PLAYTESTING EDUCATIONAL ARCHITECTURE

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ABSTRACT

PLAYTESTING EDUCATIONAL ARCHITECTURE

Architecture and game design both have very similar goals: they both are seeking to create 3-dimensional environments that deliver an optimal user experience. In game design, these environments are simulated, whereas in architecture these environments are eventually made real. Architects are uniquely able to envision fully realized 3-dimensional environments from abstract 2-dimensional drawings. Because of this, the spatial qualities of a building can remain obfuscated to anyone besides the designer until the building is actually constructed. Tools from game design offer the opportunity to not only communicate a building's spatial qualities to users and clients during the design process, but also the ability to establish metrics against which the success of a current design iteration can be tested. In game design, this is called "playtesting". Playtesting in this project involves porting a digital model of of the building into a game engine, and allowing a designer or user to interact by moving around the model with a controller. This "playtesting" process allows a designer to gather meaningful and informative feedback from users during the design process, by observing and inquiring about the user's experience during the playtest. In addition, these tools simulate the experience of movement through the space, something very difficult to understand from static drawings.

This thesis was explored through the design of an elementary school in Alexandria, VA. Elementary schools are often the subject of extensive study on user experience, because creating an optimal learning environment is so crucial to the success of young students.

PLAYTESTING EDUCATIONAL ARCHITECTURE

CHRISTOPHER SHEEHY

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(LACKING) USER-ORIENTED DESIGN

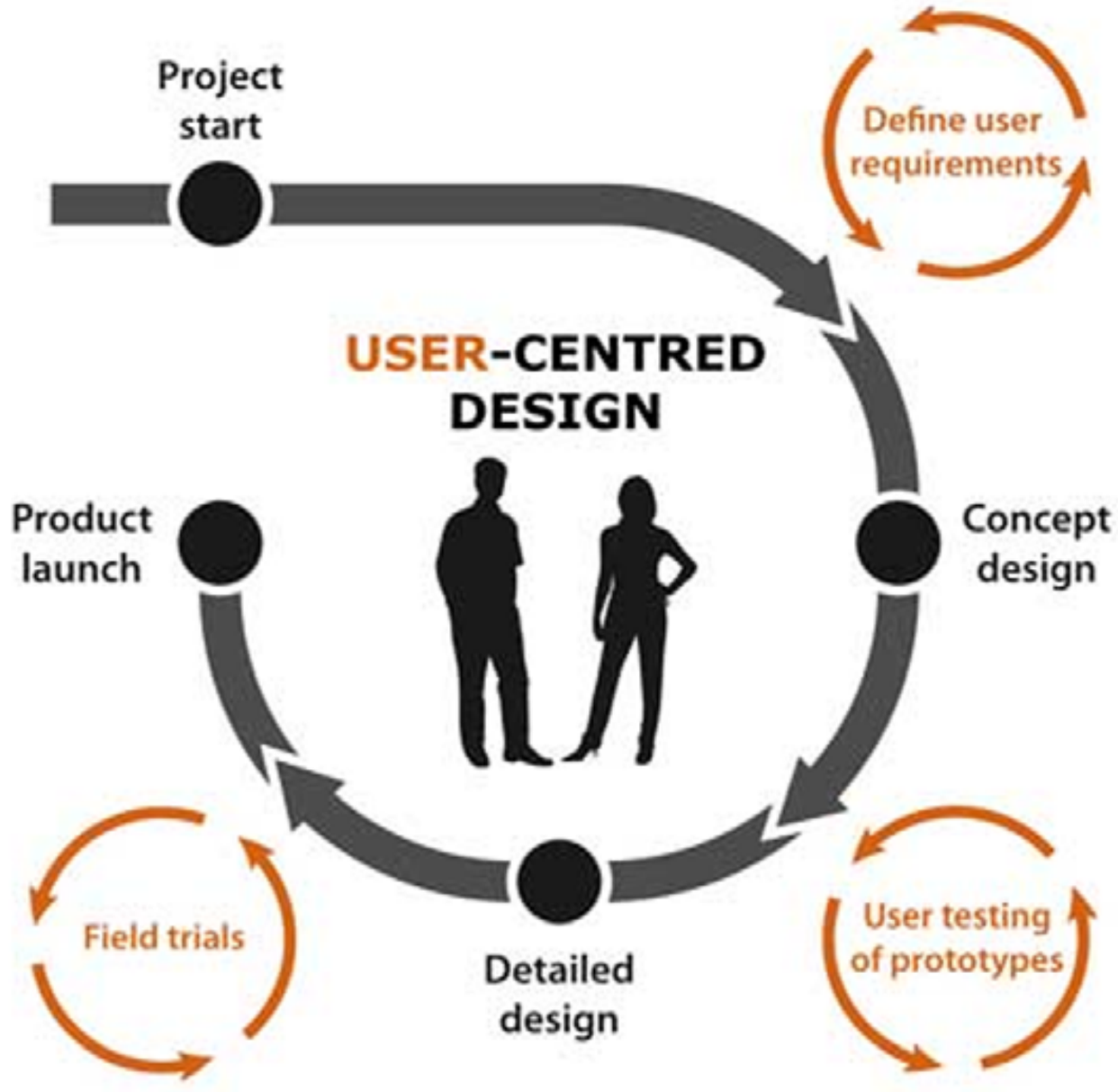


Fig. 1.1
User-centered design is about defining the needs of the user, and verifying you met them through product testing.

THE FUNDAMENTAL PROBLEM OF DESIGN

Architectural design is one of the most noble, storied, ambitious, and complex artistic undertakings of which mankind is capable The endless quest for beautiful form and sublime enclosure is tempered by the fact that we, as designers, are beholden towards those whom our efforts seek to create shelter for. In our efforts to reach skyward with our ambitions for beauty, our quest is made nobler and more difficult by our responsibility to our clients and users. We do not create static works of singular beauty, but "machines for living[1]" and occupation which must go above and beyond serving the needs of those who inhabit them.

It is the fundamental desire of architects to create something both beautiful and functional, but the problem becomes increasingly sticky as building functions become more and more complex in the modern era. Architects no longer seek to simply enclose space, but must allow for the incomprehensible variety of specialized personnel, equipment, and programmatic elements required by a technologically advanced society.

Our modern society is populated with a greater and greater variety of increasingly specialized professions. Some, like hospitals and laboratories, are made complex by their high-tech nature. Others, like offices and schools, are made complex because advances in technology afford us a more and more nuanced understanding of the effects these environments have on our everyday life, and even our mental and physical health. The greater our understanding of how various small facets of our environment affect us, the more we must hold ourselves responsible for the decisions, the modes of thought that created these facets in the first place

This understanding of the imperfections in our built environments, our "machines for living", demands redress. Designers and architects are naturally suited to provide this redress- as those who have significant impact on shaping the world around us through our ideas, we have the ability to pioneer a more appropriate, more sympathetic, and more responsive mode of living.

WHY IS SOLVING THIS PROBLEM SO DIFFICULT?

> Historically, architects, have been little concerned with user interface and experience. The best we've managed is involving clients and communities in needs analysis squatters or design charrettes. Empathy isn't an architecture school course. Wayfinding, building user behavior, and emotional reactions are thought about during design, but not tested, and for a good reason—beyond a small wall mockup, it's prohibitively expensive to prototype a full-size building, conduct focus groups, then recreate the project if it doesn't measure up. Architects instead rely on their personal experience and general assumptions about how typical users will function and feel inside their design.
> -Richard Buday, "How Behavior-Aided Design Will Transform Architecture"

While it is indeed our responsibility as designers to take responsibility for the effects of our built environment, it is arrogant and foolhardy to assume that we contain within ourselves all the knowledge necessary to design optimal environments for whatever needs any user may have. In any design endeavor, a user has the potential to be an incredible resource about the particular needs of their profession. This is nothing new.

Where difficulty arises, however, is in a condition of mutual misunderstanding between designer and user, as well as the complicated relationships modern-day architecture is a part of, where users and clients are often not the same person.

While an architect might lack understanding of the nuances of a particular profession, a user might similarly lack the archtiect's design expertise and have difficulty relating their needs to the proper architectural solutions. The architect might misunderstand the user's needs and diagnose the wrong solution, while the user might misunderstand the architect's inten and criticize their diagnosis.

USERS, AS A RESOURCE AND MODEL

My project is about creating a more effective form of communication between the needs of users and the design sensibilities of architects. While techology has made our buildings more complex, as stated before, it has increased our ability to understand them. Data and simulations afford us greater insight into the effects our environments have on us, but they also can shed greater light on the particulars of the behaviors that they host. So what if we could use these same methods to simlate user behavior?

Instead of attempting to explain or demonstrate our particular needs to users or designers, architects could effectively simlate and "test" the build environments they propose to create. They could assess the effectiveness of their ideas without investing in real-world mockups. Users could be allowed to experience architectural space without needing to construct it full-scale. Then, most importantly, the users' experience could be monitored in a way to provide the architect with useful insight and understanding which the user couldn't provide on their own.

LESSONS FROM GAME DESIGN

Architectural design and video game design have an incredible amount to teach each other. The problem is, most architectural designers aren't aware of video game design at all.

In both professions, we spend most of our time constructing digital environments. While in architecture, we make nods towards user experience, in video game design, it is absolutely everything.

Video game design operates on the fundamental principle that the game or digital space is fundamentally distinct from the experience. Designers only care about what seems to exist- the actual assembly is secondary to what the user can perceive. As they say, "if a tree falls in a forest..."

Therefore, whenever a video game designer creates a space, they are incredibly interested in how that space is occupied and understood. The user's behavior and engagement becomes their most valuable resource, because it is the most important metric for the success of their design.

CHAPTER 2-

PLAYTESTING: HOW IS IT VALUABLE? WHY DOES IT APPLY?

Fig. 2.1 Many children in this day and age are already familiar with gaming, making them ideal candidates for playtests of this sort.

WHAT IS PLAYTESTING?

Playtesting is the process by which video game designers evaluate their successes and failures during design development. It arises from first identifying the behaviors which will take place in their designed environment, and then repeatedly simulating those behaviors through different iterations of the design.

Video games and buildings are similar in that each new project strives to be different from its predecessors. Novelty sells games, and unique ingenuity garners praise for architectural projects. Unlike architecture, however, the designers of digital environments cannot assume users will have an innate understanding of how to interact with their designs because many of the most basic modes of engagement, from movement to perception to the fundamental physics of their world, are not necessarily a given. They cannot afford to assume the user has any understanding of their given task, or the methods they have to achieve it. Because of this monitoring how well a user understands and engages with their environment is vital.

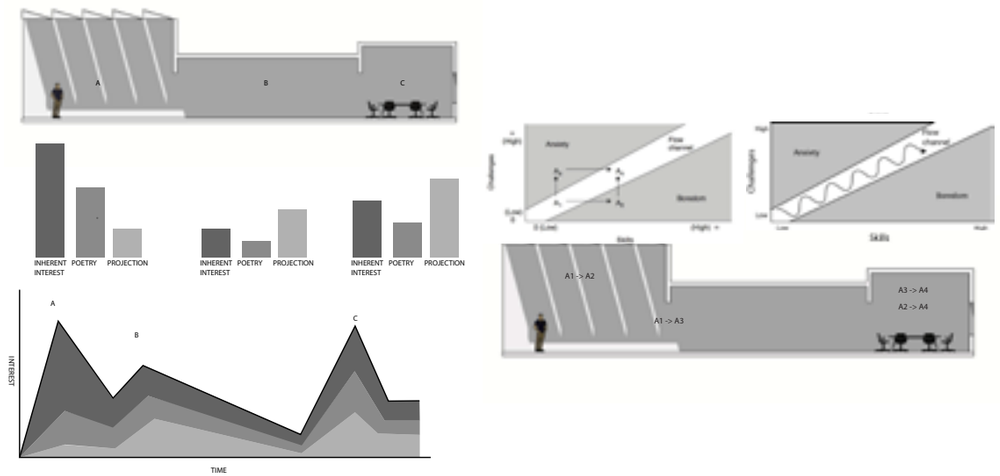
In game design, playtesting experiences are monitored and recoded so that they can be referenced for later design decisions. User engagement is examined through a variety of models to empiricise behavior for the purposes of gathering data, detailed further on.

TESTING PROCESS:

1. ESTABLISH GOALS/METRICS

DR. IVAN CROFT INTERVIEW-
Visibility, Safety, Clarity, Visual Interest/Stimulation, Feedback

2. INITIAL DESIGN, HYPOTHESIZE



3. SELF-TESTING/SUBJECT OBSERVATION

4. FOLLOW UP QUESTIONS/USER EXPERIENCE

Were you able to easily navigate to your destination?
- What factors aided you?
- What factors hindered you?

Was a teacher visible or nearby whenever you needed them to be?

Did the entrance feel welcoming and inviting?

Did you enjoy the trip to your destination?
- What parts interested you the most?
- What parts left you the most bored?

5. EXAMINE RESULTS

6. ADJUST HYPOTHESIS, REDESIGN

Fig. 2.2 Playtesting is a process used in game design that relies on user feedback during development.

THE FEEDBACK LOOP MODEL

Feedback is an absolutely critical factor in video game design, and one that deserves more notice in architecture. In short, feedback loops are a way of demonstrating a user's decision-making process when arriving at a point in an experience where they must make a choice. In short, they demonstrate the basic cycles perpetuated by changing environmental factors, which are then compensated for by changing user behavior. User experience modeled in terms of action and reaction.

This is most simply demonstrated in the first two feedback loops, which demonstrate the most simplistic model of experiencing architectural space: when our environmental factors change, we change in response. In this loop, the user and the architecture are the two points of catalytic change. Without them, there would be nothing to react to input or output, and thus no change in state.

This interaction can be modeled with more specificity, as shown with this brief sequence of spaces with a user traveling between an atrium and conference room. The first loop models the person's change in response to the transition from the open atrium to the closed hallway. The second loop models the change from the solitary environment of the hallway to the social environment of the conference room.

