

Jenks Math & Science Center

Jenks Public Schools



2012 James D. MacConnell Award





Executive Summary

This 91,580 square foot Math and Science Center for Jenks Public Schools (JPS), located near Tulsa, is a distinct central addition to the high school campus. The new LEED Gold Certified facility creates a collaborative environment, encouraging interaction among students, science and math teachers. This Math and Science Facility is intended for the everyday instruction of 10th - 12th grade high school students regularly attending Jenks Public Schools neighboring Tulsa, Oklahoma and the Jenks community.

The purpose of this educational facility is to promote collaboration and interdisciplinary programs uniting math, science, and technology disciplines. The project objectives included having the technical tools used by professional scientists and mathematicians available to students, incorporating the building as a teaching tool, and having after hour access for staff, students, and community for symposia and continued study. The facility offers spaces for the examples of applied learning projects, presentations, telescope viewing, and planetarium presentations.

JPS has a well-established science program with advanced offerings such as Anatomy and Physiology, Biotechnology, Genetics, Zoology, Marine Biology, Astronomy I and II, and GeoScience. These programs were greatly challenged by the constraints of the existing science labs. The new facility features the incorporation of universal studios for both science and higher-level math instruction in lieu of labs and classrooms. This concept provides ultimate flexibility for collaboration and curriculum delivery. A 120-seat planetarium and a large multi-use presentation hall further enhance this specialized learning center.

