from inside the building.

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<sup>93</sup> Interview with school staff.

<sup>94</sup> Interview with teacher.

<sup>95</sup> Interview with teacher.

<sup>96</sup> Ibid.

During renovations the entranceway to the school was drastically changed. A remote admission system was installed to allow the front office to unlock the front doors and allow visitors into the building. In addition, this permitted the doors to remain locked throughout the school day. The walls to the administrative offices and receptionist area space were torn down and replaced with windows.<sup>97</sup> This renovation permits the office to have a complete view of the front entrance and hallway areas of the building. All classroom doors in the facility were replaced and have reliable working locks, which can be locked and unlocked individually by teachers and administrators.<sup>98</sup> All classrooms have telephones.<sup>99</sup> School surveillance cameras, not present previously, were installed during the renovations and cover outside areas of the facility and hallway areas. These cameras now monitor all exits, and each hallway has multiple cameras. Many of the school staff and teachers mentioned how much safer the students feel in the school since the renovations. Photographs were taken of the renovated school and compared to photographs prior to renovations supplied by the project architect.

## **Documents**

Documents including purchase invoices, communications between the school system and contractors, and architect's documents were reviewed. All of these documents substantiate the interviews and the observations.

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<sup>97</sup> Interview with teachers.

<sup>98</sup> Interview with administrator.

<sup>99</sup> Interview with teachers.

Image 1. Frontal view of the facility prior to renovations



Hill, Susan S. *School Facility Prior to Renovation*. Photograph. 2004. Tate.Hill.Jacobs: Architects, Inc.

Image 2. Frontal view of the facility post renovations



Before the facility was renovated, controlled visitor access was limited. A system was not available to screen individuals visiting the school. After the renovations, the school added a remote admission system at the main entrance. The school receptionist could now determine by sight when to press a button and unlock the front door of the school. Seven years after its installation in the studied school, many districts in the country today are implementing this type of remote system for added security.

Changes were made to the entranceway of the building. Prior to the renovations the front doors opened straight into the hallway; afterwards, this area was sectioned off so that school visitors must check in at the office. The surrounding doors are locked, except for the administrative offices to the left, which is in a glass enclosure allowing a view of all visitors, from multiple angles. The outside doors of the building lock automatically. Signs are posted that indicate to visitors they must check in with the office.

Prior to the renovations the school facility had no video camera surveillance capabilities. During the renovation process, wiring was put in place and equipment added to allow for video camera monitoring outside the school and throughout the hallways. Cameras were installed, with coverage of nearly every part of the building's exterior and interior.

After renovations every classroom has a telephone whereas only some did previously. In case of an emergency, every teacher is able to call the police directly and alert the school administration quickly. In contrast, prior to renovations an extra step was sometimes necessary, using the intercom to call the front office to ask them to call the police.

Other security measures that were upgraded during the renovations were the classroom doors and windows. All of the classroom doors and all of the windows were replaced. Each teacher

has a separate key to lock their individual classroom. In addition the cafeteria and kitchen have doors that are another entry point into the facility; these automatically lock.

In addition to the facility security upgrades, the school district has employed a School Resource Officer (SRO) for this site, who is shared with another middle school.<sup>100</sup> All high schools in the district have their own dedicated SRO officer.<sup>101</sup> Other than the SROs, there are no formal security forces in the school district.<sup>102</sup> The district's inclusion of an SRO on school campuses represents an additional layer of protection over and above static security equipment.

### **Summary of Security Themes**

Notable findings included the addition of security cameras, new telephone systems, an air-lock entrance in the front of the building, and a centrally-coordinated locking system. After the renovation, dozens of new interior and exterior security cameras monitor all aspects of the school campus from a central viewing room. Unlike the old campus, in which it was expected that the general staff simply report anything unusual, most parts of the school are now monitored by the study school administration and staff, resulting in an improved sense of safety as reported by the teaching staff and administrators.

The new telephone system enables teachers in each classroom to communicate not only with the administrative offices but also directly with police in the event of an emergency. With the old school's intercom-only system, communication could only occur with the administrative offices.

The access-controlled main entrance and centrally-coordinated locking systems are new systems after the renovation that were never features of the old school. Without these, access to

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<sup>100</sup> Email correspondence from the school district administrator.

<sup>101</sup> Ibid.

<sup>102</sup> Ibid.

the school was controlled by chains and a padlock around the front doors. Several administrators and teachers commented on how much easier it was for a stranger to gain access to the school prior to these new installations.

Taken as a whole, these new facility features substantially improved security in the studied school, creating a safe environment for learning without fear of disruption or criminal acts.

## **Technological Readiness**

### **Interviews and Observations**

All participants interviewed mentioned the advancement in the technological readiness of the facility when compared prior to renovations.<sup>103</sup> Teachers noted that before the school was renovated, no networking system existed that allowed for interconnected technology in the building.<sup>104</sup> Technology was limited to non-interactive overhead projectors requiring transparency sheets.<sup>105</sup> Video instruction was done with televisions on rolling carts, there were few computers, and there was no wireless networking or high speed data connectivity.<sup>106</sup> The cabling and wiring raceways that did exist at the school visibly ran along the hallways.<sup>107</sup> Today, the hallways are clear.

During the renovations networking cabling was installed and concealed in the ceiling and underground, bringing both wireless networking and high speed internet connectivity. In turn,

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<sup>103</sup> Interviews with administrators, school staff, and teachers.

<sup>104</sup> Interview with teachers.

<sup>105</sup> Interview with school staff.

<sup>106</sup> Ibid.

<sup>107</sup> Ibid.

this made possible multiple technological upgrades. Every classroom now has a Smartboard<sup>108</sup>, flat screen television, ceiling-mounted Liquid Crystal Display (LCD) projector, and networked computers for student and teacher use.<sup>109</sup> The technologically-minded alterations to the building structure also included the addition of three computer labs in the facility and networked student computers in the library.<sup>110</sup> Following the renovations, ninety students can be on the computers in the facility at one time, not including the five or six computers located in each classroom.<sup>111</sup> The wireless networking capability allows for the usage of tablets such as iPads.<sup>112</sup> This type of learning tool requires wireless connectivity and prior to the renovations would not have been possible as a learning tool for students to use in the facility.

The school site does not have an individual computer server; rather, the school district houses a server for all schools in the system.<sup>113</sup> A full-time information technology (IT) staff member is not present at the school site, but the school district employs IT personnel to oversee all technological repair and ordering issues in the district.<sup>114</sup>

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<sup>108</sup> A Smartboard is an interactive whiteboard utilized by educators that has touch control and connects to a computer. The first Smartboard was introduced by Smart Technologies Corporation.

<sup>109</sup> Interviews with teachers.

<sup>110</sup> Interviews with staff.

<sup>111</sup> Ibid.

<sup>112</sup> Ibid. An iPad is an electronic tablet designed by Apple, Inc. The device has an interactive digital screen, virtual keyboard, and built in wireless internet capabilities.

<sup>113</sup> Email communication with the school district administrator.