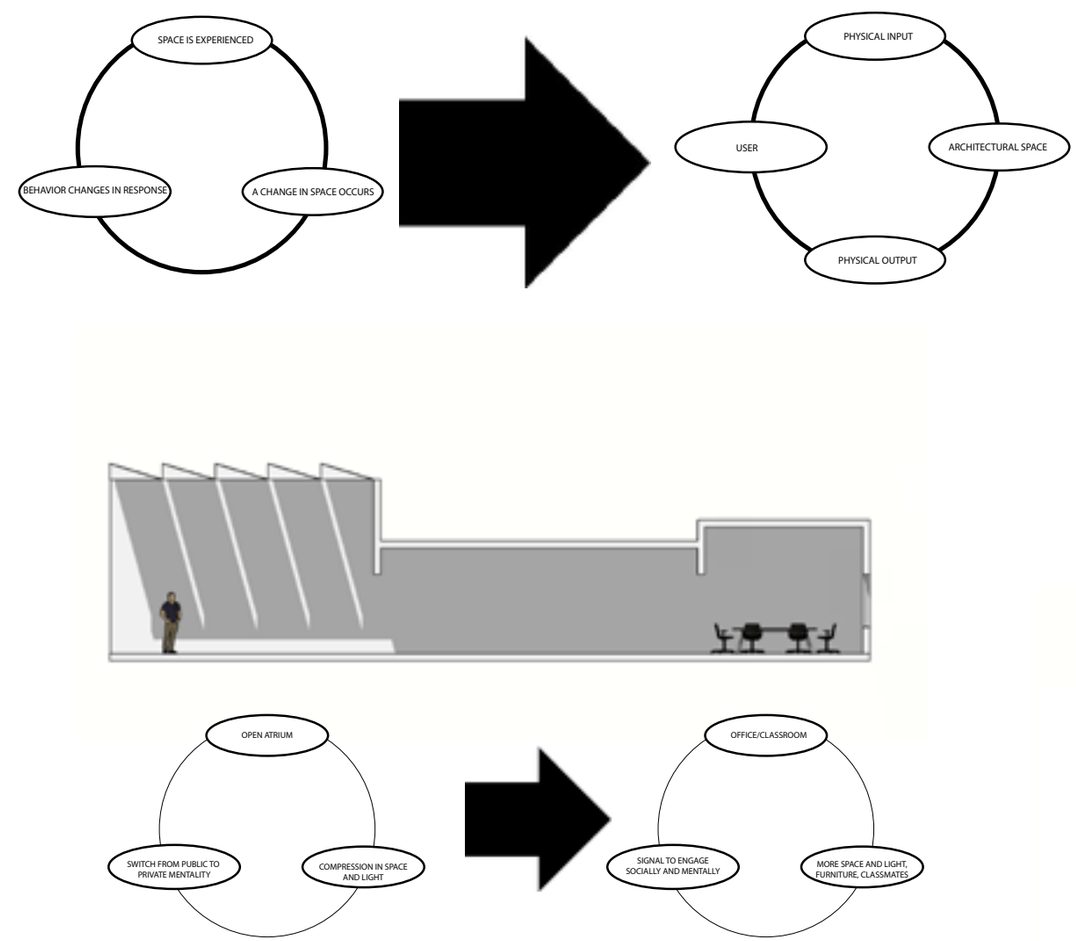


Fig. 2.3
Feedback loop-based model of user behavior in response to change

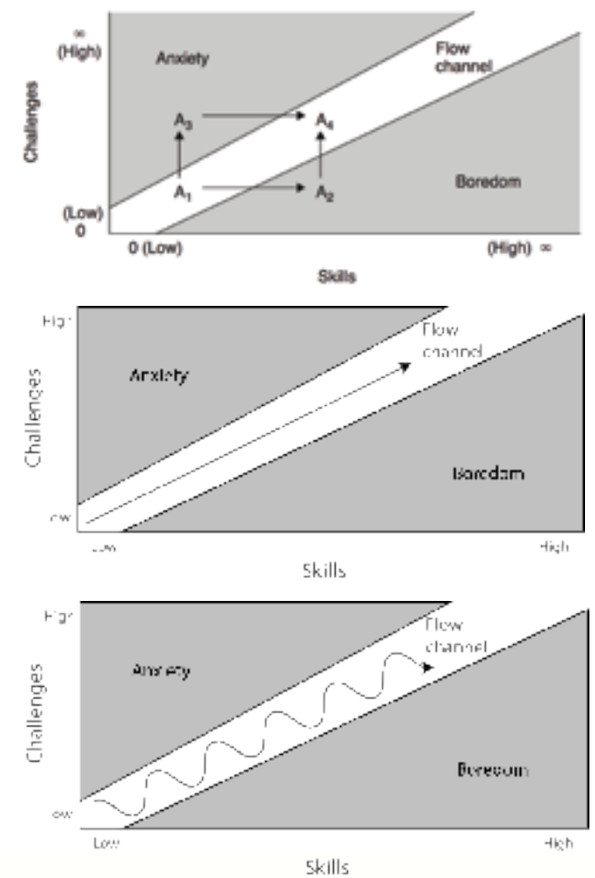
THE FLOW STATE MODEL

Flow states model user engagement as a constant transition between two or more emotional states. In this model, the two emotional states are modeled as two areas on a graph, stretching outward in opposite directions from a pair of parallel lines. The graph plots challenge on the vertical axis, and skill on the horizontal axis. The space between the parallel lines is referred to as the "flow channel".

The user moves through the flow channel when transitioning from one state to another- in this instance, it represents a point in time where challenge and skill are evenly matched. This is the ideal part of the graph, where we want the user to spend the most time for maximum engagement. Since there is no guaranteed way to ensure that the user has a constant experince of challenge and skill over time (as in the second graph), most flow states are in constant flux (as in the third graph).

This flow state demonstrates the relationship in an experience between anxiety and boredom. As a user is challenged, they can increase their skill in response. However, too much increase can lead to boredom, which can be mitigated by increasing challenge in response. Conversely, if the user is unable to increase their skill, they will move to anxiety.

The figure at the bottom demonstrates how this model of behavior can apply to transitional spaces in architecture, where the desire to explore a new space might contest with reluctance to leave a familiar environment.



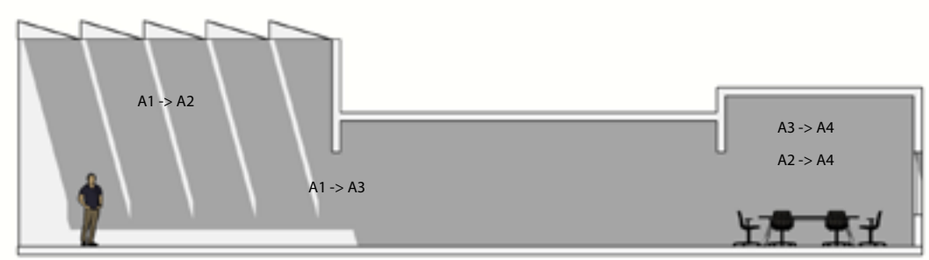


Fig. 2.4
Flow state model of user behavior, applied to a simple architectural sequence.

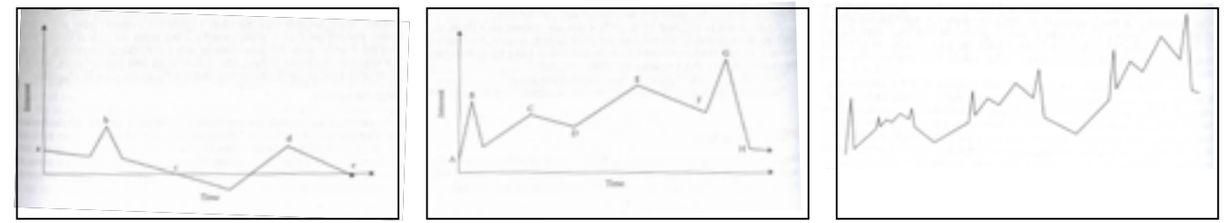
THE INTEREST CURVE MODEL

Interest curves are a tool of abstraction that is frequently used in game design, and occasionally in other forms of entertainment. Their basic function is to delineate the success of an experience, shown as fluctuations in the interest of the audience or user over time. No exact units are used- instead specific points during the experience are selected, and their heights on the vertical axis (measuring interest) are plotted relative to each other. So while this abstraction may not allow us to know exactly how much interest was generated at a specific point, we can know if a point in time during a performance was more or less interesting than a point previous. The ability to model user or audience engagement as "data" like this allows us to bring a degree of empiricism to design.

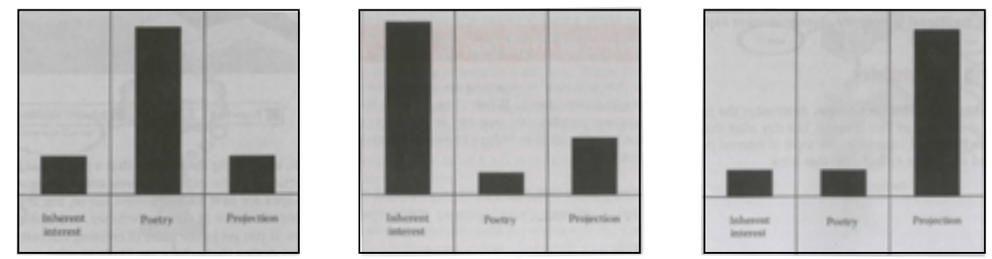
Interest curves are not constructed completely arbitrarily. First, the most important factors for generating interest are identified. In this example, they are labeled as "Inherent interest" (how exciting the given activity is by itself), "Poetry" (referring to aesthetically pleasing environments), and "Projection" (reflecting the social importance of a given situation- how many others are present and how much the audience values its relationship or interactions with them). As shown here, different sorts of activities generate interest from different factors in different amounts.

As demonstrated at the bottom, the sum of all these factors can be estimated at several point, so that they can be amalgamated into an interest curve that not only demonstrates total interest, but the varying contributing sources of that interest over time.

SAMPLE INTEREST CURVES



WHAT COMPRISES INTEREST?



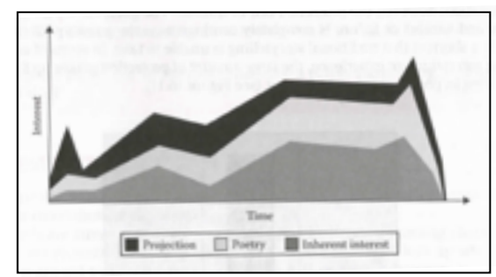


Fig. 2.5
Sample interest curves, as well as examples of generating sources of interest.
Orignally Taken from Jesse Schell's *Game Design: A Book of Lenses*

INTEREST CURVES IN ARCHITECTURE

This can be used to model user experience through an architectural sequence. This is vital because most tools of design allow architects to look at a static point in time, as opposed to a progression of spaces over several minutes. Here, I have constructed a short sequence of architectural spaces- an atrium space with a skylight, a hallway, and a conference room.

From this sequence of spaces, I constructed a curve to model the interest of a person walking from A to C, by looking at several factors of interest when the person is occupying one of the spaces, as well as when they are transitioning from one to another. These instances of time form the points on the curve.

As can be seen, the atrium space generates a high level of overall interest, with most of it being generated by the excitement of entering a new environment, as well as by the pleasing environment afforded by the high ceiling and skylight.

The hallway shows a significant decrease in engagement because of its comparatively oppressive and boring characteristics.

Finally, the conference room sees interest rise again, largely due to the interpersonal projection factor discussed previously- it is reasonable that the person moving through these spaces would encounter their peers in this room, and engage in meaningful interactions with them.

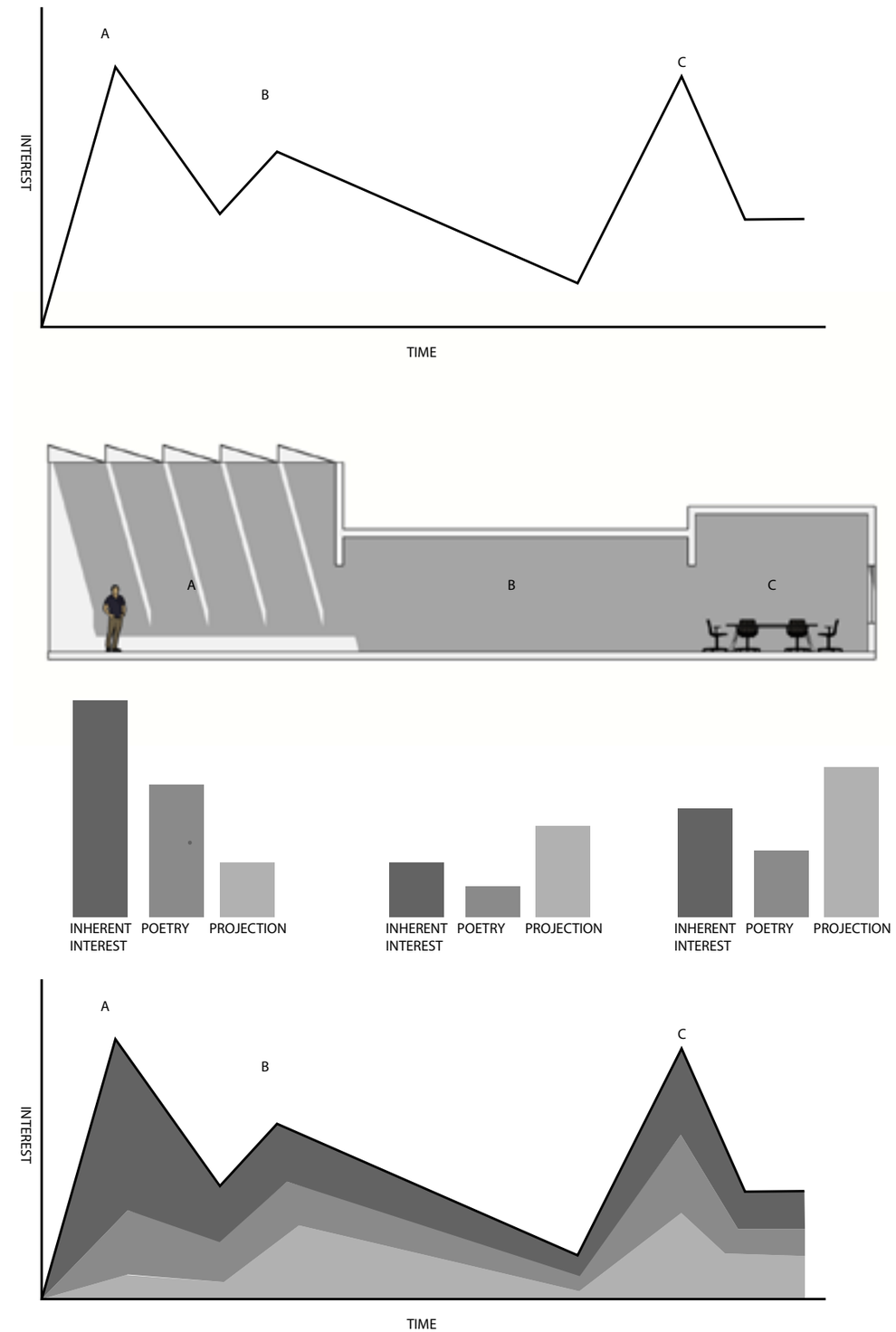


Fig. 2.6
Interest cuves generated from a simple architectural sequence.