Describe Value of Process and Project to Community at Large

JPS currently has many partnerships with local and state higher education institutions and community businesses, but intends to grow that with the amenities this building offers. Select examples of those partnerships are with the University of Tulsa, Oklahoma State University, Tulsa Community College, Tulsa Zoo, Tulsa Aquarium (only Aquarium in the state of Oklahoma), Corps of Engineers, Red Cross, Oklahoma Environmental Inc., Geophysical

Research Center, and Aerospace Commission. Examples of the new partnership opportunities this facility can support are with other neighboring school districts students making this perhaps a math and science magnet; non-profits promoting science fairs; adding a desired rocketry club; and enhancing groups such as the Tulsa Astronomy Club, Tulsa Geology Club, Boy Scouts of America, etc.

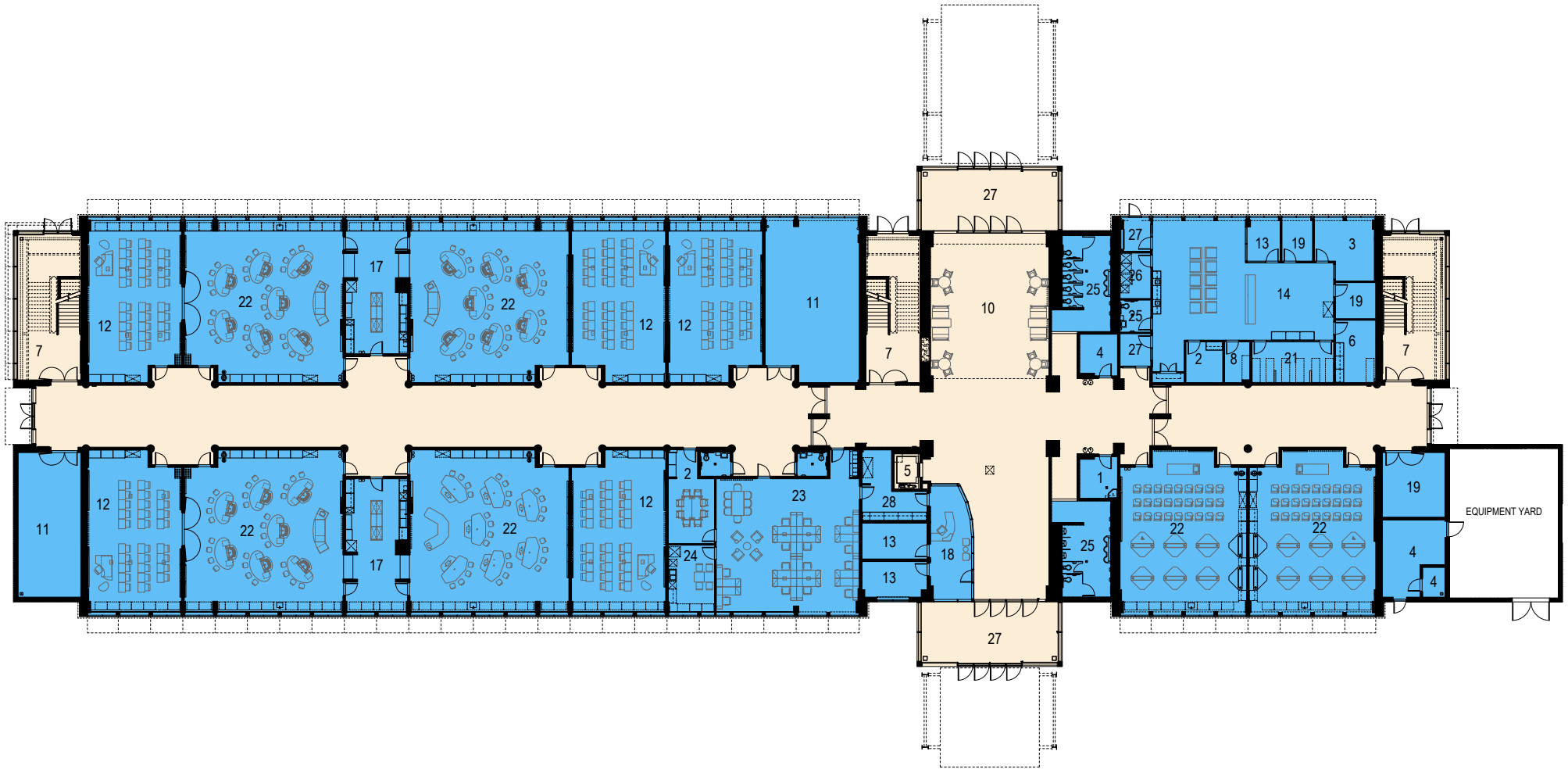
The facility includes innovative community and multi-use areas such as a state-of-the art 120 seat planetarium. The planetarium is housed in a geodesic dome that has a 65' radius, with an apex 70' above ground level, making it one of the highest points on campus and in the City of Jenks. A 4,000 square foot multi-use presentation space can be utilized for a variety of day-to-day teaching activities, special events such as science fairs, as well as a range of community events.