<sup>114</sup> Ibid.

## **Documents**

Documents reviewed to substantiate the interviews and observations included school district invoices, communications between the school system and general contractor, the architect's documents, and the author's communication with the architect.

## **Observations**

Prior to the renovations the school facility did not have the wiring capabilities for high speed internet and digital cabling. During the renovations the technological infrastructure was added to accommodate technology that was not possible previously. I noted wired and wireless high speed internet in the three computer labs, library, classrooms, administrative offices, attendance office, counseling office, cafeteria, and maintenance office. Before the renovations, wires and cabling visibly ran alongside the hallways of the building; after renovations they were concealed in the ceiling and thus no longer visible. The walls are now clear and open up the space due to the removal of these obstructions. The internet capabilities of the renovated facility allowed an advancement in use of technology in the school. Every classroom has a Smartboard and overhead projector. Wireless capability present at the school since renovations allows for the use of iPads by students and teachers.

## **Summary of Technological Readiness Themes**

An entirely new infrastructure of cables supporting wired and wireless networking as well as media delivery devices was installed. This permitted high speed internet, classroom computers, Smartboards, television monitors, overhead projectors, and three computer labs. Prior to the renovations at this facility, the inside network and cabling system was limited, which restricted

the use of technological systems used in the facility. The new networking and cabling system allowed for a new level of advanced equipment to be used in the facility.

Taken together, these new facility features substantially improved technological readiness in the studied school, creating a more productive and technologically modern school environment for learning.

## **Lighting**

### **Interviews and Observations**

Most teachers and staff members mentioned a change in lighting in the facility when compared prior to the renovations. Before renovations, several teachers mentioned their classroom, “feeling like a dungeon” with dark maroon paint and limited lighting.<sup>115</sup> Unrepaired Plexiglas® windows were a problem mentioned by a couple of teachers.<sup>116</sup> Window air conditioning units blocking the natural light into the classroom space was mentioned.<sup>117</sup>

The renovations dramatically increased the amount of natural lighting in the facility. All windows were replaced and window air conditioning units removed. The classrooms were repainted with fresh colors, that according to one teacher, “opened up the space.” Another commented, “The light, it is different. It seems brighter because the colors in the walls are a lot brighter. It was very dark brown before. The floors were tiled dark maroon and the walls were dark brown, so it was really cave-ish looking.”<sup>118</sup> Most teachers mentioned that the classrooms

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<sup>115</sup> Interview with teachers.

<sup>116</sup> Ibid.

<sup>117</sup> Interview with teacher.

<sup>118</sup> Ibid.

seemed brighter, with more natural light.<sup>119</sup> New fluorescent lighting replaced overhead incandescents. One teacher did mention missing the old windows because they could be easily opened.<sup>120</sup> While on-site, I observed a great abundance of natural lighting in the classrooms, hallway areas, and staircases.

## **Documents**

Documents reviewed to substantiate interviews and observations regarding lighting include the architect's documents and communication between the author and architect.

## **Summary of Lighting Themes**

There was a significant increase in natural daylight, the replacement of light paint colors in the facility, and new recessed, high-output fluorescent lighting. Before renovations the natural daylight in the facility studied in the case study was restricted and classroom windows were blocked by window air conditioning units, issues corrected by the renovation.

As a whole, these new facility features greatly improved lighting in the studied school, creating a school environment more conducive to learning.

## **Thermal Comfort**

### **Interviews and Observations**

The entire climate control system was overhauled during renovations. Previously, the main source of heating the building was two boiler systems,<sup>121</sup> and the building did not have central air

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<sup>119</sup> Interview with teachers.

<sup>120</sup> Interview with teacher.

<sup>121</sup> Interview with administrator and school staff.

conditioning.<sup>122</sup> Window air conditioning units were used for cooling the building,<sup>123</sup> which were loud and unreliable,<sup>124</sup> and some classrooms even lacked these.<sup>125</sup> During the renovations, a central heating, ventilation, & air condition (HVAC) unit with direct digital control (DDC) was added to the facility,<sup>126</sup> providing even climate control in all rooms overseen remotely by the district office. Window air conditioning units were removed and central air units were placed in discreet locations which I noted during my visit. While on-site I noticed a consistent and comfortable facility temperature, ranging from 68°F to 74°F, with little to no humidity present.

Teachers commented on the ability of the district office to control the temperature of the HVAC unit and remotely trouble-shoot any issues that should arise.<sup>127</sup> One teacher, however, expressed frustration with the range of temperature the central office has set the HVAC system on.<sup>128</sup>

## **Documents**

Documents reviewed to substantiate the interviews and observations included statements of costs and communications between the author and architect.

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<sup>122</sup> Interview with administrator, school staff, and teachers.

<sup>123</sup> Interview with teachers and school staff.

<sup>124</sup> Interviews with teachers.

<sup>125</sup> Interview with teacher.

<sup>126</sup> Ibid.

<sup>127</sup> Interviews with teachers.

<sup>128</sup> Interview with teachers.

## **Summary of Thermal Comfort Themes**

An entirely new heating, ventilation, & air conditioning (HVAC) system, with direct digital controls (DDC), was installed, providing a consistent form of heating and cooling with centrally-regulated temperature and humidity.

The DDC unit attached to the HVAC system allows the school district office to remotely monitor and trouble-shoot any malfunctions with the unit, eliminating intermediate communication steps. As a result, the school employees are better able to focus on the instruction of the students instead of the thermal comfort and regulating the school and classroom temperature. Another major improvement was students' improved ability to hear the teachers' instruction after eliminating the noise of window AC units.

Together, these new facility features greatly improved thermal comfort in the studied school, creating a more consistent school temperature and a less distracting environment for learning.

## **Air Quality**

### **Interviews and Observations**

Prior to renovations there was no central air and heat as previously mentioned, a ventilation system was not present at the facility, and chalkboards were used. School employees were limited to opening a window to allow fresh air in; the facility did not have fans, so the air remained stagnant. A school staff member clearly recalled the effect the lack of central ventilation had in the building before renovations. In order to get air circulating in the facility

after a weekend, on Monday morning, all the air conditioners would be turned on high and the classroom doors opened to allow forced cross-ventilation to take place.<sup>129</sup>

A couple of teachers commented on how dusty the building appeared before renovations,<sup>130</sup> which they attributed to the use of chalkboards instead of whiteboards. One teacher thought she noticed a decrease in asthma in her students when these were replaced with whiteboards. It is not known if this is confirmed elsewhere, but multiple teachers noted an overall decrease in dust. During renovations, all chalkboards were replaced with whiteboards, which use markers in lieu of chalk, thus creating less dust. Many teachers commented on how clean the building and classrooms are post renovations.<sup>131</sup>

The HVAC system added during renovations contains a filter,<sup>132</sup> so the incorporation of HVAC vents throughout the building and in classrooms<sup>133</sup> make possible filtered air circulation through the entire facility. Augmenting the central filter are individual filters in every room of the school.