SKETCHUP->UNITY: THE TOOLS

In order to emulate the process of video game design in the execution of my thesis, I made use of a game engine called Unity. This has many similarities to other 3d design software: it is fundamentally based around functionalities which allow the user to design and create complex 3-dimensional environments in a digital space. In addition, it had compatibility with existing architectural design software which would allow me to continuously re-import my developing design between different programs.

The important factor that separates Unity (and other game design software) from architectural design software is their capability to embody an experience from the point of view of a character within the digital environment being designed. Unity contains the functionality to inhabit characters from first or third person views, with numerous other functionalities to allow for movement, action, and even the creation of autonomous non-player entities.

The possibilities for incorporating this technology further into architectural design are incredibly expansive: they could allow firms to run surveys during the design phase after allowing hundreds, or even thousands of potential users through parts of the design. These could serve the same function as post-occupancy surveys do in current practice, but they would not require that the building be constructed first, and data from the survey could be used to adjust the building while it is still in the design phase.

Fig. 2.7
Buillding geometry is modeled in SketchUp, then ported to Unity for VR testing

APPLICATIONS FOR THIS PROJECT

For my project, I was most interested in the ability to inhabit the point of view of a character in the environment I was designing, so I could examine my design from the perspective of a potential occupant. I wanted to design a simulation that would allow whoever was currently "playtesting" my building to run through its interior spaces, experiencing changes that occurred through different design iterations and having the ability to evaluate them from the perspective of a prospective user.

Virtual Reality is a new and exciting technology that comes in many forms, and has a growing presence in architectural practice. It often calls to mind complete immersive experiences where a user wears a headset to provide them a 360-degree view of a virtual environment, and perhaps even allows limited mobility in a small area. This project makes use of a rudimentary, limited-immersion type of VR, referred to as Through the Window, or Desktop VR- basically, a first person view projected through a screen, where the user controls their view and movement through an interface such as a mouse or controller.

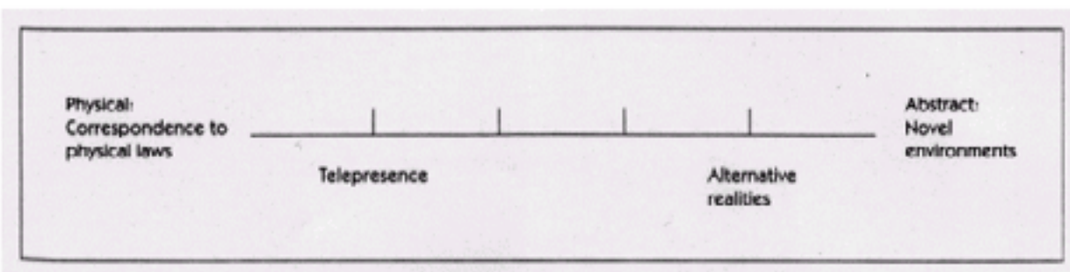


Fig. 2.8
VR is classified on a spectrum which defines the user's relationship with physical reality.

Fig. 2.9
Controlling a character through a computer screen is a common VR experience that most people often forget about in light of new technologies.

"With this kind of system, also known as "desktop VR" the user sees the 3-D world through the 'window' of the computer screen and navigates through the space with a control device such as a mouse. Like immersive virtual reality, this provides a first-person experience. One low-cost example of a 'Through the window' virtual reality system is the 3-D architectural design planning tool Virtus WalkThrough that makes it possible to explore virtual reality on a Macintosh or IBM computer. Developed as a computer visualization tool to help plan complex high-tech filmmaking for the movie The Abyss, Virtus WalkThrough is now used as a set design and planning tool for many Hollywood movies and advertisements as well as architectural planning and educational applications. A similar, less expensive and less sophisticated program that is starting to find use in elementary and secondary schools is Virtus VR (Law, 1994; Pantelidis, nd).

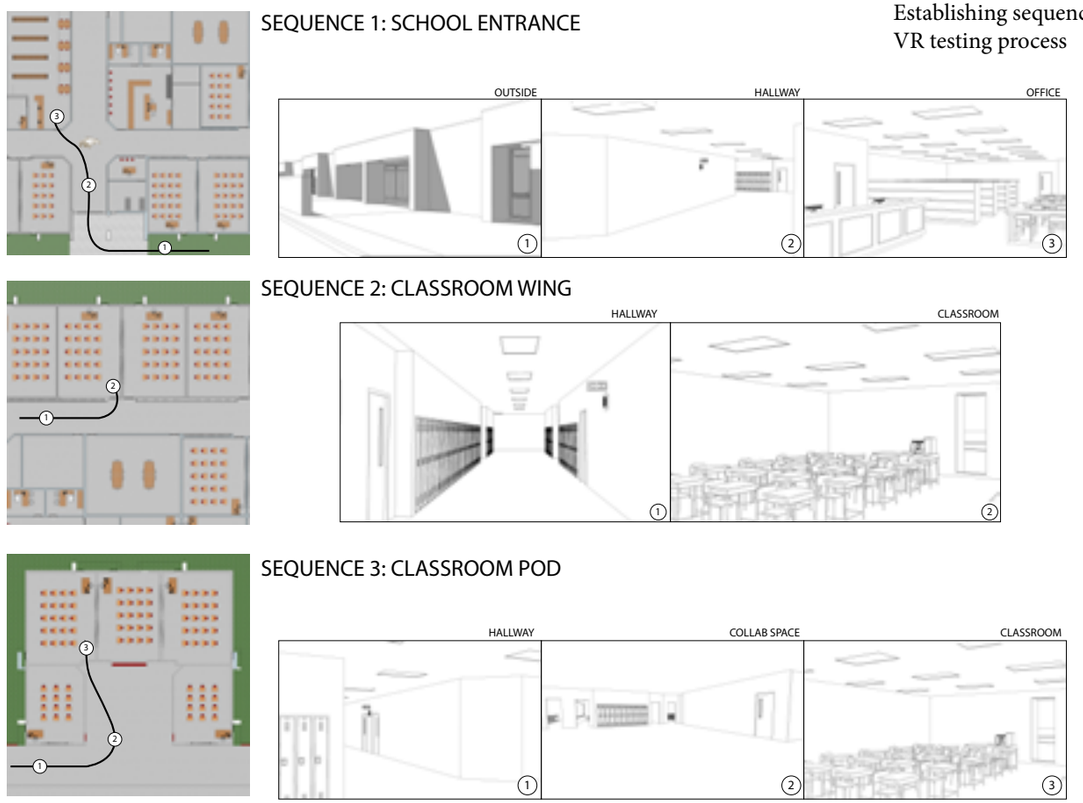
THE USER SIMULATION

The method I developed for my design process was thus:

At specific design milestones, I would evalute my decisions by importing my design thus far from Sketchup into Unity, and then simulating occupant behaviors by moving from place to place within the digital model using a controller, experiencing it from the viewpoint of someone walking throughout the building. The purpose of this exercise was to use VR as a design tool as effectively as possible. Therefore, I focused on testing the spaces in the building where movement occurred- mostly, the hallways and other transition spaces within the building.

PLAYTESTING EDUCATIONAL ARCHITECTURE: METHODS

Fig. 2.9
Establishing sequences for VR testing process



ESTABLISHING DESIGN GOALS

In order to establish the metrics I would be testing for when undergoing the simulations in VR, I got in contact with a variety of people who work in elementary schools, such as teachers, administrators, and resource psychologists. I asked them questions such as the following in order to try and establish what behaviors would let me know that my design was more or less successful:

What are some general environmental factors that can affect a student's concentration in the classroom?

> For instance, do students of certain ages have difficulty concen trating for extended periods of time? Every student is different, but is there a way how are activities and experiences planned to hold a student's attention for the duration of the class period?

What sort of environmental factors or experiences can a student undergo when they enter a school or travel through the hallways that affect their concentration and performance in class?

> For instance, bullying often occurs in between classes, away from direct teacher supervision. Are there things we can do to help students feel safe traveling from class to class?

As a counterpoint, are there other factors(positive and negative) that occur when a student moves from place to place that helps them perform well in the classroom? Has anyone ever examined the effect of transitional spaces on student learning?

Are "gamification", and gaming terms such as flow states, interest curves, and feedback loops ever used when planning student activities? How so?

As a more general question, what measurements or metrics are often used to determine if a student is doing well in the classroom? Grades and instructor feedback are an obvious answer, but do people ever conduct studies that look at different indicators of success?

CHAPTER 3-
SITE AND PRECEDENT

Fig. 3.1
Potomac Yards Market Square Development, Conceptual Render.
From Potomac Yards SAP 2018

Fig. 3.2
Potomac Yards large site plan

SITE: POTOMAC YARDS

For my site, after much deliberation, I selected Potomac Yards. This is an area slated for further development located in northern Alexandria, VA. It is planned to become much more urban in character, accompanying several thousand new residents, as well as numerous opportunities for retail and commercial. Along with this projected growth in business and commerce is the anticipation of new residents, whose children will exceed the current capacity of the Alexandria school system. According to the Potomac Yards 2017 Small Area Plan:

> "If elementary school student generation rates continue to increase the City will need additional capacity to support elementary school students. Furthermore, if middle and high school generation rates continue to increase, in the long-run, the City will face additional capacity challenges in the middle and high schools. The most critical need is the provision of additional system capacity at the elementary school level.
> (p. 70, North Potomac Yards Small Area Plan, 2017)

This particular site is designated as block 4, as is slated to be a potential site for the construction of a new elementary school according to the plan.

POTOMAC YARDS: NEIGHBORHOODS

CRESCENT GATEWAY

To be built at the northern end of the proposed Potomac Yards District, Crescent Gateway will mostly consist of high-density residential. It will serve as the threshold for the rest of the development. Local amenities include vistas across the Potomac and access to proposed Crescent Park and Four Mile Run Park. Uses are mainly high-density residential, with the notable exception of a school or community center being planned for plot 4. My thesis project will be centered on this site.

Fig. 3.3
Crescent Gateway neighborhood
From Potomac Yards SAP 2018

MARKET STREET

Centrally located within the heart of the proposed Potomac Yard development, this neighborhood will house the diverse retail and social functions that will make the new development an attractive destination, as well as creating space for a variety of residential and commercial uses.

Fig. 3.4
Market Street neighborhood
From Potomac Yards SAP 2018

LAND USE

1

VISTAS

1

CURRENT SITE

Fig. 3.5
Site analysis diagrams, per SAP

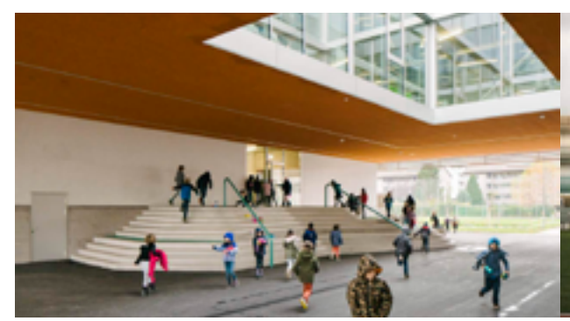
Fig. 3.6
Current site conditions

Fig. 3.7
Kai Tak and Gartenhof Elementary, interior and exterior views.

KAI TAK PRIMARY SCHOOL
Hong Kong

Kai Tak is an Elementary school in Hong Kong. It was particularly important as a precedent for this project due to its dense urban site, its integration with the nearby urban environment, its unique architectural style, and its community engagement. Particularly compelling was the openness and accessibility of the school structure to the surrounding community, a factor I found sorely lacking in many US schools.

PRIMARY SCHOOL GARTENHOF
Allschwil, Switzerland



Primary School Gartenhof was another example of design in the international community. I sought inspiration from other countries because I believed that the similar construction of most schools in the United States indicated that there were many lessons we had yet to learn. I enjoyed this school for its exterior treatments and small site utilization.

Fig. 3.8
Tenderloin and Woodland Schools, interior and exterior veiws.

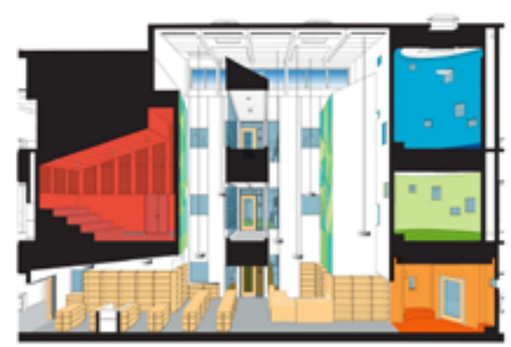
TENDERLOIN COMMUNITY SCHOOL

San Francisco

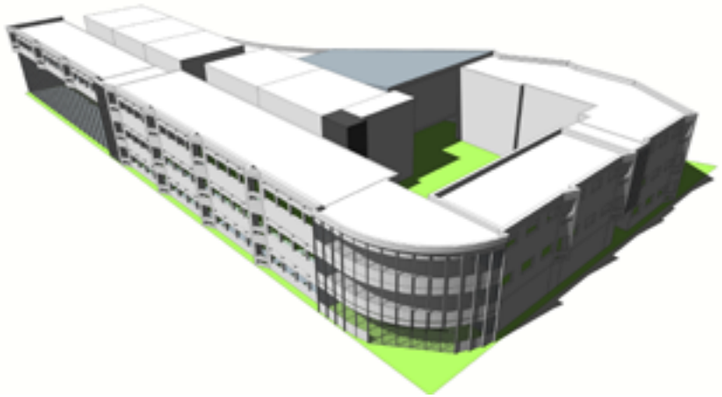
Tenderloin Community School is a great example of an urban school being built in an atypical paradigm in the United States. In addition, it is specifically called out in the Potomac Yards Small Area Plan as a likely precedent for a facility to be constructed on the site I selected.