The Math and Science Center is a well-planned facility that will not only strengthen the education offered within but also fortify the surrounding community.

Explain How the Project Achieves School District Goals

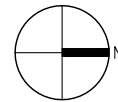
The district administrators' prerequisite in the selection of construction managers, architects, and contractors was that this building be LEED certified. The nature of this building being a facility for the improved math and science education of high school students paired well with the objectives of LEED and the opportunities LEED initiatives posed for the building to be a teaching tool. The district wanted to utilize strategies for energy savings and unique infrastructure that they could work into their curriculum. Exhibits of this are the geothermal system, sunshades, and wind turbines. The students and community can literally see how the goals can be accomplished in an aesthetically pleasing and efficient way.





- CIRCULATION
- PROGRAM SPACE
- ROOF
- GREEN ROOF

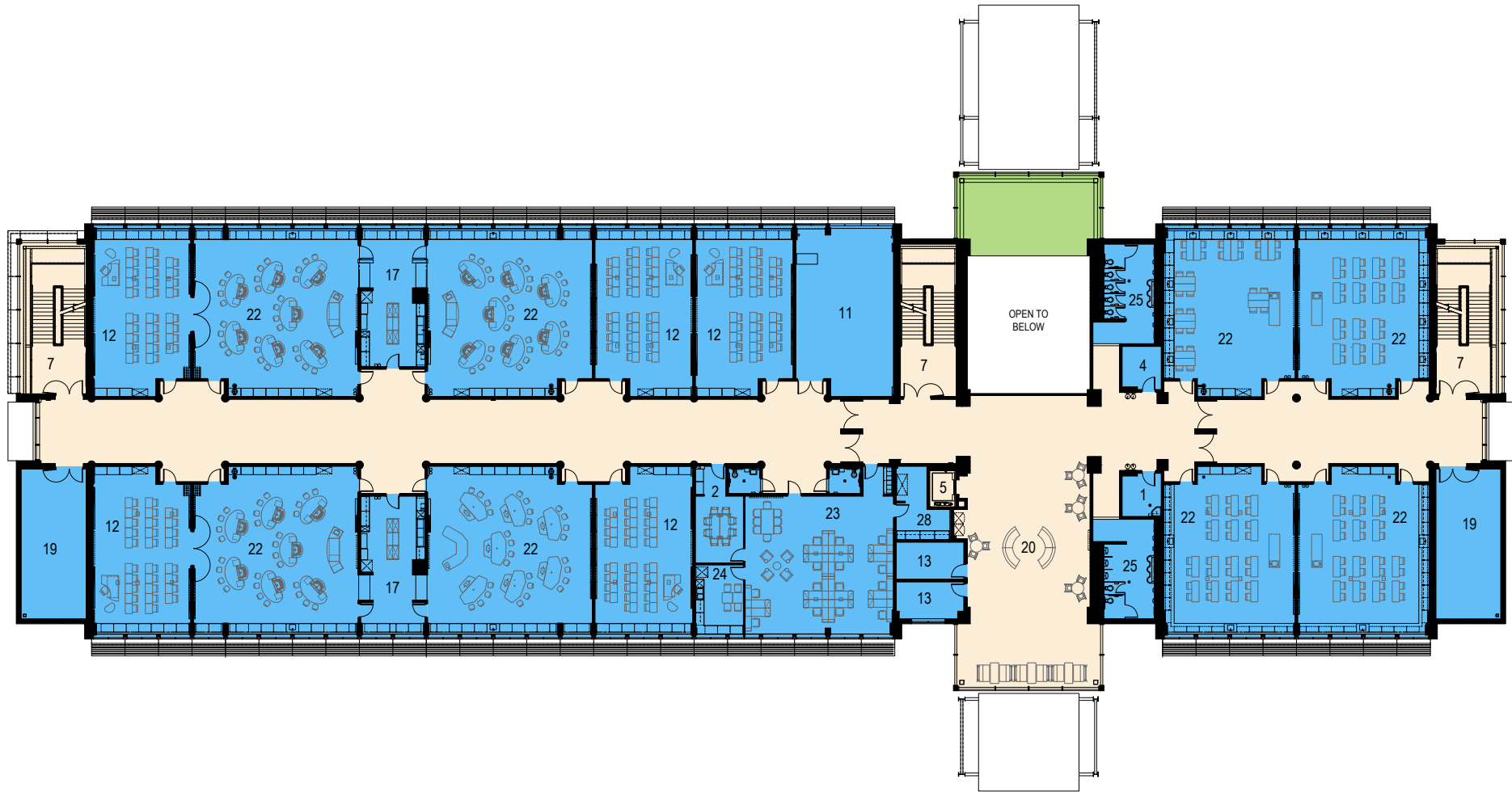
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- 2. CONFERENCE ROOM
- 3. CLINIC
- 4. ELECTRICAL
- 5. ELEVATOR
- 6. EXAM ROOM
- 7. EXIT STAIR
- 8. ISOLATION ROOM
- 10. LOBBY
- 11. MECHANICAL
- 12. MATH STUDIO
- 13. OFFICE
- 14. OPEN OFFICE
- 15. PRESENTATION ROOM
- 16. PLANETARIUM
- 17. PREP ROOM
- 18. RECEPTION
- 19. STORAGE
- 20. STUDENT ACTIVITY
- 21. SICK BAY
- 22. SCIENCE STUDIO
- 23. STAFF PLANNING
- 24. STAFF LOUNGE
- 25. TOILET
- 26. UTILITY ROOM
- 27. VESTIBULE
- 28. WORKROOM