During the renovations, it was important to the architect that the use of paints with low VOCs be used in the facility. These paints are less off-gassing, meaning they release fewer potentially hazardous paint compound particles into the air. Prior to renovations, the use of paints with low VOCs was not a consideration. It is unclear whether the paints used in the building prior to renovations was more hazardous; however, it is clear that the modern use of paints with low VOCs are healthier for students, than paint typically used previously in such applications.

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<sup>129</sup> Interview with school staff.

<sup>130</sup> Interview with teachers.

<sup>131</sup> Ibid.

<sup>132</sup> Interview with school staff.

<sup>133</sup> Ibid.

During renovations, paint with low Volatile Organic Compounds (VOCs) was used and carbon monoxide testers were installed. Site visit confirmed the presence of newly painted walls, doors, staircases, and moldings, which was also voiced during teacher interviews.<sup>134</sup> Not present previously, carbon monoxide testers now monitor the air and alert if unhealthy compounds are detected.<sup>135</sup> This new environmental safety measure prevents the presence of a harmful, though odorless, gas from going unnoticed.

## **Documents**

Documents reviewed that substantiated the interviews and observations included an installation notices, communications between the school system and the architect, and correspondence between the author and the architect.

## **Summary of Air Quality Themes**

Notable findings included the addition of the Heating, Ventilation, & Air Conditioning (HVAC) system, facility ventilation and filters, use of low Volatile Organic Compound (VOCs) paints, replacement of chalkboards with whiteboards, and the addition of carbon monoxide detectors.

Together, these new facility features greatly improved air quality in the studied school, creating a cleaner and consistent environment for learning. It was not apparent in this study if the increase in air quality has had an effect on the student absenteeism rate.

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<sup>134</sup> Interview with teachers.

<sup>135</sup> Interview with school staff.

## **Additional Unanticipated School Features Studied**

### **Auditorium**

#### **Interviews and Observations**

Interviews revealed the communities' desire to keep the auditorium during the renovation process, the participant's thankfulness it remained, the addition of the studio, new seating, and community use of the space.<sup>136</sup> Prior to the renovations the school had an original WPA auditorium, and there was concern among community members there would not be enough money to rebuild a new one should the school facility be torn down and replaced.<sup>137</sup> Therefore, many of the participants noted how glad they were that the facility was renovated and the auditorium remained.

During the renovations the chairs in the auditorium were refurbished and a large studio was added above the auditorium so that students could learn about stage lighting and sound. There is an orchestra pit for student use, trimmed in dark paint to keep light out and better view the stage. The original and still very beautiful, wood paneling enhances the space. The auditorium was being set up for 8th grade graduation ceremonies when I was on-site. With an auditorium still on campus, students, teachers, and families were able to remain in their school environment for the ceremony instead of traveling for the event, thereby clearly linking the recognition of learning milestones to the site where that learning took place. In addition to being used for school functions, the auditorium hosts events for the surrounding community such as lectures and concerts.<sup>138</sup>

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<sup>136</sup> Interviews with administrators, teachers, and school staff.

<sup>137</sup> Interview with administrator.

<sup>138</sup> Interview with administrator.

Combined, these new facility features greatly improved the auditorium space, maintaining and generating a use of the structure that added to the learning environment for the students and community.

## **Documents**

Documents reviewed to substantiate the interviews and observations included statements of completed plans and specifications between the architect and the general contractor.

## **Disabled Accessibility**

### **Interviews and Observations**

Prior to the renovations disability accessibility was not a top priority when constructing buildings.<sup>139</sup> Disabled students may not have attended regular schools in the past but today they are common to the learning environment. Accordingly, new building requirements state that upgrades must be made in public schools,<sup>140</sup> which made disabled accessibility a priority in the renovation of the study school.<sup>141</sup> This is evident in the installment of an elevator and restroom facility upgrades such as greater clearance for wheelchairs and hand rails.

Together, these new facility features greatly improved the facility access for disabled students, thus providing an environment more conducive to learning for that group.

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<sup>139</sup> Interview with administrator.

<sup>140</sup> Ibid.

<sup>141</sup> Ibid.

## **Documents**

Planning documents and construction invoices confirm elevator installation and bathroom modifications.

### **Classroom Renovations According to Content Area**

#### **Interviews and Observations**

Participant interviews noted additions to the band classroom, art room, home economics room, computer classroom, and science rooms.<sup>142</sup> Prior to the renovations the school facility was unequipped to provide sufficient learning areas according to content.<sup>143</sup> The band classroom was outside of the main building in a portable unit, the art room did not have a sink, storage cabinets, or a kiln room, the science rooms did not have proper desks, the home economics classroom did not have necessary appliances and kitchens for instruction, and the computer room was not content-specific. Prior to renovations content area classrooms were spread out and not situated in like-subject areas.

While on-site I visited the band classroom, now located inside the main building with additional square footage compared to before. I noted the art room has a sink, storage cabinets, and a kiln room. The science rooms have desks specifically outfitted for science education. The home economics classroom has four kitchens and a variety of other appliances such as a washer, dryer, and dishwasher for student learning. The computer rooms have desks that allow space for computers, electronic equipment, and sufficient outlets. These exploratory classrooms (classrooms that are not core-curriculum subjects) are in a separate hallway within the main

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<sup>142</sup> Interviews with teachers.

<sup>143</sup> Ibid.

facility building. Similar subject areas are grouped together and classrooms are no longer located outside of the main building.

The renovation process updated the facility, while adding additional classroom space, storage, desks, and appliances for student academics.<sup>144</sup> The additional space and capabilities greatly improved the ability for the classroom space to be used for content specific purposes.

## **Documents**

Installation invoices, communications between the architect and the general contractor, communications between the architect and school district, and Kentucky Department of Education documents all substantiate the interviews and observations.

## **Summary of Results for Research Question #2**

The security, technological readiness, lighting, thermal comfort, and air quality changed from prior to the *Rose* decision and after in the school facility studied. As in all qualitative studies, topics emerged that were unanticipated. In this case study these themes are the auditorium, disabled accessibility, and classrooms built for content area. Participant interviews, the collection of documentation, and on-side observations were used to determine the findings regarding this research question. Each feature experienced substantial change during the renovation period. The three methods of data collection, interviewing, documentation, and observation allowed for rich description for this question.

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<sup>144</sup> Ibid.

### **Research Sub-Question #3**

*How has the opportunity for an adequate education been diminished, stayed the same, or improved on the basis of facilities renovation prior to and since the Rose decision?*

The term adequacy is used in the study to mean the fiscal sufficiency to meet a qualitative achievement standard required by the state, either by policy promulgated by its state board of education, or in state statute, rather than a standard of academic achievement.

Student opportunities for an adequate education have improved in the study school because of renovation since the *Rose* decision for various reasons. Participant interviews, document review, and on-site observations were used to determine this. I concluded that several aspects of the facility provide improved opportunities for a student's adequate education. These include technological readiness, lighting, and thermal comfort. Regarding security features and air quality in relation to adequacy, the evidence gathered was inconclusive in these two areas. In addition, further student opportunities for an adequate education have been improved by the facility's auditorium renovations, the addition of disabled accessibility, and classroom renovation according to content area.