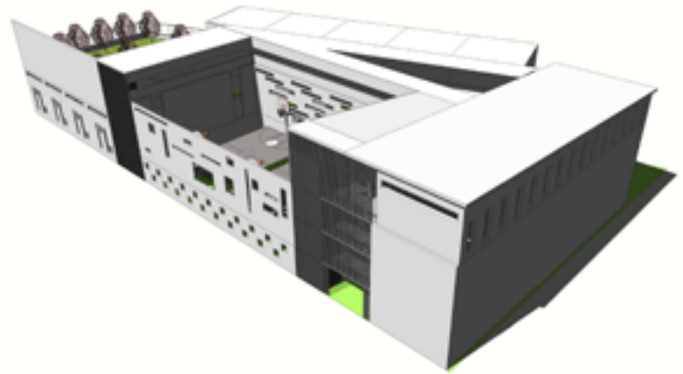
WOODLAND ELEMENTARY SCHOOL

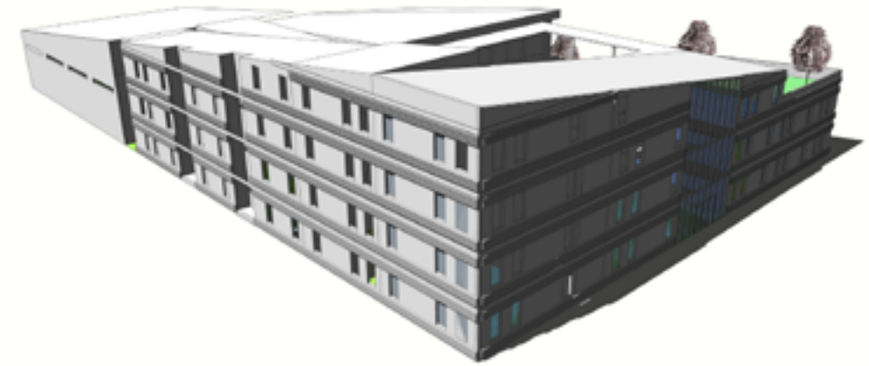
Woodland, MA



The Woodland Elementary School featured an incredibly interesting interior, with multilayered sectional relationships involving viewpoints and trasparency that I sought to emulate in my own design.







CHAPTER 4- DESIGN PROCESS

Fig. 4.1
Design options feeding into main design for development.

DESIGN DEVELOPMENT: OPTIONS

The design process began with the development of some basic options based on the standardized City of Alexandria programmatic requirements for a standard-size elementary school. These finalized into 3 basic design options, each drawing some inspiration from other precedents around the world.

Once this was complete, I wanted to begin testing how well each design achieved the goals I had established in my research and with my interviews with school faculty and psychologists. I began by establishing sequences between programmatic elements. The two main sequences I tested were a journey through the entrance of the school to a classroom, and a journey within the school from a classroom to a media center.

Upon taking these journeys in the VR simulation, I then rated different parts of the sequences based on various factors I was looking for: Visual Interest, Simplicity of Wayfinding, and Visual Connection to other parts of the building program. These factors were established to be important parts of school design, as well as things that took the greatest advantage of using Unity's VR capabilities as a design tool. I would plot my findings about each of these three factors on an abstract imitation of an interest curve, in an attempt to not only show how effectively I was achieving my goals, but how that success increased or decreased over time, and what factors contributed the most to it.

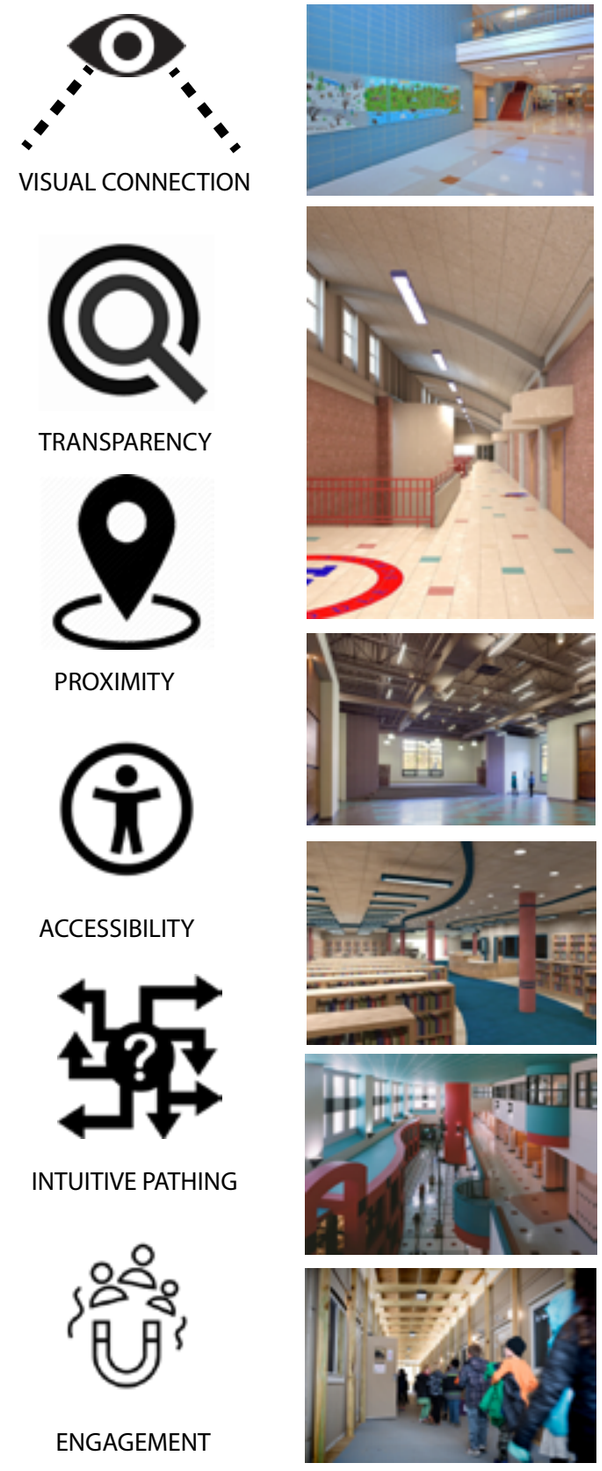
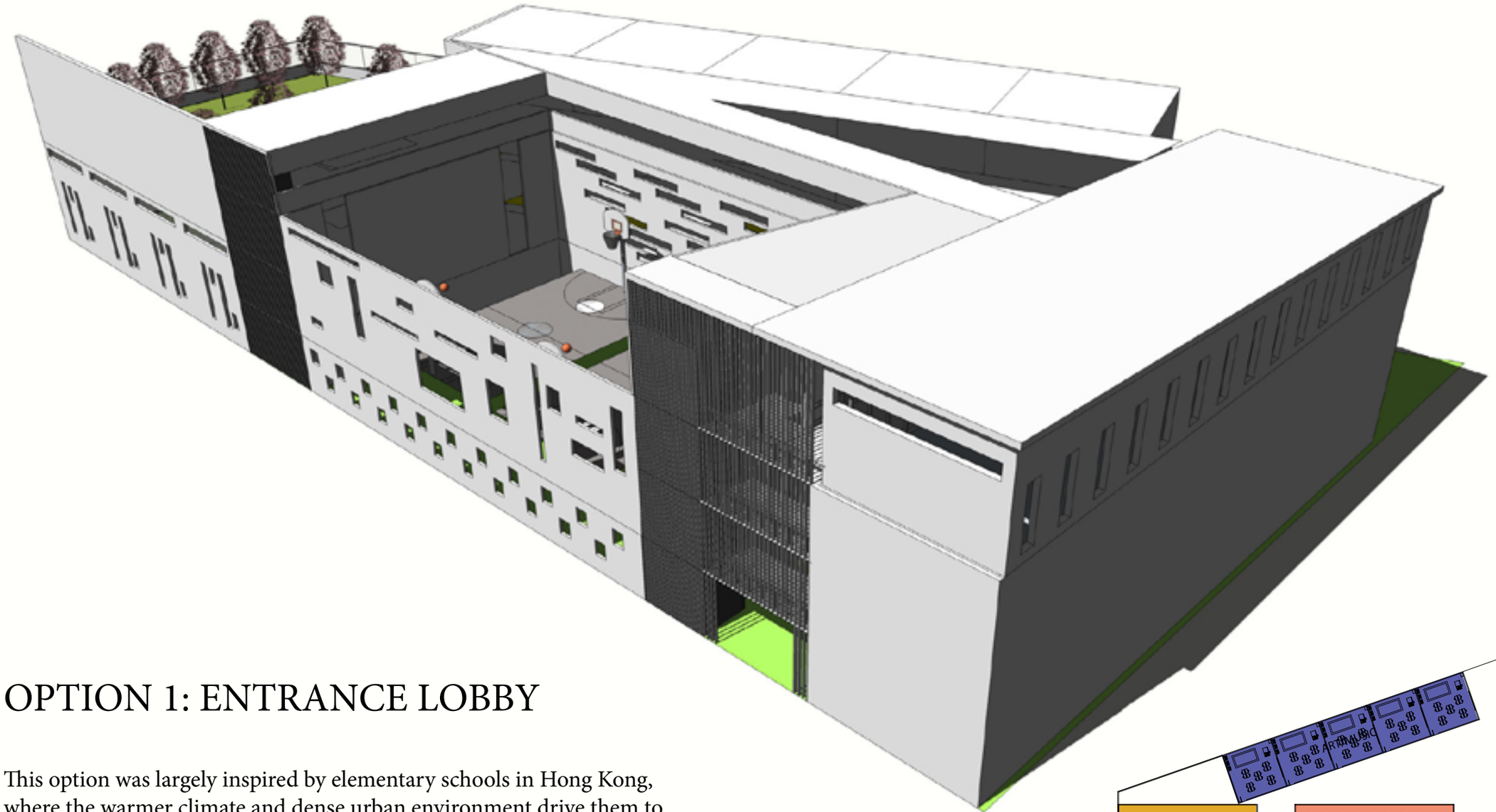


Fig. 4.2
Design factors for consideration, alongside sample transitional spaces.

Fig. 4.3
Option 1 Exterior View



OPTION 1: ENTRANCE LOBBY

This option was largely inspired by elementary schools in Hong Kong, where the warmer climate and dense urban environment drive them to design open-air schools with widespread access to the street outside. This design is built around two open central elements. The first is a blacktop play area, and the second is an outdoor atrium that extends through all floors of the building. It attempts to take advantage of the triangular shape of the site while organizing circulation around central public elements.

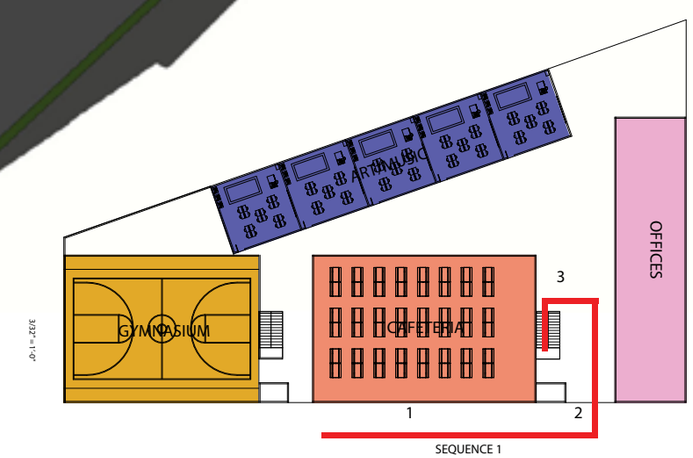
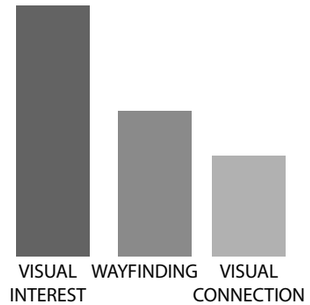
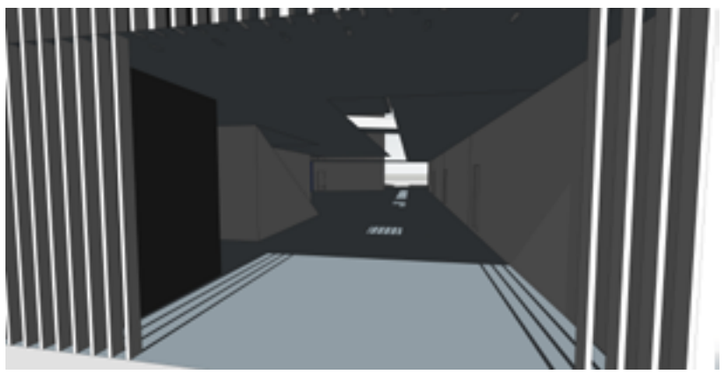


Fig. 4.4
Sequence 1 path

OPTION 1- LOBBY





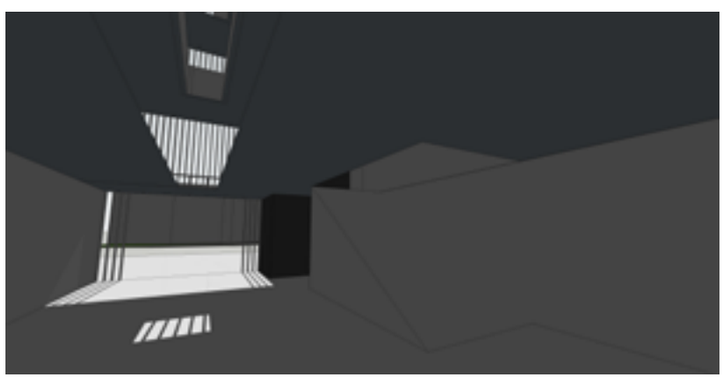


Fig. 4.5
Sequence 1 views, with corresponding data

OPTION 1: TESTING AND RESULTS

The entry sequence I followed in VR for this test involved walking along the west face of the building, through the main entrance, and up to the main stair. Upon completing this sequence, following my previously established interest curve method, I found that my experience achieved my design goals less and less over time. Most of all, visual interest decreased dramatically once the user entered the building.