FIRST LEVEL FLOOR PLAN

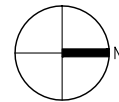
GRAPHIC SCALE





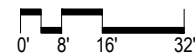
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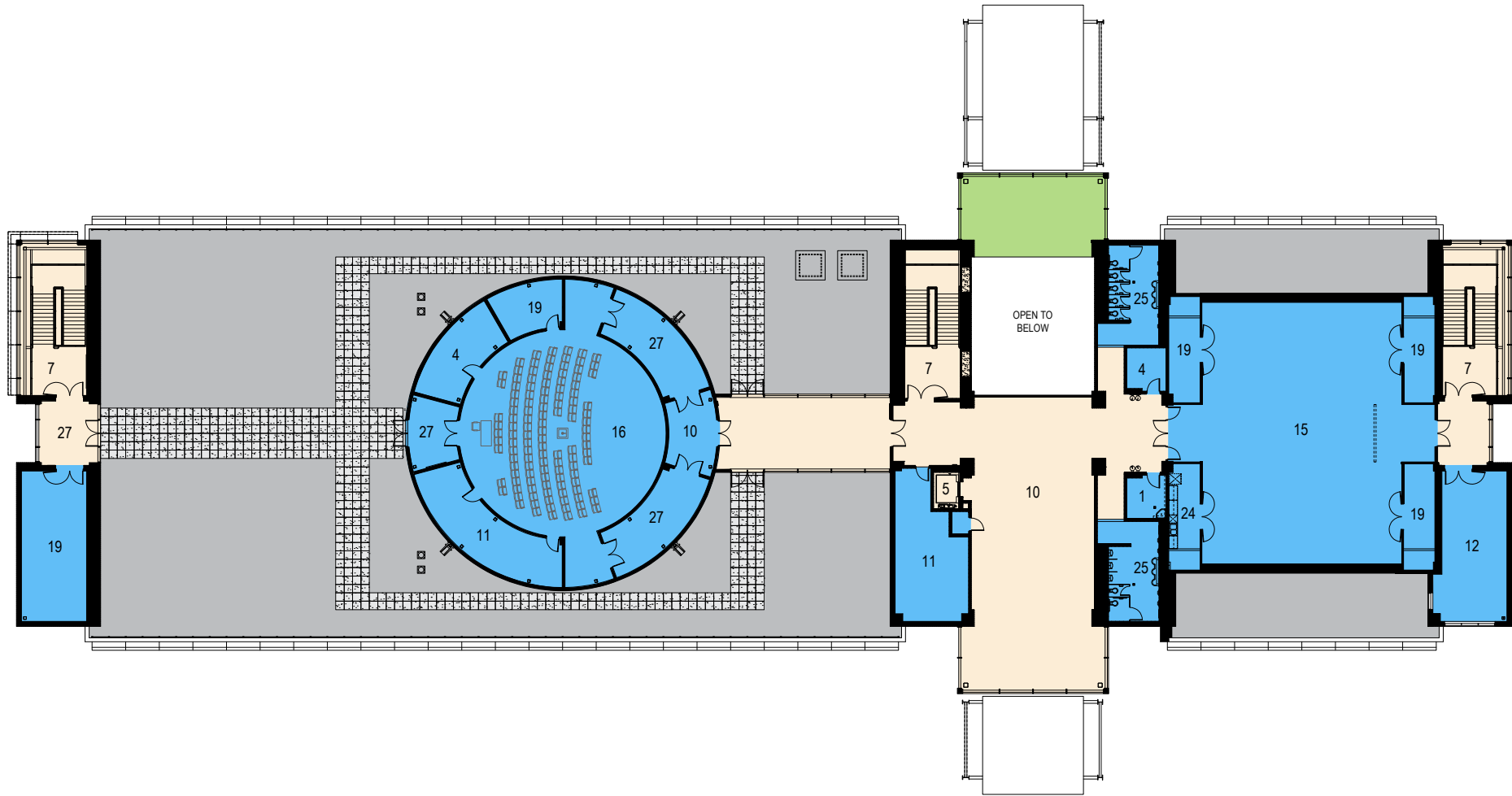
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| 5. ELEVATOR | 20. STUDENT ACTIVITY |
| 6. EXAM ROOM | 21. SICK BAY |
| 7. EXIT STAIR | 22. SCIENCE STUDIO |
| 8. ISOLATION ROOM | 23. STAFF PLANNING |
| 10. LOBBY | 24. STAFF LOUNGE |
| 11. MECHANICAL | 25. TOILET |
| 12. MATH STUDIO | 26. UTILITY ROOM |
| 13. OFFICE | 27. VESTIBULE |
| 14. OPEN OFFICE | 28. WORKROOM |
| 15. PRESENTATION ROOM | |



SECOND LEVEL FLOOR PLAN

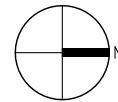
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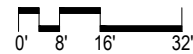
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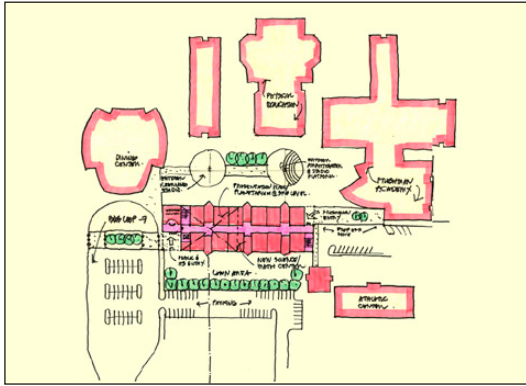
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| 14. OPEN OFFICE | 28. WORKROOM |
| 15. PRESENTATION ROOM | |