### **Security**

#### **Interviews and Observations**

Incidents of violence and trespassing on public school campuses nationwide have elevated the awareness about public school facility safety and security measures. Security implies freedom

from harm and distress.<sup>145</sup> The term also encompasses measures taken to prevent and respond to harmful or disruptive activities that are dangerous or threatening.<sup>146</sup>

Administrators, teachers, and school staff all mentioned the improvements in this area in the school facility. There was genuine consensus that this feature had been dramatically upgraded by the implementation of new equipment and the new networking system that supported it. One teacher went as far as to say security had been improved 100%.<sup>147</sup> However, no participant specifically mentioned improved security as a feature that enhanced the adequacy of the education.

Although the literature supports the link between security and a more adequate education, the data collected did not provide a conclusive connection between the two in this school. More data needs to be collected in order to prove that improved security enhances adequacy.

## **Documents**

Correspondences between the district, the security network company, the general contractor, the architect and other sources such as school district invoices and the *KYschool designs.org* website were reviewed and document the advancements to security in the study school. These include the new telephone and intercom systems, the security alarm system, landscaping, security cameras, new building interior façade with air-lock entrance at the main administration area, all inside locking windows, and facility door locks.

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<sup>145</sup> National Center for Education Statistics and the National Cooperative Education Statistics System, “Planning Guide for Maintaining School Facilities.”

<sup>146</sup> U.S. Department of Homeland Security, “Primer: To Design Safe School Projects in Case of Terrorist Attacks and School Shootings.”

<sup>147</sup> “Safety-wise, I feel it is 100% safer structurally than probably the old portion of the building because it was so old. The safety issues are so much better now than they were before.” School Staff 13 Interview.

## **Technological Readiness**

### **Interviews and Observations**

In the modern digital age, public school facilities are expected to have an up-to-date technological infrastructure, which refers to both the technological device and the cabling needed for the device.<sup>148</sup> Public schools must also have broad access to the internet, allowing simultaneous usage by students and educators anywhere in the school building.<sup>149</sup> In the facility studied, a modern technological infrastructure was added during renovations, including wired and wireless networking hardware and the media delivery devices that use it to deliver educational material. Therefore, as administrators, teachers, and school staff commented, students now have the opportunity for 21st century learning exposure in a way they did not previously, which creates a more adequate learning environment.

### **Documents**

Communications from the contractor to the school district, a networking company, and architect all provide evidence the following was added to the technological readiness of the building: Inside building network and cabling system and video distribution system design, TV brackets and projection screens, cables in classrooms and office, project management for installation of Smartboards, television monitors, and DVD players, wiring for computers in

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<sup>148</sup> National Center for Education Statistics, "Technology in Schools: Suggestions, Tools, and Guidelines for Assessing Technology in Elementary and Secondary Education."; According to the National Center for Education Statistics, "Devices supporting technology in schools include specialized equipment (such as switches, routers, modems, or codecs) that link computers or video hardware to networks. Infrastructure also refers to cabling, whether wire, fiber optic, or coaxial. In newer systems, links between computers are wireless, in which case infrastructure refers to receivers and transmitters."

<sup>149</sup> U.S. Department of Education, "Infrastructure: Access and Enable."

classrooms, cabling and wiring for computer networking, data cabling, and high speed internet connectivity.

## **Lighting**

### **Interviews and Observations**

Lighting issues are a significant concern in public school facility design. In the study conducted by Barrett et al. (2013), it was found to impact the learning rates of primary school students.<sup>150</sup> The quantity of light needed by students in schools is not in question; however, the type and quality of light is under inquiry.<sup>151</sup> Researchers link student performance to sufficient lighting. Kuller and Lindsten's (1992) study found that students lacking access to natural light demonstrated diminished cortisol levels, potentially leading to decreased concentration abilities.<sup>152</sup> On-site observations led to the determination that students have improved opportunities for an adequate education due to lighting improvements in this school facility since the *Rose* decision and renovations. Before the remodeling, lighting was blocked in the classrooms due to window air conditioning units, the quality of overhead lighting was lacking, and dark paints lined the hallways and classrooms. This situation gave the building a gloomy appearance and made it more difficult for students to view their school work and remain alert. Since the remodeling the hallways and classrooms are brighter due to the removal of classroom window air conditioning units, repainting the building using bright colors, the replacement of all windows, and the addition of more powerful overhead fluorescent lighting. Therefore, as

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<sup>150</sup> Peter Barrett, et al., "A Holistic, Multi-level Analysis Identifying the Impact of Classroom Design on Pupils' Learning".

<sup>151</sup> Baker and Bernstein, "The Impact of School Buildings on Student Health and Performance: A Call for Research."

<sup>152</sup> Küller and Lindsten, "Health and Behavior of Children in Classrooms With and Without Windows," 305-317.

administrators, teachers, and school staff commented, students now have the opportunity to learn in a better-illuminated academic environment, without learning barriers created by a poorly-lit learning space. Post renovations, students receive a more adequate education in that their school no longer has lighting deficiencies. They are able to better see their school work and stay alert due to higher-quality lighting in the learning environment.

## **Documents**

Messages between the district and architect confirm the replacement of all windows, the addition of lighter paint colors, and the new fluorescent overhead lighting that was added.

## **Thermal Comfort**

### **Interviews and Observations**

Thermal comfort, or the suitable heating or cooling of a facility is important in modern school design. Research indicates that slight temperature variations can affect student performance.<sup>153</sup> Harner (1974) found that the best temperature range for learning reading and math is 68°F to 74°F and that the ability to learn the subject is adversely affected by temperatures above 74°F.<sup>154</sup> Chan (1980) came to the conclusion from the results in his study that a significant relationship exists between students in air conditioned public school facilities and higher academic achievement.<sup>155</sup> Students in the facility studied have central air conditioning and heating due to school renovations. Before the addition of the HVAC unit, the school facility did not have a

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<sup>153</sup> Baker and Bernstein, "The Impact of School Buildings on Student Health and Performance: A Call for Research."

<sup>154</sup> David P. Harner, "Effects of Thermal Environment on Learning Skills," *CEFP Journal*, 12, no. 2 (1974): 4-6.

<sup>155</sup> Tak Cheung Chan, "Physical Environment and Middle Grade Achievement," *Greenville County School District*, (1980), ERIC Document Reproduction Service, No. ED 198 645.

consistent temperature range; students were often cold in the winter months and hot in the spring/summer months. Administrators, teachers, and school staff commented that students are now better able to concentrate and focus on their work, creating a learning space that is more adequate by eliminating the distractions to learning of temperature extremes. In addition, without window air conditioning units, students are better able to hear their teacher during class interaction. Improved opportunities for adequacy include the elimination of the distraction of thermal discomfort in the learning environment and improved ability of students to hear the instructions given by the teacher.