This sequence showed that I needed to take more care in the presentation of the entrance of my interior, so that it is not disappointing in comparison to the outdoor approach.

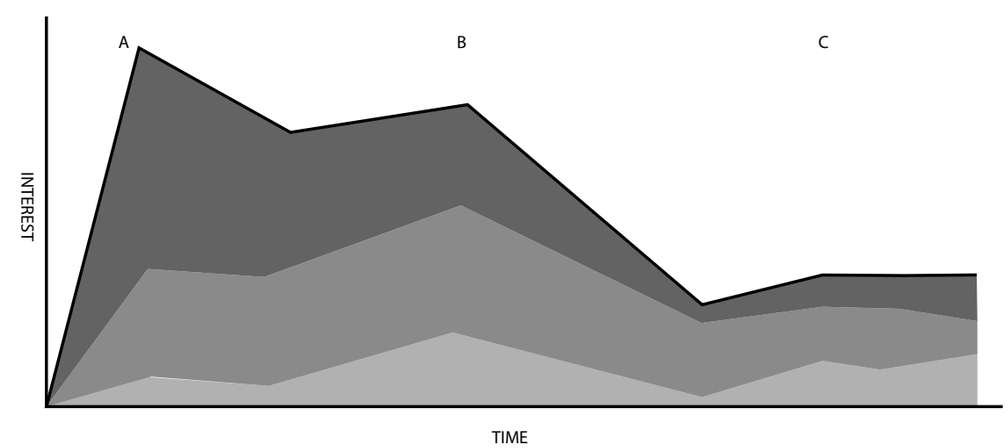
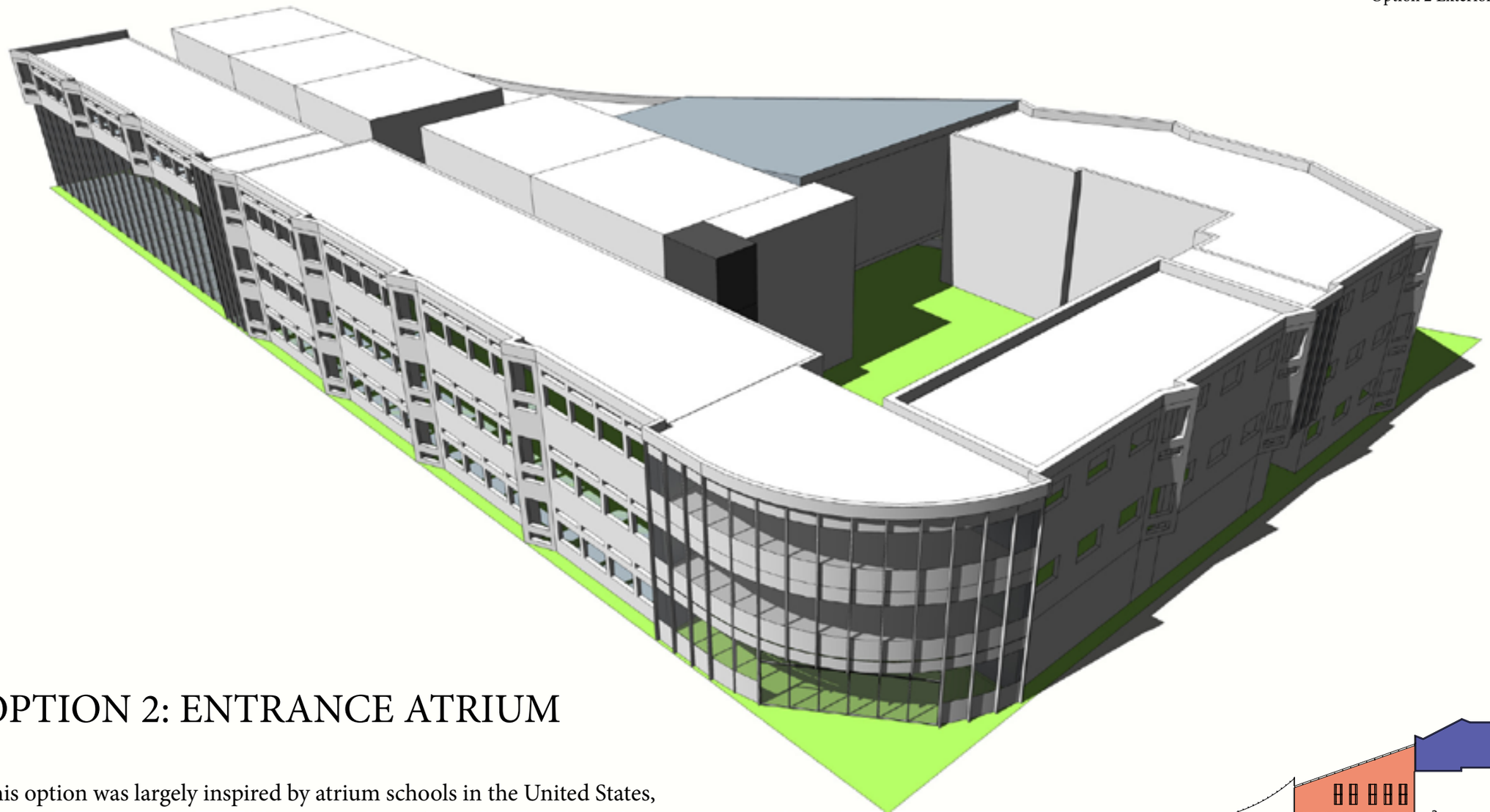


Fig. 4.6
Sequence 1 data plotted over time

Fig. 4.7
Option 2 Exterior View



OPTION 2: ENTRANCE ATRIUM

This option was largely inspired by atrium schools in the United States, which use this initial public forum as a place of social gathering and of safety. The presence of students in the atrium at the beginning of the day and during public functions allows teachers and administrators to be able to easily observe and account for them, if need be.

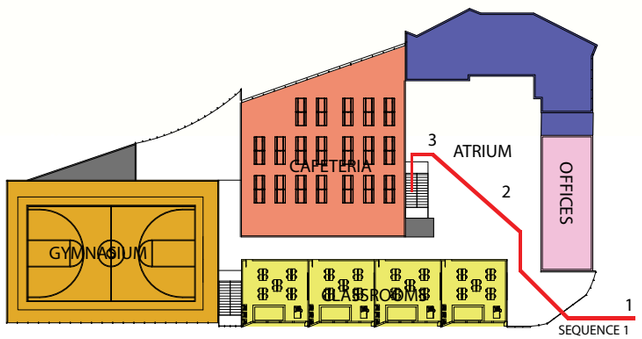
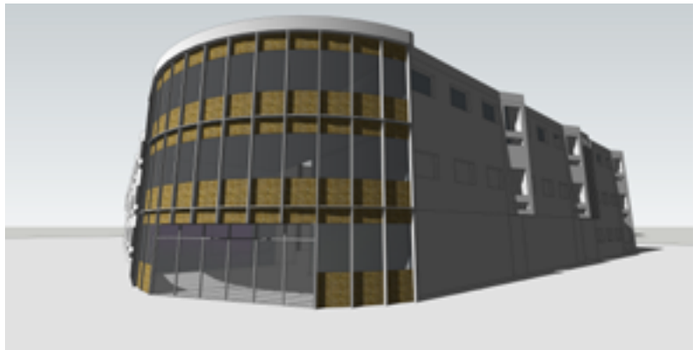
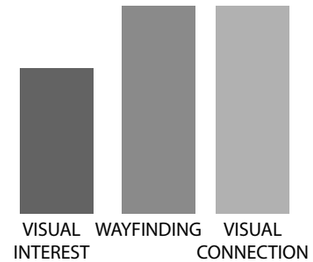


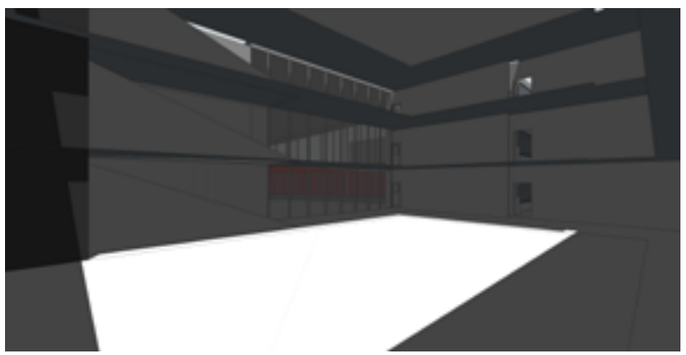
Fig. 4.8
Sequence 1 path

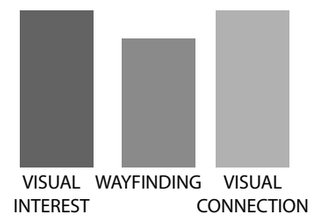
OPTION 2- ATRIUM



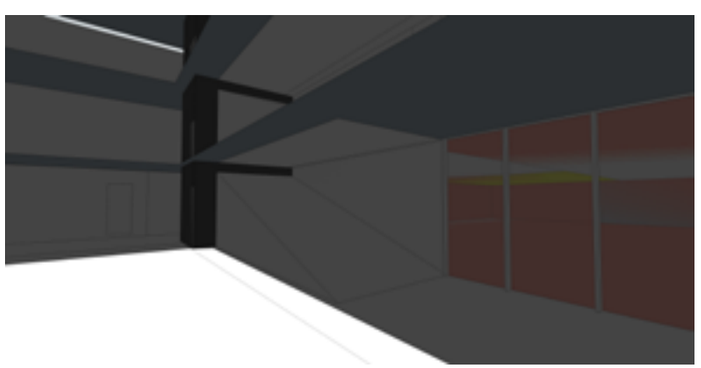


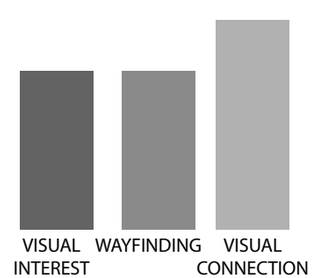
A





B





C

Fig. 4.9
Sequence 1 views, with corresponding data

OPTION 2: TESTING AND RESULTS

The entry sequence I followed in VR for this test involved walking towards the entrance at the southwest corner of the building, through the main entrance, and into the main atrium. Upon completing this sequence, following my previously established interest curve method, I found that this sequence had a considerably high level of visual interest and engagement. Most of all, I achieved my design goals at a comparatively high level which diminished to a relatively small degree throughout the sequence.

This sequence demonstrated how an interior atrium was altogether more successful in creating a good entry sequence. In addition, the construction of the entrance at the corner showed how visual connection to people inside the school at the approach could help visual interest remain consistent.

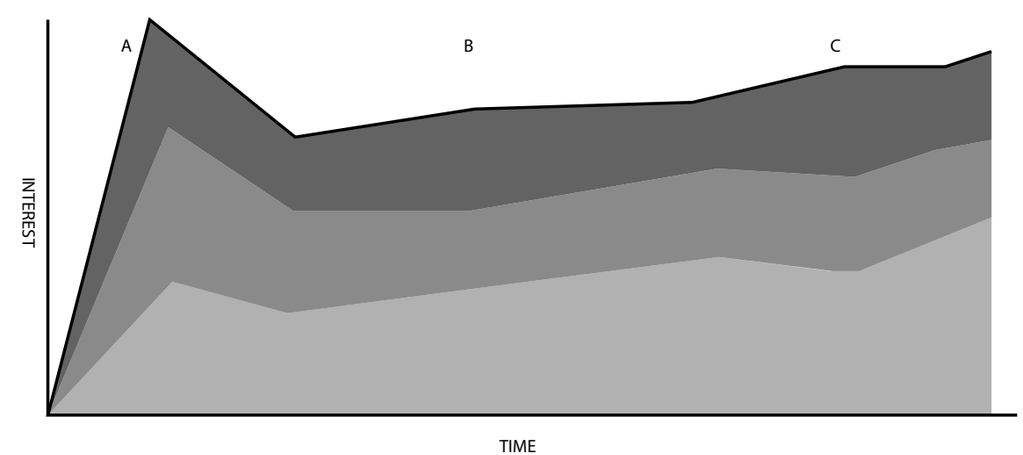
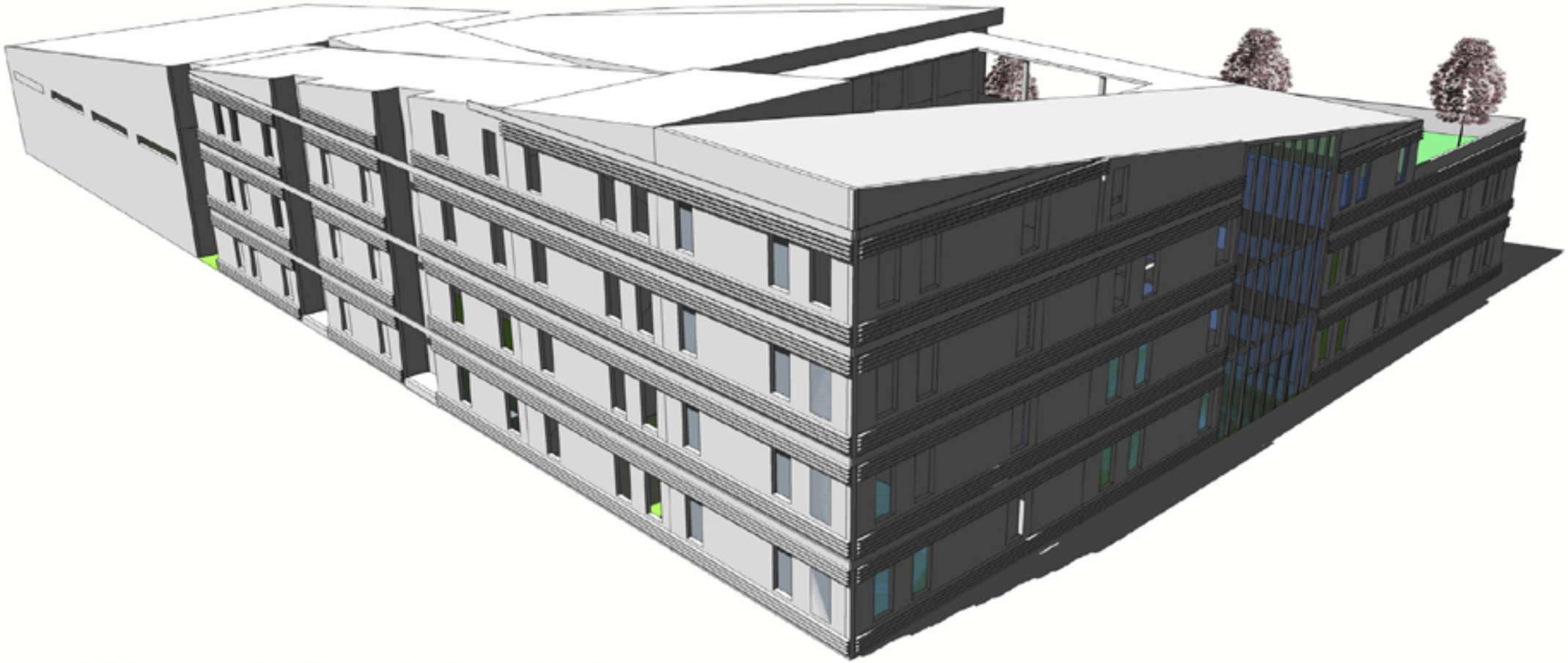