THIRD LEVEL FLOOR PLAN

GRAPHIC SCALE





10 MODERN MATH
CLASSROOMS

14 FLEXIBLE SCIENCE
TEACHING STUDIOS

Challenges

The new Math and Science Facility is located on the densely developed existing high school campus. The site parameters restricted the building location and orientation. A one-story administration building was demolished to provide space and the new building became three-stories to accommodate the necessary spaces within the site limitations. One significant challenge was the building being positioned north/south because of the existing campus constraints of nearby buildings, parking lots, and exterior covered walkways. A more suitable positioning would have been to orient the building east/west but after considering this building orientation option, JPS decided that the north/south location was more responsive to the site context. The architectural team responded by providing appropriate exterior sun control devices to allow daylight and views while reducing glare in the learning studios. A computer model was generated to explore the proper placement, type, orientation, and size of sun shading devices related to the time of day and year. The final solution was a thoughtful compromise that enhanced campus connectivity between the Freshman Academy and the Senior High School while providing a sustainable building.

The project schedule was a significant challenge as well. An occupancy date of August 2011 was the fixed point from which the schedule was generated. To allow construction to start as soon as possible, the project was issued in multiple bid packages, the first construction package – building foundations, was issued in February 2010 while the project was still in the design development phase. In order to generate this package, the package to immediately follow it – steel, had to be near completion so the foundations could be sized properly. With the building design still in flux, a lot of assumptions had to be made. Items constructed as part of early bid packages became the new 'existing condition' which following decisions had to consider. There was an ever- changing 'existing condition'. The owner's desires and decisions had to work around what was in place at the time and the design and construction team had to find creative ways to make the desires work and also to be cost efficient.

Scope of Work

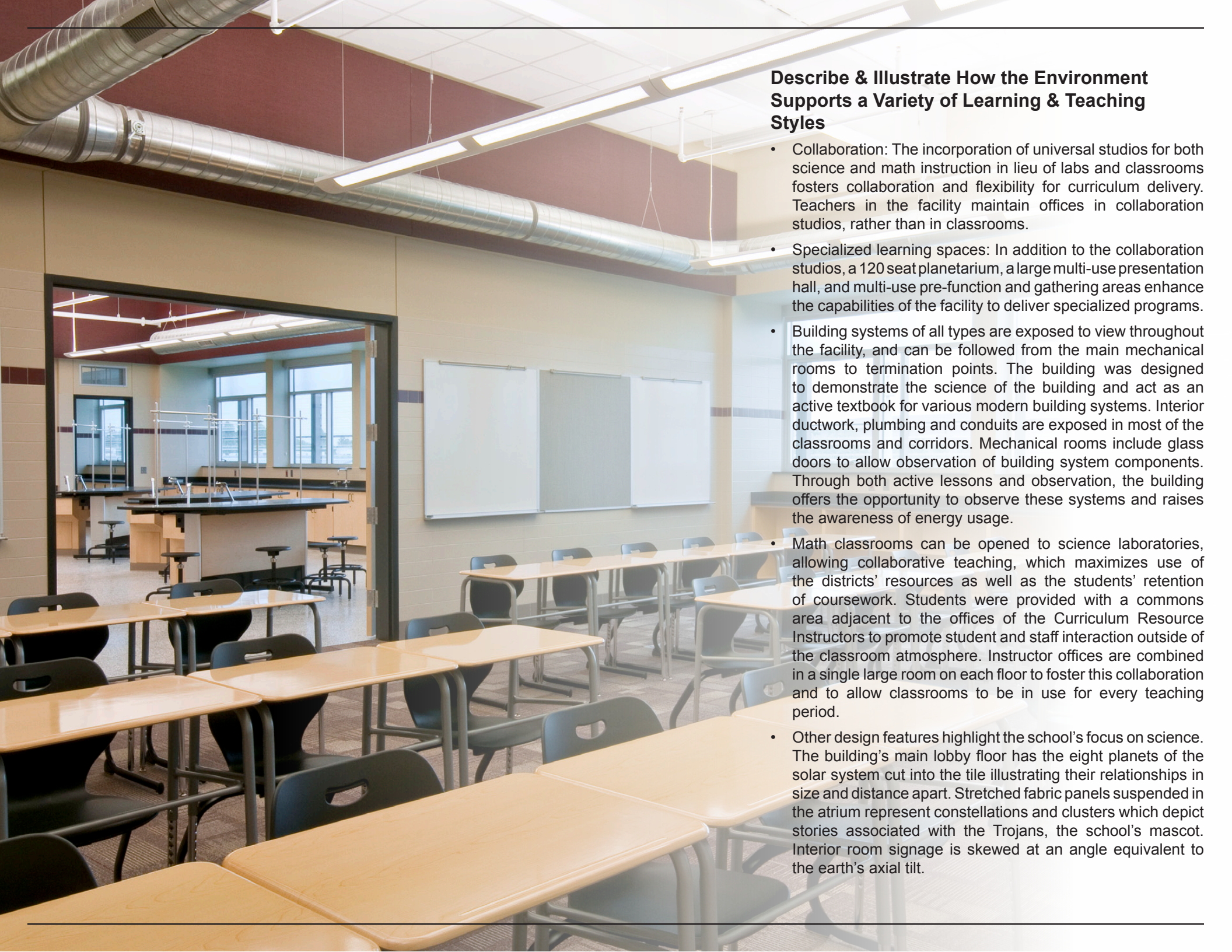
The state-of-the-art center is unlike any other secondary education facility in the region. This advanced math and science facility includes 91,580 square feet on three floors. The project is located on the JPS Central Campus between the Freshman Academy and Senior High School buildings. The program includes ten modern math classrooms and fourteen flexible science teaching studios.