## **Documents**

Many documents encompass information concerning the application of thermal comfort modernizations at the school facility. Correspondences between the district and the architect demonstrate that the following items were added to the facility: a heating, ventilation, & air conditioning (HVAC) unit with direct digital controls (DDC) with provisions for a fixed range of school and classroom temperature under central control.

## **Air Quality**

### **Interviews and Observations**

Air quality is another concern during school design with student performance implications. Shaughnessy et al. assessed the relationship between indoor air quality and student achievement in public school facilities.<sup>156</sup> The researchers concluded a significant relationship existed between classroom-level ventilation rate and student achievement.<sup>157</sup>

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<sup>156</sup> Shaughnessy, et al., "A Preliminary Study on the Association Between Ventilation Rates in Classrooms and Student Performance," 465-468.

There are contaminants found in air such as mold, bacteria, and volatile organic compounds (VOCs) which evaporate easily at room temperature.<sup>158</sup> The microorganisms and VOCs have been linked to respiratory issues, visual ailments, and memory deficiencies.<sup>159</sup> Mold has been associated with respiratory sickness and asthma.<sup>160</sup> These air pollutants contribute to student illness and absenteeism.<sup>161</sup> Smedje and Norback (1999) determined that in affected children a connection exists between airborne bacteria and mold to asthma which fostered an increase in student absentee rates.<sup>162</sup>

Proper air ventilation prevents the build-up of these toxins in the public school facility. Since ventilation removes and or dilutes the pollutants, proper implementation of it is vital, particularly since children bring in a larger volume of air in relation to their body weight than adults.<sup>163</sup>

Air quality conditions at the school studied improved greatly as a result of the renovations. This was due to the installation of a central air and heat system, improved facility ventilation, the addition of facility filters, the use of low VOC paint, replacement of chalkboard with whiteboards, and new carbon monoxide detectors. Only a couple of participants commented on the change in air quality and the improvements made since renovations, and none mentioned

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<sup>157</sup> Ibid.

<sup>158</sup> Baker and Bernstein, "The Impact of School Buildings on Student Health and Performance: A Call for Research."

<sup>159</sup> Ibid.

<sup>160</sup> Ibid.

<sup>161</sup> Mark Schneider, "Do School Facilities Affect Academic Outcomes?," *National Clearinghouse for Educational Facilities*, 2002, accessed on November 18, 2012, <http://www.ncef.org/pubs/outcomes.pdf>; Jim Holland, "Heath Wise," *American School and University*, 82 (2009): 21-22.

<sup>162</sup> Greta Smedje and Dan Norback, "The School Environment: Is it Related to the Incidence of Asthma in the Pupils?," *Indoor Air*, 5 (1999).

<sup>163</sup> Schneider, "Do School Facilities Affect Academic Outcomes?," 2.; National Resources Defense Council, "Our Children At Risk: The Five Worst Environmental Threats to Their Health."

improved air quality as a feature that enhanced the adequacy of the education. Although the literature supports the connection between air quality and adequacy, the evidence collected in this study did not provide a direct link between air quality and students receiving a more adequate education. More evidence needs to be collected in order to make the connection.

## **Documents**

Communications between the district and the architect and other sources such as school district facility documents and the *KYschool designs.org* website confirm the air quality improvements during renovations. These document the following items were added to the facility to assist in air quality: a heating, ventilation, & air conditioning (HVAC) unit with individual classroom vents and filters, low Volatile Organic Compound (VOCs) paints, water source heat pumps with direct digital controls, whiteboards, and carbon monoxide detectors.

## **Additional Student Opportunities**

During the study, it became clear that there were some unanticipated facility improvements that enhanced adequacy in the studied school. These include the retention and improvement of the remaining Works Progress Administration (WPA) auditorium, added disabled accessibility, and classrooms built for content areas.

## **Auditorium**

### **Interviews and Observations**

Regarding the auditorium, it was part of the original construction and built in 1937 as part of the Works Progress Administration (WPA).<sup>164</sup> During the renovation planning process, it was determined it would not be feasible to build another auditorium should the community decide to build another school to replace the one studied instead of renovating it. Therefore, the administrators, teachers, and school staff decided that was in the students' best interest to renovate the existing facility instead of building a new facility in another location.

While on-site, I noticed the auditorium has an orchestra pit, as well as a studio room above the auditorium for students to learn about stage lighting and sound. As mentioned previously, during my visit, the 8th grade held their graduation in the auditorium. The students would have lost the opportunity to use this facility had the school been replaced rather than renovated. Therefore, as study participants commented, students have improved educational adequacy compared to what their opportunities would have been had the auditorium not been retained.

### **Documents**

Documents pertaining to the renovation of the auditorium were located at the district board of education. These documents include invoices for new auditorium seating, carpet, paint, and

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<sup>164</sup> Works Project Administration (WPA) was part of the New Deal under President Franklin D. Roosevelt. It was an agency that employed millions of people to construct public works projects. These projects included public schools, public buildings, and roads. Mary McLaren, Jennifer Bartlett, and Angelia Pulley, "WPA: An Important Chapter in U.S. and Kentucky History," *Library Presentations*, accessed, July 10, 2013, [http://uknowledge.uky.edu/libraries\\_present/32](http://uknowledge.uky.edu/libraries_present/32).

acoustic panels.<sup>165</sup> New security cameras added to the building and carbon monoxide detectors were also part of the auditorium's renovation.

## **Disabled Accessibility**

### **Interviews and Observations**

Disabled accessibility is mandated in new school facilities. Under Section 504 of the United States Rehabilitation Act of 1973 and the 1990 Americans with Disabilities Act, the rights of students with handicaps are protected.<sup>166</sup> Part of these acts prohibits discrimination against those with disabilities. Prior to renovations there was not a handicap elevator to assist students getting up and down stairs; students relied on faculty assistance. An administrator stated, "handicap accessibility was a high priority" during the renovation process,<sup>167</sup> which led to the addition of the elevator as well as making certain school restrooms were handicap accessible. Disabled access allows these students the same independent physical opportunities as other students since they are more self-reliant and do not need as much special treatment by teachers and staff. By removing potential barriers to learning (reliance on others for assistance and self-consciousness of being different), adequacy for these students has been enhanced.

### **Documents**

A document concerning the addition of a disabled accessible elevator during facility renovations was located at the district board of education. This was a district internal document

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<sup>165</sup> District invoice from architect.

<sup>166</sup> U.S. Department of Education, "Office for Civil Rights: Protecting Students with Disabilities," *Ed.gov*, accessed May 30, 2013, <http://www2.ed.gov/about/offices/list/ocr/504faq.html>.

<sup>167</sup> Interview with administrator.

outlining the contractor, type of submittal required, and approval status.<sup>168</sup> The installation of a new elevator during renovations was submitted and approved by the district.