Fig. 4.10
Sequence 1 data plotted over time

Fig. 4.11
Option 3 Exterior View

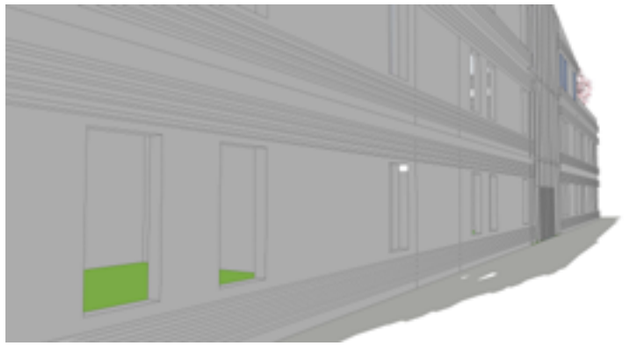


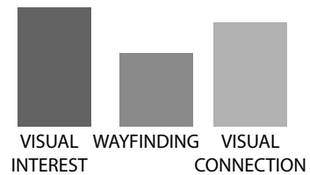
OPTION 3: ENTRANCE COURTYARD

This option took the motif of the entrance atrium and opened it up completely, turning it into a courtyard in the classical style. Taking more inspiration from classical buildings, I organized the majority of the circulation to orbit around the courtyard, which not only increased its presence as a hierarchical space but also brought the added benefit of visual relationships to almost all other parts of the school at once.

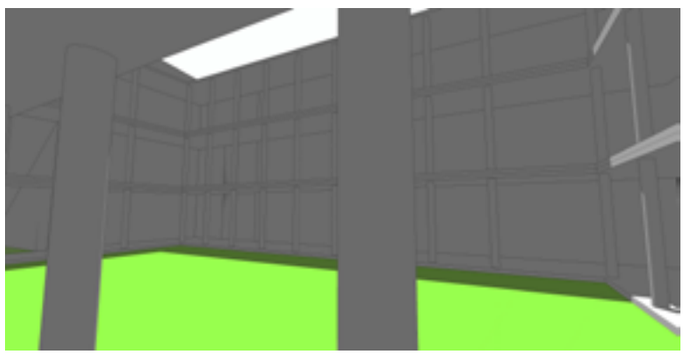
Fig. 4.12
Sequence 1 path

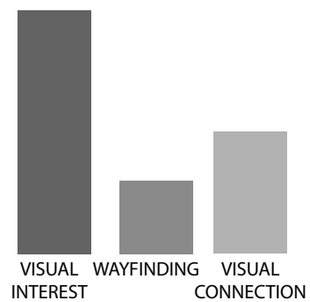
OPTION 3- COURTYARD





A





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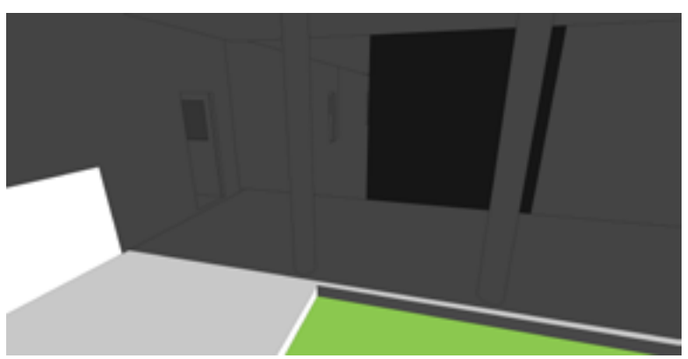
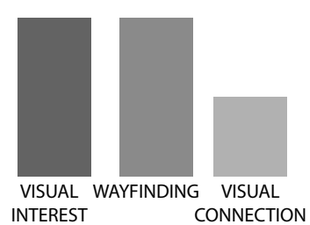




C

Fig. 4.13
Sequence 1 views, with corresponding data

OPTION 3: TESTING AND RESULTS

The entry sequence I followed in VR for this test involved walking along the south face of the building towards the entrance on the center of t the south side, entering into the central courtyard and proceeding towards one of the northern classrooms. Upon completing this sequence, following my previously established interest curve method, I was pleasantly surprised to see how acutely my visual engagement rose once I was within the courtyard. I kept the visual connections I experienced here as an important indicator of how I could achieve my design goals through the interior circulation.

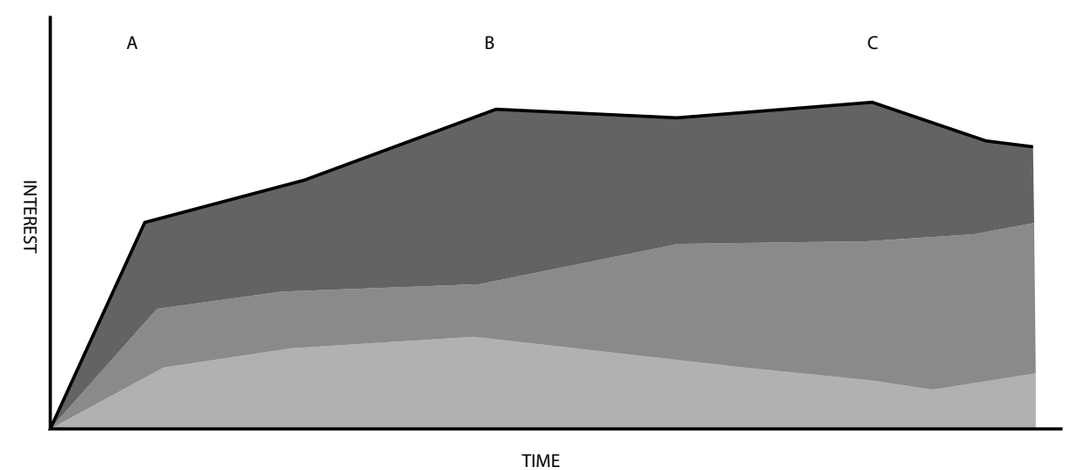


Fig. 4.14
Sequence 1 data plotted over time

Fig. 4.15
Option 1 Exterior View

OPTION 1: OVERLOOK

The interior circulation here wraps around the edge of the asphalt play area and the small interior courtyard. Once again taking inspiration from schools in Hong Kong, the circulation is mostly open-air. This allows it great visibility of the areas it passes by. The second sequence, moving to the media center from a classroom on the same floor, passes by several of the building's most eye-catching elements during the journey.

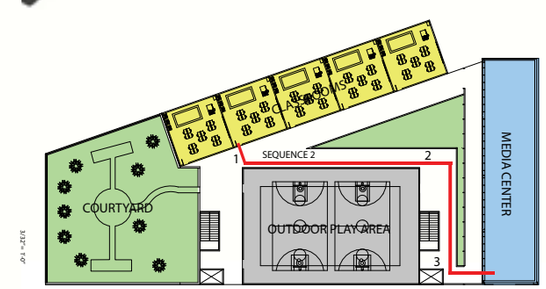


Fig. 4.16
Sequence 2 path

OPTION 1: TESTING AND RESULTS

The entry sequence I followed in VR for this test involved walking from a classroom on the north side of the top floor, proceeding through main walkways to the media center. This circulation takes me past the centrally located asphalt play area and central courtyard on the way. The most important takeaway from this sequence was the engagement I felt as I had such interesting views on both sides of the hallway. I felt this contrasted sharply with standard elementary school corridors, which are often double-loaded and have no access to natural light.

I noticed that most of the time, I felt like this design drew most of its success from the many visual connections to different parts of the building, which helped with interest and wayfinding.