The project scope evolved throughout the design process. The original project scope from which the bond dollar was set did not include a planetarium or a large multi-purpose room, yet those became owner requirements. These two spaces pushed the square footage beyond what was estimated and the uniqueness of these spaces pushed the per square footage cost up. In order to stay within the allotted budget and provide these spaces, the project team explored multiple opportunities for cost savings. A few that were related to the corridors, science studios, and roof-top garden. The corridors were widened to serve a dual use. They provide circulation throughout the building and also serve as small group break-out spaces, which eliminated the need to a separate space to serve these small groups. Science studios were designed to allow for flexible instruction instead of having two separate spaces, one for hands-on work and one for desk work. A roof-top garden was included in the design development package for both the main roof and the roof canopies. When the programmed interior functions cut into the budget causing the deletion of the roof-top garden, the opportunity for one more LEED credit and another instructional tool was lost.

Budget / Cost Information

Total Project Cost	\$23,007,503
Estimate/Budget:	\$23,000,000
Construction Cost:	\$21,500,000
Cost Per Square Foot:	\$244/SF





Describe & Illustrate How the Environment Supports a Variety of Learning & Teaching Styles

- Collaboration: The incorporation of universal studios for both science and math instruction in lieu of labs and classrooms fosters collaboration and flexibility for curriculum delivery. Teachers in the facility maintain offices in collaboration studios, rather than in classrooms.
- Specialized learning spaces: In addition to the collaboration studios, a 120 seat planetarium, a large multi-use presentation hall, and multi-use pre-function and gathering areas enhance the capabilities of the facility to deliver specialized programs.
- Building systems of all types are exposed to view throughout the facility, and can be followed from the main mechanical rooms to termination points. The building was designed to demonstrate the science of the building and act as an active textbook for various modern building systems. Interior ductwork, plumbing and conduits are exposed in most of the classrooms and corridors. Mechanical rooms include glass doors to allow observation of building system components. Through both active lessons and observation, the building offers the opportunity to observe these systems and raises the awareness of energy usage.
- Math classrooms can be opened to science laboratories, allowing collaborative teaching, which maximizes use of the districts' resources as well as the students' retention of coursework. Students were provided with a commons area adjacent to the offices of the Curriculum Resource Instructors to promote student and staff interaction outside of the classroom atmosphere. Instructor offices are combined in a single large room on each floor to foster this collaboration and to allow classrooms to be in use for every teaching period.
- Other design features highlight the school's focus on science. The building's main lobby floor has the eight planets of the solar system cut into the tile illustrating their relationships in size and distance apart. Stretched fabric panels suspended in the atrium represent constellations and clusters which depict stories associated with the Trojans, the school's mascot. Interior room signage is skewed at an angle equivalent to the earth's axial tilt.



Describe & Illustrate How the Environment Supports the Curriculum / Educational Environment

The building is designed to demonstrate the science of building. Interior systems are exposed to view throughout. Mechanical rooms include glass doors to allow observation of system components. Building water, gas and electrical data is tracked via control systems. Students can study and compare utility usage and then strategize measurable actions that can be taken to decrease utility usage.

Math classrooms can be opened to science laboratories, allowing collaborative teaching, which maximizes use of the districts' resources. Evening access to the multi-use spaces is provided for community members, encouraging life-long learning and expanding the boundaries of available educational opportunities.