## **Classroom Renovations According to Content Area**

### **Interviews and Observations**

There is limited research discussing classrooms built for content area as it relates to student academics. However, teachers mentioned the effect the lack of content specific classrooms had on student learning in the facility studied. Prior to renovations the classrooms were not built for the content being taught, so in many situation students did not have access to a proper work space, depending on the class. For example, the home economics room did not have kitchens, the art room did not have a kiln, sinks, or supply storage, the science room did not have science desks, equipment outlets, and emergency shower, and the band room lacked sufficient square footage for students and their instruments. During my on-site visit, I toured classrooms and made many observations regarding the conditions of the classrooms. The home economics room has four ovens, four stoves, four sinks, four microwaves, washer and dryer. The art room contains a kiln room, sink, storage cabinets, and storage closets for paper and art supplies. The science rooms have counter space for experiments, sinks, and cabinets for equipment storage. The band room, now located inside the main building, contains a large center room for orchestra style practice, separate practice rooms on the side, and storage rooms for extra instruments. Renovations of these classroom spaces provided students the opportunity to learn a subject in a room constructed specifically for the course being taught. The renovations allowed students to receive a total learning experience in the content area, thus delivering more learning opportunities for students. Therefore, as teachers commented, students are now experiencing

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<sup>168</sup> District internal document.

improved educational adequacy since they are learning in classrooms that have optimal characteristics needed for the content area.

## **Documents**

Internal district documents were reviewed and include orders for science room equipment, science room tables, home economics ranges, dishwashers, refrigerators, four kitchen stations, art room square footage increase, cabinets, and increase in band room square footage.<sup>169</sup>

## **Summary of Results for Research Question #3**

The opportunity for an adequate education has been improved on the basis of facilities renovation since the *Rose* decision in the school facility studied in regards to technological readiness, lighting, thermal comfort, the facility's auditorium renovations, added disabled accessibility, and classroom renovations according to content area. Participant interviews, the collection of documentation, and on-site observations were used to determine the findings regarding this research question. The evidence concerning security features and air quality upgrades did not provide a direct relationship which afforded enhanced opportunities for a student's adequate education in this facility.

## **Findings and Data Analysis**

Question one addresses the history of the school facility and its community. The school facility in the case study was built in 1937, added onto in 1962, and renovated most recently in 2007. The original WPA auditorium and gymnasium remain in renovated form. The current school population is diverse with five ethnicities represented.

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<sup>169</sup> District internal documents.

The community surrounding the school has experienced changes since the building was first built. It is no longer the center of population in the town. However, it has remained a community-centered school with students living in close proximity. The community also utilizes the school facilities and has a sense of pride for the school.

Question two addresses how the security, technological readiness, lighting, thermal comfort, and air quality changed from prior to the *Rose* decision and after in this school. The security, technological readiness, lighting, thermal comfort, and air quality were all substantially improved from prior to the *Rose* decision and after in the school facility studied. As in all qualitative studies, topics emerged that were unanticipated. In this case, these themes include the auditorium, disabled accessibility, and classrooms built for content area. These were additional areas that were substantially improved during the renovations.

Question three addresses how the opportunity for an adequate education has been diminished, stayed the same, or improved on the basis of facilities renovation prior to and since the *Rose* decision? This case study indicates that the opportunity for an adequate education has been improved on the basis of facilities renovation since the *Rose* decision in the school studied. Improvements and upgrades to the school's technological readiness, lighting, thermal comfort, auditorium, disabled accessibility, and content area specific classrooms all contributed to this. In the data gathered during this study, security features and air quality upgrades did not appear to enhance opportunities for a student's adequate education in this facility. More data would be necessary to demonstrate a relationship in these areas.

## Conclusions

The additional facilities funding since the *Rose* decision for a selected Kentucky public school affected the provision of an adequate education by creating a more adequate learning environment for students as outlined in the principles of the case.<sup>170</sup> The case study site was in a community with needs due to its geographic location in a less affluent county and the poor conditions of the public school facility. The Kentucky Department of Education policies recognized this and funded the renovations. The renovations of the facility studied increased educational opportunities, thus providing students with a more adequate education than prior to renovations. Specifically, six areas of improvement were found, including technological readiness, lighting, thermal comfort, auditorium renovations, added disabled accessibility, and classroom renovations according to content area.

The security features added to this facility during renovations have produced a more secure learning environment for students. Although the literature supports the link between security and a more adequate education, the data collected did not provide a conclusive connection between the two in this case. More data would need to be collected in order to establish a link. It is important to note that the facility in the study had many security features added in 2007 that districts across the country are attempting to add today, which places the facility ahead of its peers at a national level.

Concerning technological readiness in the facility studied, a modern technological infrastructure was added during renovations. A network system and cabling were put in place

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<sup>170</sup> Specifically, Principles 7, 8, and 9 that derived out of *Rose v. Council for Better Education* speak to the issue of adequacy. The Principles read, “(7) The premise for the existence of common schools is that all children in Kentucky have a constitutional right to an adequate education.; 8) The General Assembly shall provide funding which is sufficient to provide each child in Kentucky an adequate education.; 9) An adequate education is one which has as its goal the development of the seven capacities recited previously.” *Rose v. Council for Better Education*, 790 S.W.2d. 186 (Ky. 1989).

allowing high speed internet connectivity, wireless networking, and the use of many new technology instructional learning devices. Every student has access to technology in the facility which was not possible prior to renovations. I was surprised at the level of technological upgrades that were put in place given that the time of renovations was the year 2007. With current technology norms, I would anticipate these additions being present in a school being renovated today; however, the case study school was renovated six years ago. Regarding technological readiness, then, this school has been well prepared before the norm. Therefore, more opportunities for an adequate education have been created by the forward-thinking renovations.

With regard to lighting, vast improvements have been made in the facility when compared prior to renovations. More natural light as well as additional overhead lighting were made possible by the remodeling. The brightly painted hallways and classrooms let the flow of natural light to permeate the facility. With clear links between satisfactory lighting and student performance in the literature,<sup>152-154</sup> the lighting improvements in this school demonstrate another obvious enhancement to educational adequacy. I was surprised by the expanse of the windows and at how the bright color scheme of the building improved the interior lighting. The classroom spaces are bright with natural lighting, highlighting the architect's emphasis on keeping and expanding the natural light during the facility's renovation.

Concerning thermal comfort, students in the facility studied now have central air conditioning and heating, unlike before the renovations when the facility did not have central air and heat and a consistent temperature range. One teacher expressed frustration with not being able to control the classroom temperature herself. However, taken as a whole, the comfort of the school facility has greatly improved with the renovations when compared to previously. The majority of

administrators, teachers, and school staff recognized the improved in this area. Students now have an opportunity to learn in a comfortable environment, with fewer distractions, another element of an adequate education.

Pertaining to air quality at the school studied, the conditions were lacking prior to renovations when compared to afterwards. There was no central air and heat and no ventilation or air filtration system. Low VOC paint was not used, dusty chalkboards were in all classrooms, and no carbon monoxide detectors were in use anywhere in the entire facility. The employment of all of the above features at the time of renovations greatly enhanced the facility air quality. I was impressed with the thought that went into choosing the correct details for the renovations, including low VOC paints for student health. Many public buildings today are without carbon monoxide detectors, yet in 2007 this school added them. This fact offers another example of how the school facility renovation was ahead of its time. However, the evidence collected in this study did not provide a direct link between air quality and students receiving a more adequate education. More evidence need would need to be collected in order to make the connection.