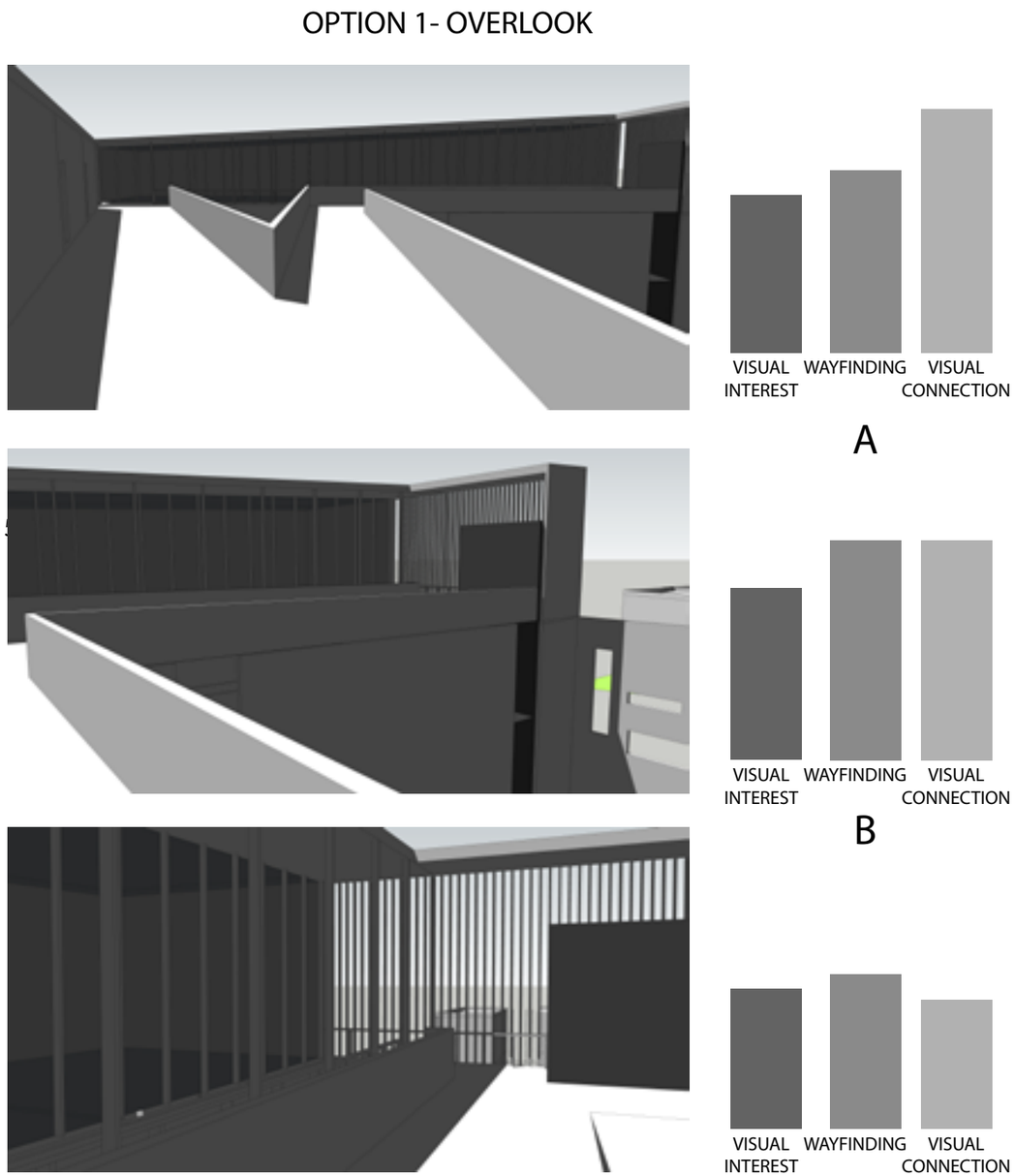


Fig. 4.17
Sequence 2 views, with corresponding data

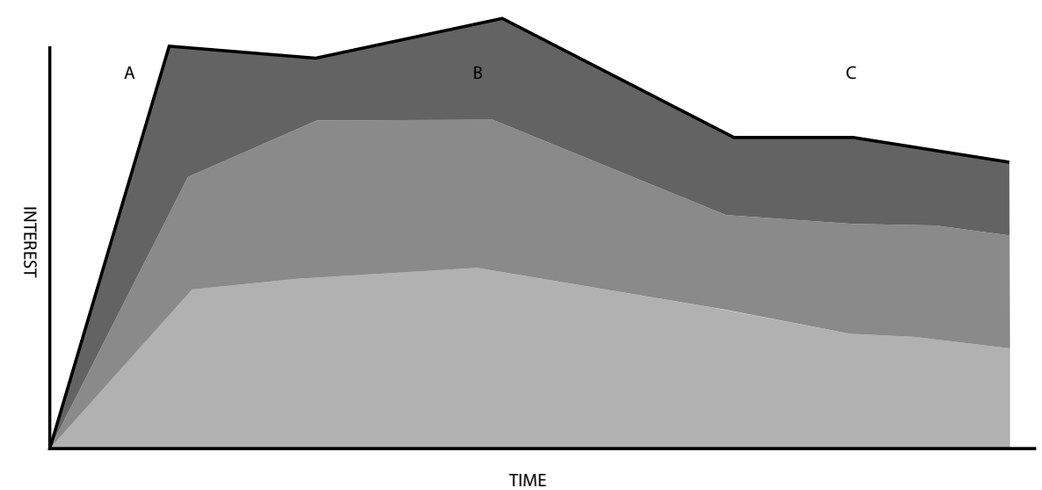
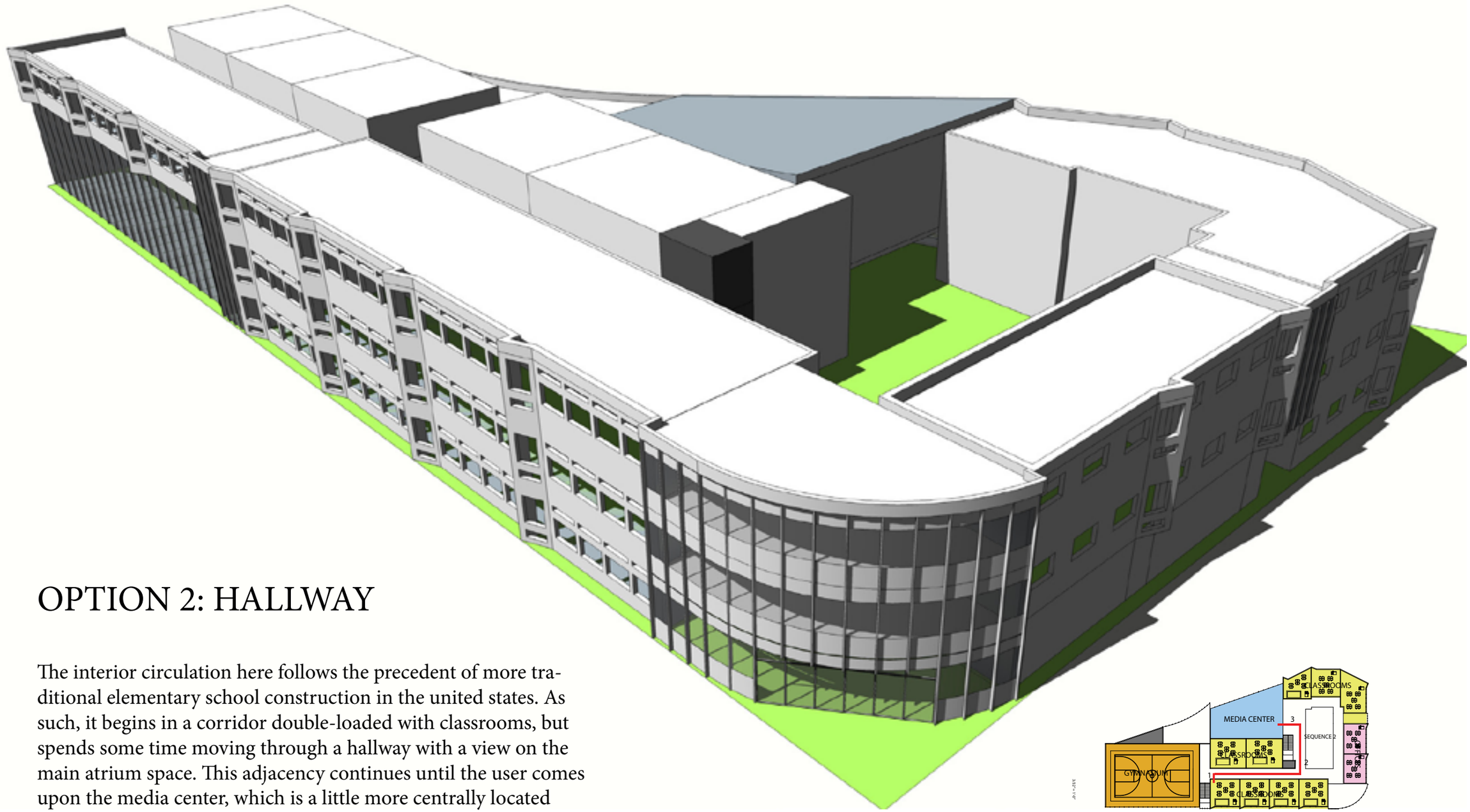


Fig. 4.18
Sequence 2 data plotted over time

Fig. 4.19
Option 2 Exterior View



OPTION 2: HALLWAY

The interior circulation here follows the precedent of more traditional elementary school construction in the united states. As such, it begins in a corridor double-loaded with classrooms, but spends some time moving through a hallway with a view on the main atrium space. This adjacency continues until the user comes upon the media center, which is a little more centrally located than in the previous design.

Fig. 4.20
Sequence 2 path

OPTION 2- HALLWAY

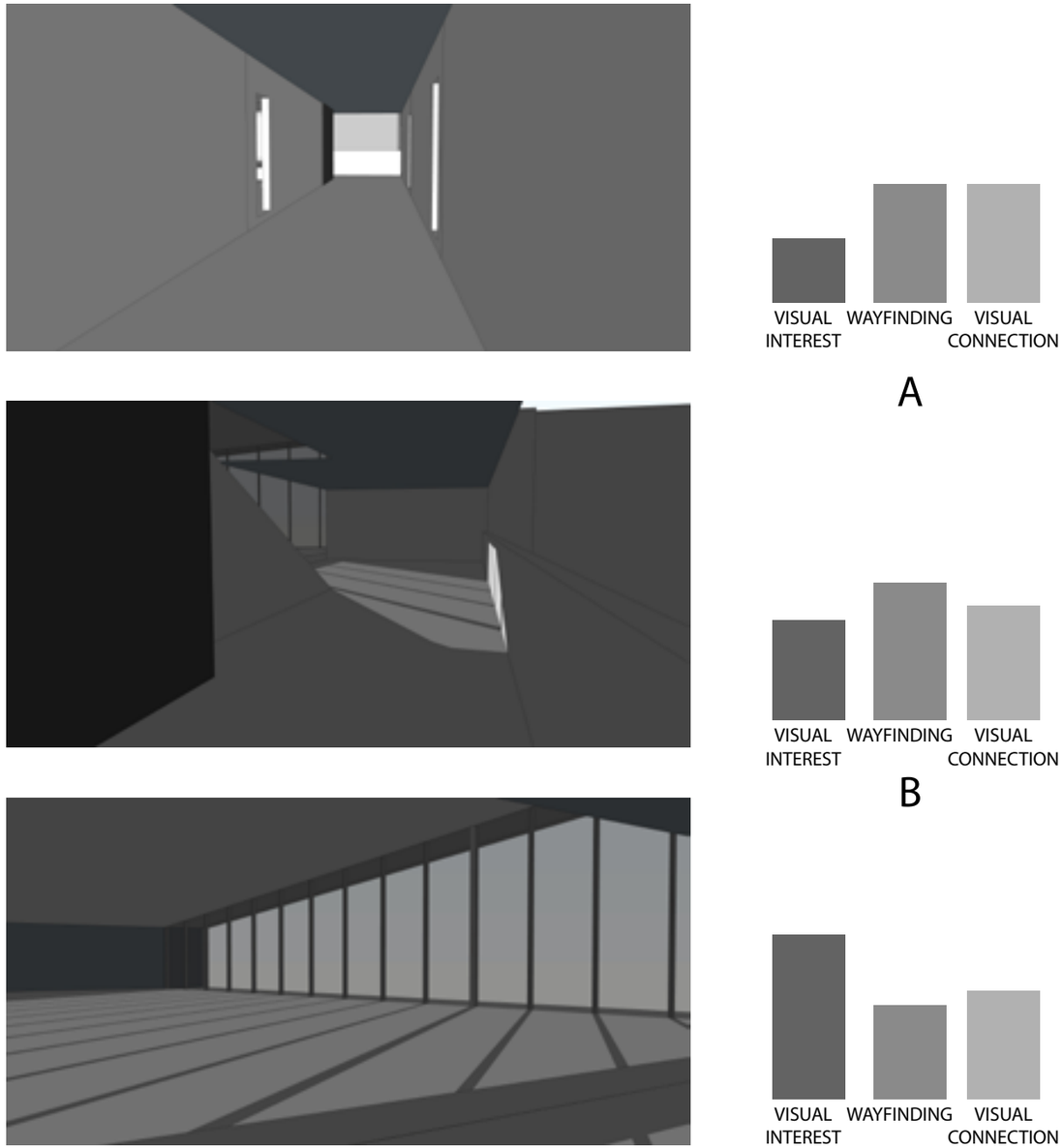


Fig. 4.21
Sequence 2 views, with corresponding data

OPTION 2: TESTING AND RESULTS

The entry sequence I followed in VR for this test involved walking from a classroom in a double-loaded corridor on the north side of the building, proceeding briefly through a hallway with views on the main atrium, and into the centrally located media center. Something that was immediately obvious as I explored this option was how, though it at times found itself proceeding next to the atrium in plan, the configuration of the atrium and the placement of the main stair impeded the access to light and openness that I had though would be more evident here.

Overall, I felt like this design was less successful in achieving my goals than the other two options. Most importantly, it demonstrated that I have to be careful with the placement of interior elements obstructing views, and that it is more difficult to get a satisfactory penetration of natural light through and interior atrium than adjacent to an exterior court.

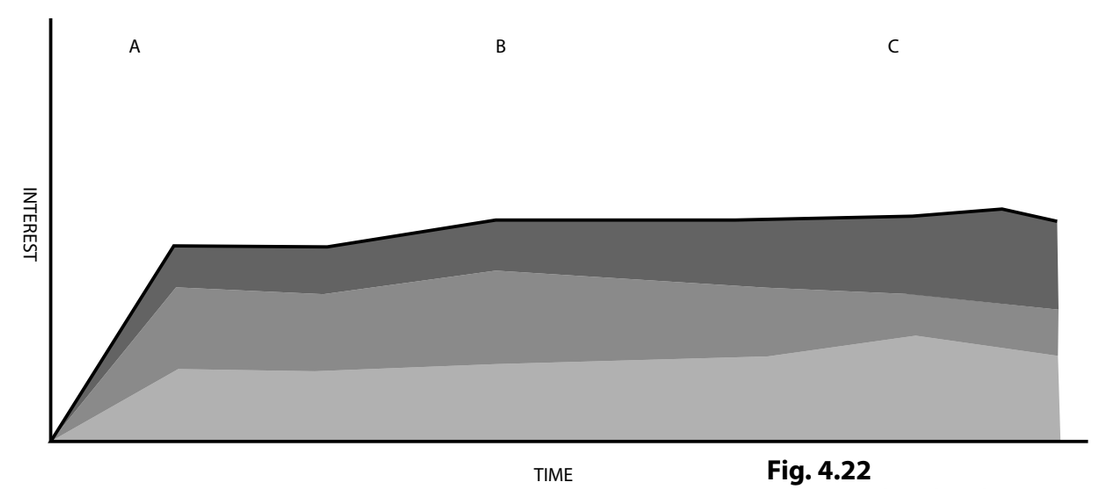
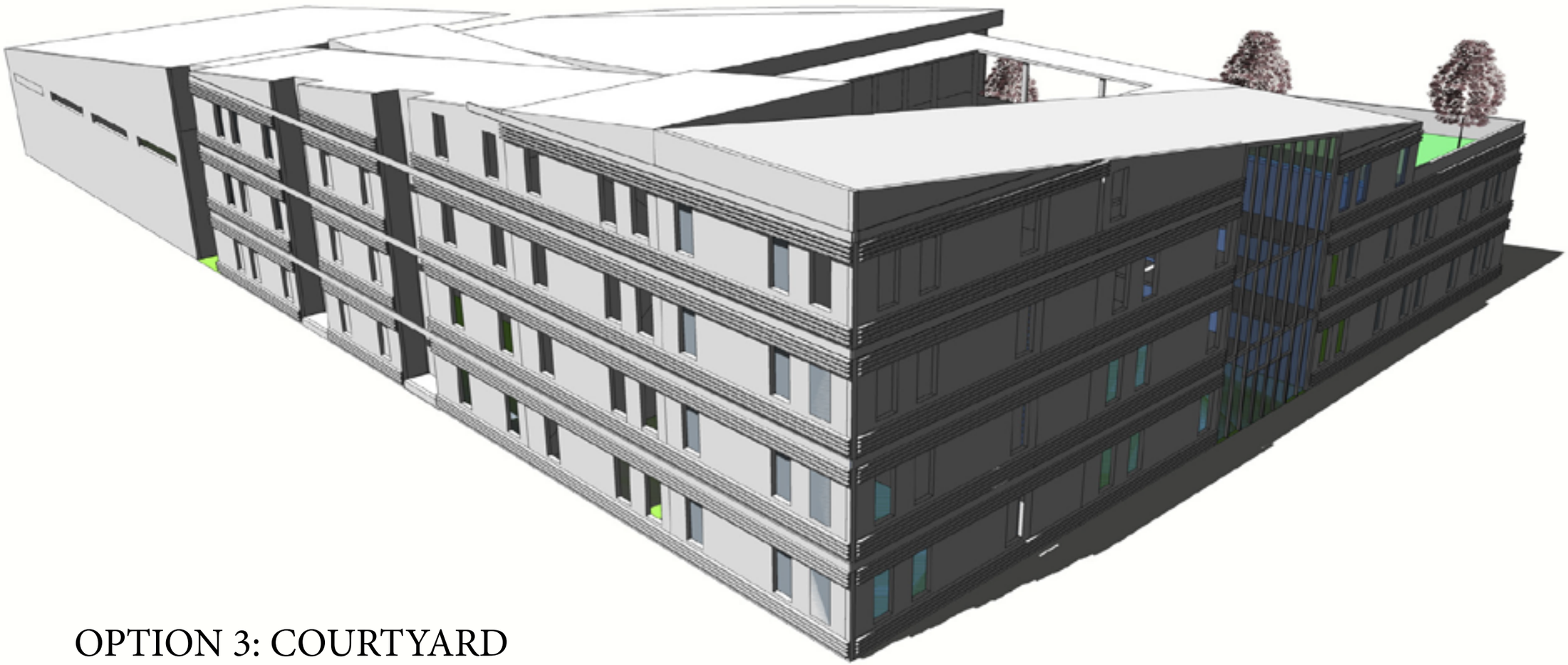


Fig. 4.22
Sequence 2 data plotted over time

Fig. 4.23
Option 3 Exterior View



OPTION 3: COURTYARD

The interior circulation here is something of a combination of the previous two options- it has some of the qualities of the double-loaded corridor that option 2 starts in, but it also takes a lot of cues from option 1 by using the openness of the central courtyard to create a visually interesting journey and provide opportunities for visual connection and ease of navigation.