- The Math and Science Center includes innovative community and multi-use areas including a state-of-the art 120 seat planetarium.
- The atrium/lobby space features murals that illustrate the intent of the curriculum to teach math and science together — emphasizing their interdependency. Two etched tile murals in the atrium illustrate this concept. One is a 32'x20' design based on an ancient mathematical sequence which is often expressed as the Golden Section or Fibonacci Spiral. Portions of the building's massing and geometry are based upon this sequence. The other mural is 20'x20' and was inspired by Leonardo da Vinci's drawing, The Vitruvian Man.
- The Math and Science Center is LEED® Gold Certified. Sustainable features include a high-efficiency geothermal HVAC system, four vertical axis wind turbines, recycling centers, and sun control devices. Mechanical rooms include glass doors to allow observation of building system components.
- Exposed building systems provide visual cues about the integration of technology. A data/communications raceway runs the length of each corridor. Classrooms are served via wireless communication hubs and have wired outlets at teaching stations for secure access. Each classroom has a large "smart board" for interactive presentations.
- A Building Management System monitors and controls the HVAC and lighting systems. Lighting is also controlled through occupancy sensors in each classroom and office. The wind turbines outside communicate wirelessly to any computer inside the facility so that any student may monitor the energy production of each turbine.



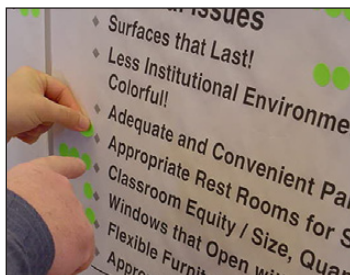
Community Engagement Process & Identification of Stakeholders

Planning the new facility involved two global tasks - identifying the curriculum and determining the building program.

Identifying the Curriculum

The District Curriculum Resource Instructors assembled a planning/coordination team comprised of faculty, administrators, and staff. This team worked together for several months to envision a new curriculum for crossover of math and science for a more inclusive learning process. Once the curriculum had taken shape, the same team along with the design team took part in visioning sessions, which ultimately led to the design objectives that shaped the facility. These included making the tools used by scientists and mathematicians available to students, incorporating the building as a teaching tool, and having opportunities for community outreach.

The team's assignment was to envision what the new curriculum could be, finalize the curriculum, and determine how the building and curriculum could support one another. The process of planning the curriculum based learning experience was a collaborative effort that occurred for multiple months prior to the actual construction. The team started by voicing each member's goals and dreams for their curricular focus. Once this brainstorming was complete, the team compared the District's existing math and science curricula, how it met the goals or fell short, and then prepared an outline of the new curriculum. All the while, the focus was to provide a collaborative math and science curriculum that provides the necessary crossover of these subjects for a more inclusive learning process. The detailed result of these planning sessions is the course offerings, extra-curricular, and public educational opportunities and lessons.



Determining the Building Program

The facility programming began in the fall of 2009. During this time, two expectations became clear: the existing math and science curriculum will have amenities fostering a progressive curriculum; and the new facility will foster an increased awareness of human ecology, natural ecology and the school facility. Members of the design team included the Superintendent, school Principals, facility director, science and math department staff, students, and architects. Goals for the new facilities were identified in these meetings by evaluating the shortcomings of the existing facilities. A facility that enhances the curriculum was a result.



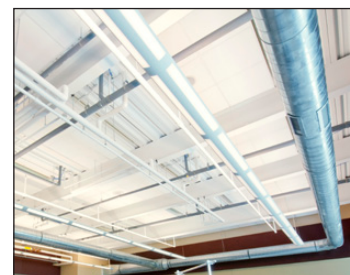
Curriculum examples implemented at the new facility:

1. Students tabulate the adverse effects of gasoline fueled motorized vehicles and learn specifically the impact they personally and collectively have on the environment. They investigate starting from their individual home location, given a specific motorized vehicle, how much gasoline is used and adverse emissions produced driving to school and the direct environmental effect. They combine their individual results to understand the entire class population's impact and determine how long it takes for specific actions to repair the environmental damage. They use the average of this data to determine the environmental savings results of the theory that for each bicycle storage rack on campus, one student rides a bike to school. The goal and outcome is the student understands the direct impact of their individual actions and the magnitude created by a group of people.

2. Students use the building automation and controls system to tabulate utility usage based upon condition. Building water, gas, and electrical usage is tracked via the controls system with time, day, and date information. The students study how these utilities are used when the building is fully occupied during a school day versus when there is no school. They compare usage by time of day and time of year. They strategize ways they individually and collectively can decrease utility usage, develop a plan of action, implement it and track results. The goal is for the students to understand the outcome of their actions and give them an opportunity to be informed participants improving the environment.