Concerning the WPA auditorium, the renovations allowed for the students to keep their auditorium, which they currently use for school-wide events such as talent shows, band/choral events, and 8th grade graduation. Students would have been unable to have access to an auditorium had the school's auditorium not been retained and improved during the renovations. Thus, the renovations enhanced the adequacy of their education by maintaining auditorium access.

Regarding disabled accessibility, this is a necessary element in modern school facilities. Prior to renovations the school facility studied did not have a way to independently allow disabled students to go up or down stairs. The addition of the elevator, as well as restroom improvements,

during renovations affords these students the same independent physical opportunities as other students, thereby improving adequacy compared to before the renovations.

Pertaining to classrooms being built according to content area, renovations altered the situation at this school facility. Prior to renovations the classrooms were not built for the specialized content being taught, resulting in students not having access to an appropriate work space. I was taken aback at the thought that the students went as long as they did without an art room and kitchens in the home economics room. The lack of appropriate content area space for learning was not ideal for student learning. Renovations of these classroom spaces gave students the chance to learn a subject in a classroom built for the course being taught. Students were provided with the total learning experience in the content area due to remodeling, greatly enhancing their learning experience. Adequacy in this context is improved in that educators are better able to efficiently teach specialized content to a higher standard than they were able to previously.

Overall, the renovations made in this facility due to funding were found to have enhanced educational adequacy in six of the eight features studied. These six areas of improvement include technological readiness, lighting, thermal comfort, the facility's auditorium renovations, added disabled accessibility, and classroom renovations according to content area. These enhancements added to the educational opportunities afforded to the students, which would not have been made possible without funding for facilities.

The renovations made to the facility were state of the art. However, the state should not rest on its laurels; adequacy is a moving target. What is considered necessary to provide an adequate education today may differ tomorrow. Teachers interviewed mentioned that since the 2007

renovations the case study school had not been revisited for further upgrades.<sup>171</sup> The needs of students evolve with the changing society, so districts in the state of Kentucky will continue to need money to maintain adequacy for their students. Vigilance is necessary to maintain adequacy in school facilities yearly since what is adequate this year may not be so next year.

### **Implications**

The results of the study imply the school facility funding as a result of the *Rose* decision has created an adequate education for students in a facility that previously might have delivered an inadequate educational experience. School administrators and policy makers can use additional funding to this aim in a similarly-situated school and be satisfied that the funding will advance adequacy in most areas. The school site of the case study, school district, and community are similar to many other rural towns across the United States. The changing economy of similarly-situated communities across the country has made it difficult for the public school districts to fund public school facility renovations. These towns, once located in the wealthiest regions in their states, have experience great economic challenges, with the result being that many schools in other states also have critical facility needs. Money spent on facility renovations made a difference in the case study school; in similar fashion, additional funding for facility renovation could make a difference in many other schools in similar communities across the United States.

### **Recommendation for Future Studies**

Future studies that address security and air quality as they relate to a student's opportunity for an adequate education should be considered. The findings in this study were inconclusive regarding the effects of improvements in those areas. Therefore, a study that further addresses

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<sup>171</sup> Interview with teachers.

these topics in the following manner is recommended. 1) Regarding security, a study addressing the students' and educators' perceptions of the learning environment prior to and after renovations in a public school facility is suggested. Interviews with students and educators concerning students' feelings of security and safety in the learning environment before and after renovations, the gathering of data including behavior incidents, and field observations of the facility after renovations will clarify whether facility security renovations have diminished, not affected, or improved a student's opportunity for an adequate education. 2) Concerning air quality, a study addressing the students' and educators' perceptions of the learning environment prior to and after renovations in a public school facility is encouraged.<sup>172</sup> Interviews with students and educators concerning students' comfort level in the learning environment before and after renovations, the gathering of data including student absentee rates, and field observations of the facility after renovations will shed more light on whether facility air quality renovations have diminished, not affected, or improved a student's opportunity for an adequate education.

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<sup>172</sup> Screening for environmental allergies and asthma before and after renovations should be considered.

## References

- 111<sup>th</sup> U.S. Congress. "American Recovery and Reinvestment Act of 2009." 123 STAT. 115. Accessed on November 30, 2012. <http://www.gpo.gov/fdsys/pkg/BILLS-111hr1enr/pdf/BILLS-111hr1enr.pdf>.
- Adams, Jacob E. "School Finance Reform and Systemic School Change: Reconstituting Kentucky's Public Schools." *J. Educ. Fin.* 18, (1993): 318-345.
- Baker, Lindsay, and Harvey Bernstein. "The Impact of School Buildings on Student Health and Performance: A Call for Research." *McGraw-Hill Construction Research Foundation and the Center for Green Schools*. Accessed November 18, 2012. <http://mcgraw-hillresearchfoundation.org/wp-content/uploads/2012/02/GreenSchoolsWP-2012.pdf>.
- Barrett, Peter, Yufan Zhang, Joanne Moffat, and Khairy Kobbacy. "A Holistic, Multi-level Analysis Identifying the Impact of Classroom Design on Pupils' Learning." *Building and Environment*, 59 (2013): 678-689.
- Berne, Robert, and Leanna Stiefel. *The Measurement of Equity in School Finance : Conceptual, Methodological, and Empirical Dimensions*. Baltimore : Johns Hopkins University Press, 1984.
- Chan, Tak Cheung. "Physical Environment and Middle Grade Achievement." *Greenville County School District* (1980).
- Creswell, John W. *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*. Thousand Oaks: Sage, 2013.
- Filardo, Mary W., Jeffrey M. Vincent, Ping Sung, and Travis Stein. "Growth and Disparity: A Decade of U.S. Public School Construction." Accessed July 19, 2013. <http://www.eric.ed.gov/PDFS/ED498100.pdf>.
- Harner, David P. "Effects of Thermal Environment on Learning Skills." *CEFP Journal*, 12, no. 2 (1974): 4-6.
- Hunter, Molly A. "All Eyes Forward: Public Engagement and Educational Reform in Kentucky." *Journal of Law & Education*, 28 (1999): 1-26.
- International Society for Technology in Education. "Maximizing the Impact: The Pivotal Role of Technology in a 21<sup>st</sup> Century Education System." 2007. Accessed January 20, 2013. [http://www.setda.org/c/document\\_library/get\\_file?folderId=191&name=P21Book\\_complete.pdf](http://www.setda.org/c/document_library/get_file?folderId=191&name=P21Book_complete.pdf).