Students work with the staff to determine the best way to display this information and convey the results within the public spaces for visitor viewing.

Building feature examples that subtly call one's awareness to the surroundings include exposed mechanical, electrical, and technology components throughout; recycling centers; and sun control devices - unlike anything on the campus. The facility provides the staff and students the visibility



to observe these features and directly involves the patrons of our school district to have ownership in this facility for more awareness and understanding of

this facility in regard to energy usage.

Through both active lessons and passive observation, the new building offers the opportunity to show and teach JPS students and community members that we can envision and work toward a better world.



Describe & Illustrate the Physical Attributes of the Environment

- Site limitations for this 91,580 square foot classroom and laboratory facility provided an opportunity to help unify a loosely linked campus. The Math and Science Center creates a visual gateway and physical link between the High School and the Freshman Academy. The main entry lobby/atrium bisects the structure and encourages students to move through the building. The planetarium dome becomes a beacon at the center of campus and welcomes visitors to public planetarium shows and the 4,000 square foot multi-use presentation hall.
- One significant challenge was the required north/south building orientation due to existing campus constraints. The architectural team adjusted to this orientation by providing appropriate exterior sun control devices, allowing daylight and views while reducing glare in the learning studios. A computer model was generated to explore the proper placement, type, orientation and size of sun shading devices related to both the time of day and time of year.
- Materials were selected to give the facility a modern appearance, and to maintain campus continuity. The multi-use room and planetarium are visible symbols of the opportunities available to the community.

Technical Information / Materials & Systems

- The structural system for the facility includes an auger cast pile foundation, concrete slab on grade, structural steel moment frame with composite steel/concrete floor and roof deck. The planetarium structure is an aluminum geodesic dome resting on a steel frame base.
- Exterior materials include clay and concrete unit masonry, insulated metal panels, and high performance glazing systems.
- The facility utilizes a geothermal HVAC system.
- The HVAC systems exhaust 100% of the air that passes through the units so that no contaminants which may be present in the laboratories are cycled through the building. Energy recovery systems help to use the latent energy of this exhausted air to temper the make-up air entering the classrooms.





Physical Environment: Environmentally Responsive Design

This building was completed in the summer of 2011 and is LEED® Gold Certified. Sustainable highlights of the building include:

- Energy efficient heating and cooling system, which is anticipated to reduce the annual energy cost by 30% from an average school building.
- Four vertical axis wind turbines that can be monitored with wireless control systems. These can be integrated into the curriculum to study renewable energy.
- The ground source heat pumps use the mass of the earth to temper water to heat and cool the building. The system pumps water through 217 vertical wells, which are each 400 feet deep. This is approximately 33 miles of piping.
- High efficiency appliances that reduce the process water waste by 40%.
- High efficiency plumbing fixtures throughout the building are anticipated to reduce water usage by 30%.
- White reflective roofing material, concrete paving, and vegetated canopies significantly reduce the heat island effect of the project.
- The high performance building envelope consists of insulated metal panels and high-performance glazing. The glazing is protected by fixed vertical and horizontal sunshades to reduce glare and solar heat gain that is produced by direct sunlight.
- Large strips of high-efficiency glazing provide the classrooms with an abundance of natural light, which has been proven to increase learning retention.
- Low-VOC materials were utilized for the carpet, sealants, and paint. Indoor pollutants are controlled with walk-off carpets and by exhausting 100% during air changes.

Evening access to the building is also provided for community members, encouraging life long learning and expanding the boundaries of educational opportunities such as conferences, math and science fairs and community events.

Located on the densely developed existing high school campus, the site parameters restricted both the building location and orientation. The Math and Science Center establishes a “bridge” between the senior high building and the freshman academy. A one-story administration building was demolished to provide space and the new building required three-stories to accommodate the necessary spaces within the site limitations. One significant challenge was the required north/south building orientation due to existing campus constraints. The architectural team adjusted to this orientation by providing appropriate exterior sun control devices, allowing daylight and views while reducing glare in the learning studios. A computer model was generated to explore the proper placement, type, orientation and size of sun shading devices related to both the time of day and time of year.

The facility received LEED Gold Certification from the United States Green Building Council. This is the first dedicated K-12 education project in the State of Oklahoma to receive LEED Gold Certification and the first LEED Certified building in the City of Jenks.

The Center was awarded the 2011 Honor Award from the Eastern Oklahoma Chapter of the American Institute of Architects (AIA) and a Jury's Choice Award from School Planning and Management.