- Kentucky Department of Education: Division of Facilities Management. "Project Application. 702 KAR 4: 160. Revised 3.21.05.
- Kentucky Department of Education. "Facilities Assessment Project." Last modified October 10, 2012. <http://education.ky.gov/districts/fac/Pages/Facilities-Assessment-Project.aspx>.
- Kentucky Department of Education. "Facilities Inventory & Classification System Kentucky School Score Report." Accessed October 22, 2012. <http://education.ky.gov/districts/fac/Documents/KFICS%20State%20Report%20School%20List%20by%20District%20School%20.pdf>.
- Kentucky Department of Education, Office for State Budget Director. "Department of Education: Support Education Excellence in Kentucky (SEEK)." Accessed September 20, 2012. [http://osbd.ky.gov/NR/rdonlyres/BDD61E11-A1E0-4B08-8247-C79ED6A48319/0/SupportEducationExcellence\\_in\\_Kentucky.pdf](http://osbd.ky.gov/NR/rdonlyres/BDD61E11-A1E0-4B08-8247-C79ED6A48319/0/SupportEducationExcellence_in_Kentucky.pdf).
- Kentucky Legislative Research Commission. "A Review of the School Facilities Construction Commission." no. 332 (2006): 1-131.
- Kentucky Legislative Research Commission. "Kentucky Legislature: KRS 157.420." Accessed January 20, 2013, <http://www.lrc.ky.gov/KRS/157-00/420.PDF>.
- Kentucky Legislative Research Commission. "Kentucky Revised State Statute, 157.310," Declaration of Legislative Intent. Accessed January 10, 2013, <http://www.lrc.ky.gov/KRS/157-00/310.PDF>.
- Kentucky Legislative Research Commission. "Ky Const § 183 General Assembly to Provide for School System." *Baldwin's Kentucky Revised Statutes Annotated*. September 23, 2012. Westlaw.
- Kentucky School Designs. "Home." *KYschooldesigns.org*. Accessed on May 21, 2013. <http://www.kyschooldesigns.org/index.php>.
- Küller, Rikard, and Carin Lindsten. "Health and Behavior of Children in Classrooms With and Without Windows." *Journal Of Environmental Psychology* 12, no. 4 (1992): 305-317.
- Lucas, Tim. "BG-1 Project Application." Kentucky Department of Education. e-mail message to author, April 29, 2013.
- Lucas, Tim. "School Building Inventory Sheet." Kentucky Department of Education. e-mail message to author, April 29, 2013.
- Lucas, Tim. "Urgent-Needs Grant." Kentucky Department of Education. e-mail message to author, April 29, 2013.

- McLaren, Mary, Jennifer Bartlett, and Angelia Pulley. "WPA: An Important Chapter in U.S. and Kentucky History." *Library Presentations*. Accessed on July 10, 2013, [http://uknowledge.uky.edu/libraries\\_present/32](http://uknowledge.uky.edu/libraries_present/32).
- Meehan, Mary. "University of Kentucky Celebrates Historic WPA Collection." *Lexington Herald-Leader* (Lexington, KY), Sept. 3, 2012.
- National Center for Education Statistics. "How Old Are America's Public Schools?: Overview". 1999, <http://nces.ed.gov/surveys/frss/publications/1999048/>.
- National Center for Education Statistics. "Technology in Schools: Suggestions, Tools, and Guidelines for Assessing Technology in Elementary and Secondary Education." Accessed January 20, 2013. <http://nces.ed.gov/pubs2003/2003313.pdf>.
- National Center for Education Statistics and the National Cooperative Education Statistics System. "Planning Guide for Maintaining School Facilities." Accessed January 20, 2013, <http://nces.ed.gov/pubs2003/2003347.pdf>.
- Patterson-Grant, Paige. *Building Assessment System*. E-mail message to author, January 16, 2013.
- Price, Christopher. "The Impact of the Mechanization of the Coal Mining Industry on the Population and Economy of Twentieth Century West Virginia." *West Virginia Historical Society*. Accessed on July 10, 2013. <http://www.wvculture.org/history/wvhs2203.pdf>.
- Prichard Committee. "Ten Steps Forward, Sources, Details, and Trends to Support Kentucky Schools: Achieving the Top 20 by 2020." Accessed October 20, 2012. <http://www.prichardcommittee.org/about-us/top-20-by-2020>.
- Rose v. Council for Better Education*, 790 S.W.2d. 186 (Ky. 1989).
- Schneider, Mark. "Do School Facilities Affect Academic Outcomes?" *National Clearinghouse for Educational Facilities*. 2002. Accessed on November 18, 2012. <http://www.ncef.org/pubs/outcomes.pdf>.
- Shaughnessy, Richard J., Ulla Haverinen-Shaughnessy, Alec Nevalainen, and Demetrios Moschandreas. "A Preliminary Study on the Association Between Ventilation Rates in Classrooms and Student Performance." *Indoor Air*, 16 (2006): 465-468.
- Smedje, Greta, and Dan Norback. "The School Environment: Is it Related to the Incidence of Asthma in the Pupils?." *Indoor Air*, 5 (1999): 445-450.

- The Kentucky Heritage Council. "Kentucky Historic Schools Survey: An Examination of the History and Condition of Kentucky's Older School Buildings." Accessed June 14, 2013. <http://www.heritage.ky.gov/NR/rdonlyres/186485D6-1783-488E-ACBC-F6E18166F284/0/KYHistoricSchoolsSurvey.pdf>.
- The University of Kentucky. "KERA Information," Accessed October 23, 2012. <http://education.uky.edu/site/KERAinformation>.
- U.S. Census Bureau. *Census.gov*. Accessed June 28, 2013. <http://www.census.gov/>.
- U.S. Department of Education. "General: State Fiscal Stabilization Fund." *Ed.gov*. Last modified March 15, 2010. <http://www2.ed.gov/policy/gen/leg/recovery/factsheet/stabilization-fund.html>.
- U.S. Department of Education. "Infrastructure: Access and Enable." Accessed November 18, 2012. <http://www.nrdc.org/health/kids/ocar/chap4.asp>.
- U.S. Department of Education. "Office for Civil Rights: Protecting Students with Disabilities." *Ed.gov*. Accessed May 30, 2013. <http://www2.ed.gov/about/offices/list/ocr/504faq.html>.
- U.S. Department of Homeland Security. "Primer: To Design Safe School Projects in Case of Terrorist Attacks and School Shootings." 2012. Accessed January 17, 2013. [http://www.dhs.gov/xlibrary/assets/st/bips07\\_428\\_schools.pdf](http://www.dhs.gov/xlibrary/assets/st/bips07_428_schools.pdf).
- U.S. General Accounting Office. "School Facilities: Conditions of America's Schools." Accessed November 30, 2012. <http://www.gao.gov/assets/230/220864.pdf>.
- Verstegen, Deborah A. "Kentucky." In *A Quick Glance at School Finance: A 50 State Survey of School Finance Policies and Programs Vol. I: State by State Descriptions*, Center for Research and Educational Planning, University of Nevada, Reno. Accessed July 16, 2013. <http://schoolfinancesdav.wordpress.com/>.
- Verstegen, Deborah A., and Terry Whitney. "From Courthouses to Schoolhouses: Emerging Judicial Theories of Adequacy and Equity." *Educational Policy* 11, no. 3 (1997): 330-352.