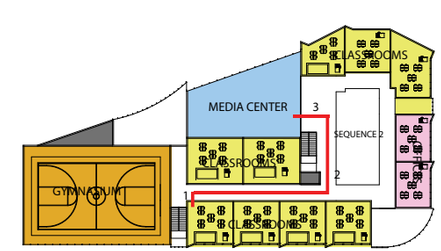


Fig. 4.24
Sequence 2 path

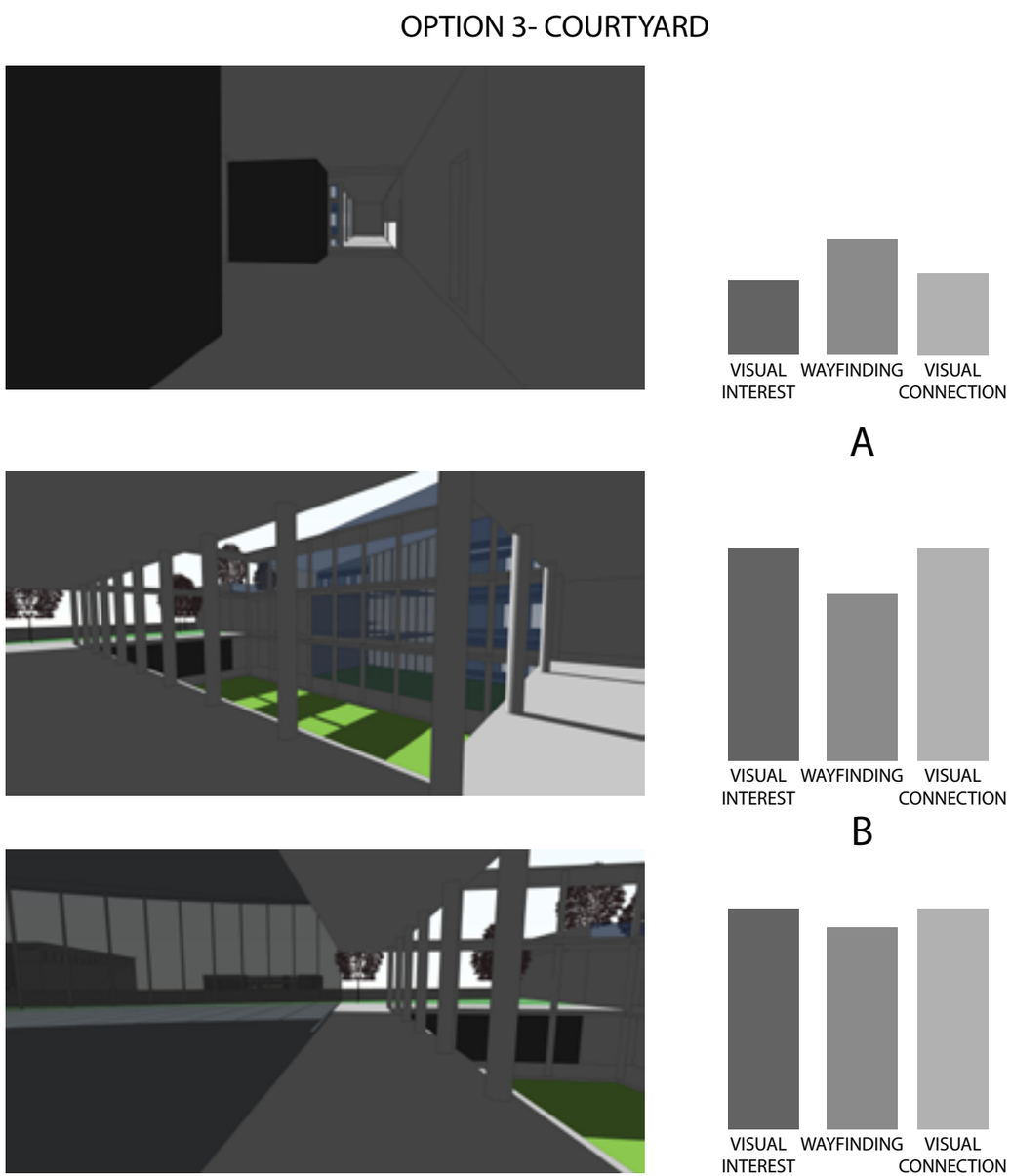


Fig. 4.25
Sequence 2 views, with corresponding data

OPTION 3: TESTING AND RESULTS

The entry sequence I followed in VR for this test was, as mentioned previously, sort of a combination of the previous two. I proceeded from a classroom in a double-loaded corridor, then along a corridor adjacent to the exterior courtyard. Combining elements of the previous two options demonstrated to me fairly clearly what I felt like worked well, and what did not work. As evidenced by the curve, the design became significantly more successful once I left the corridor and proceeded into the open area.

A lesson I learned here, though, was that there is some value in the significant change between parts A and B of the sequence. A successful interest curve is not static, consisting of several peaks and valleys that maintain engagement throughout the entire life of the sequence, something I would do well to consider further in the design.

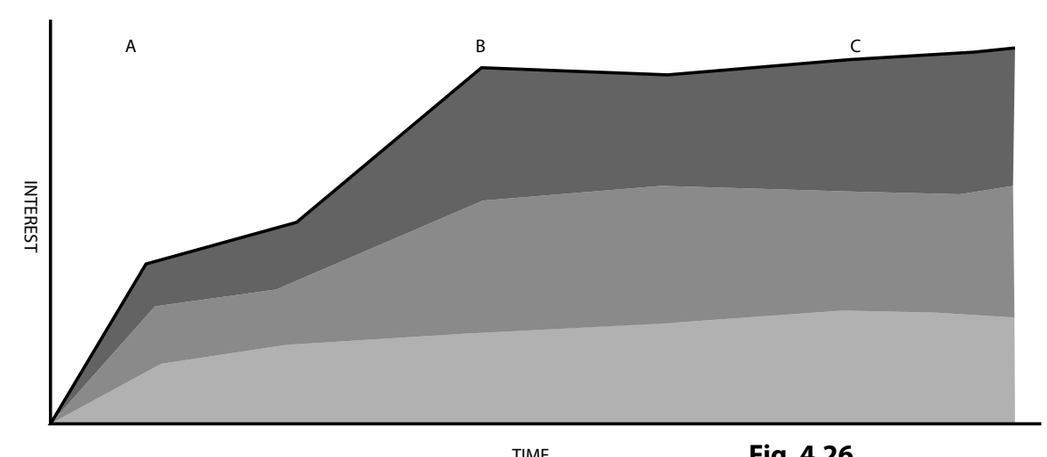
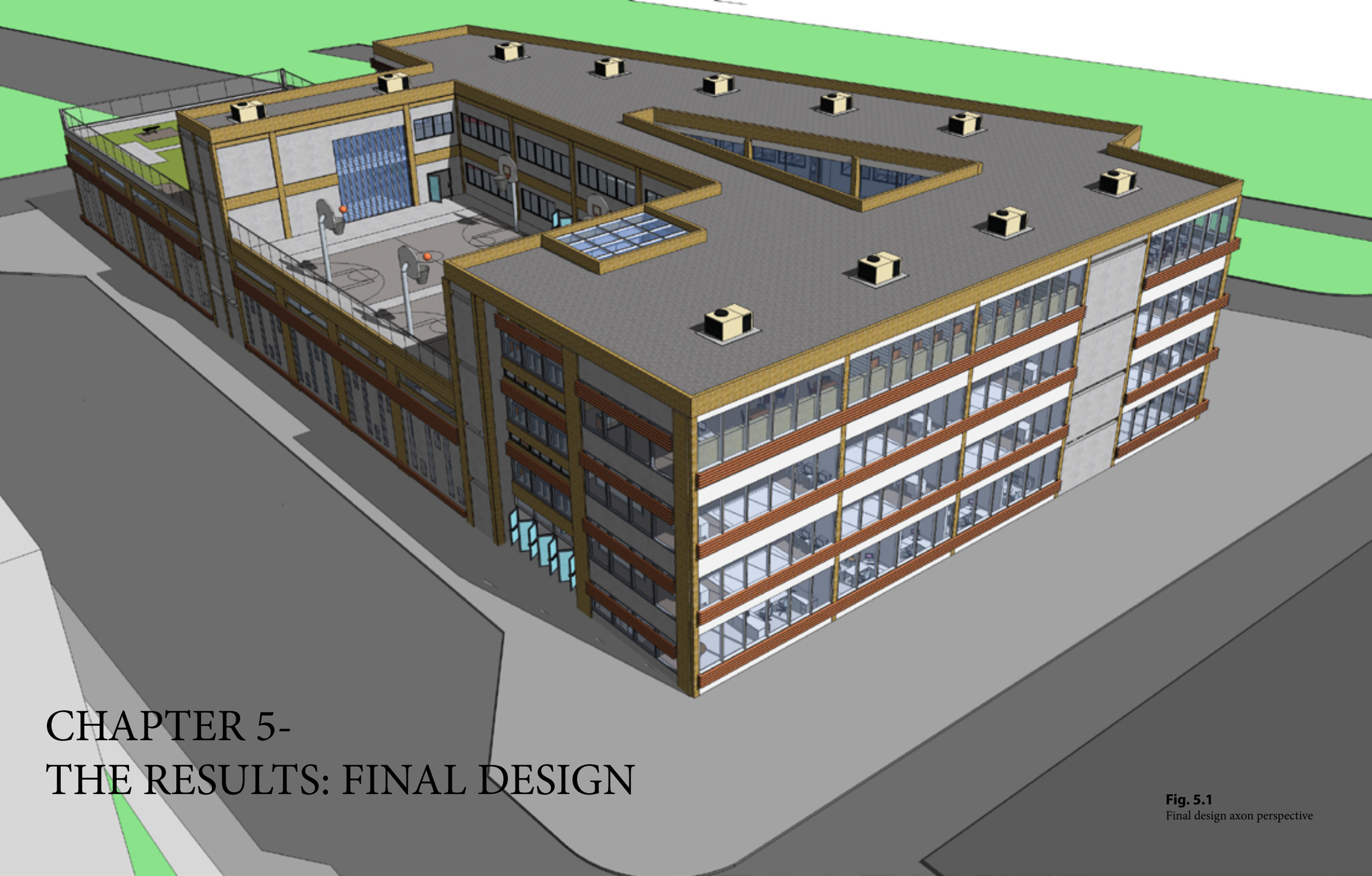


Fig. 4.26
Sequence 2 data plotted over time



CHAPTER 5-
THE RESULTS: FINAL DESIGN

Fig. 5.1
Final design axon perspective

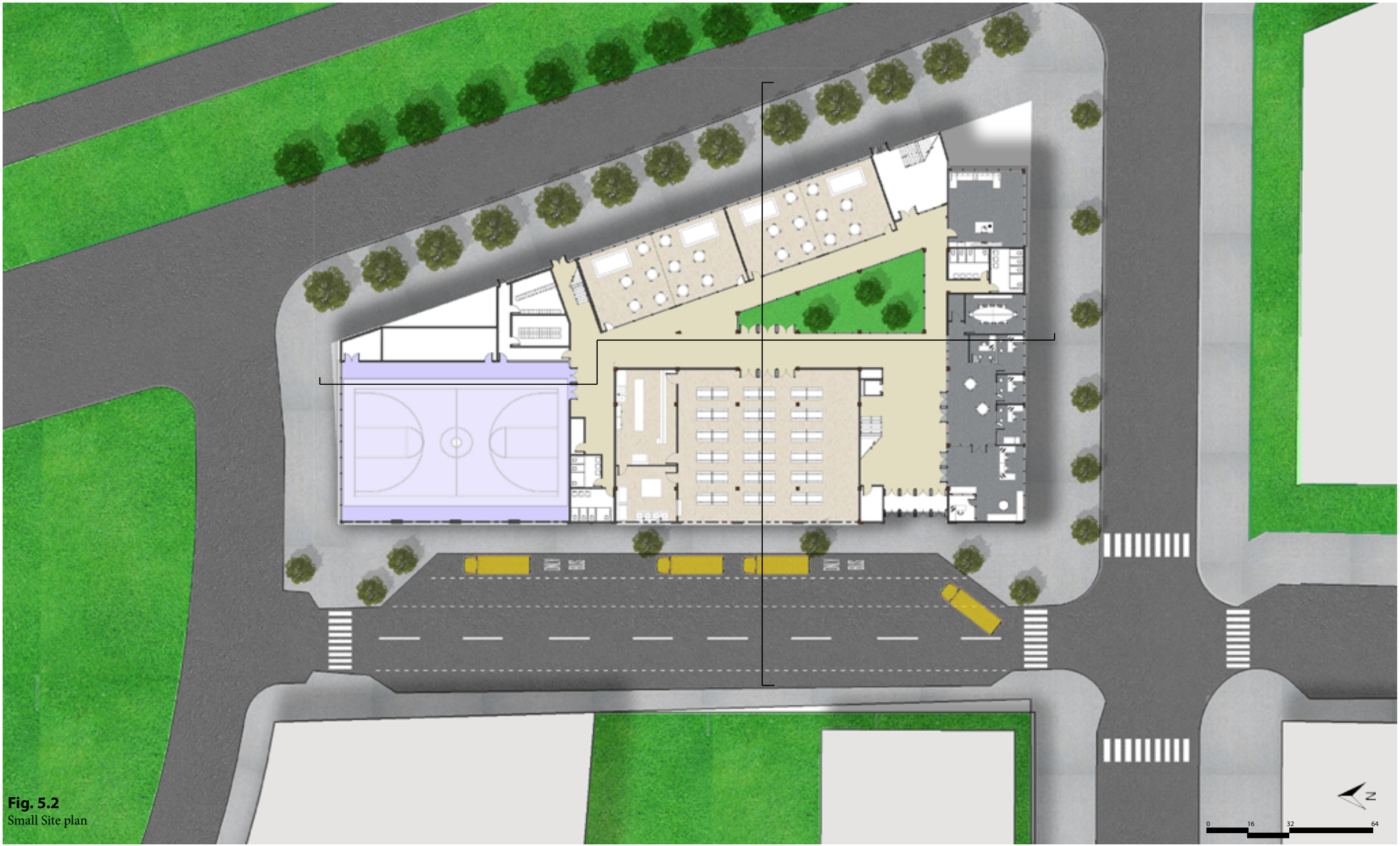


Fig. 5.2
Small Site plan

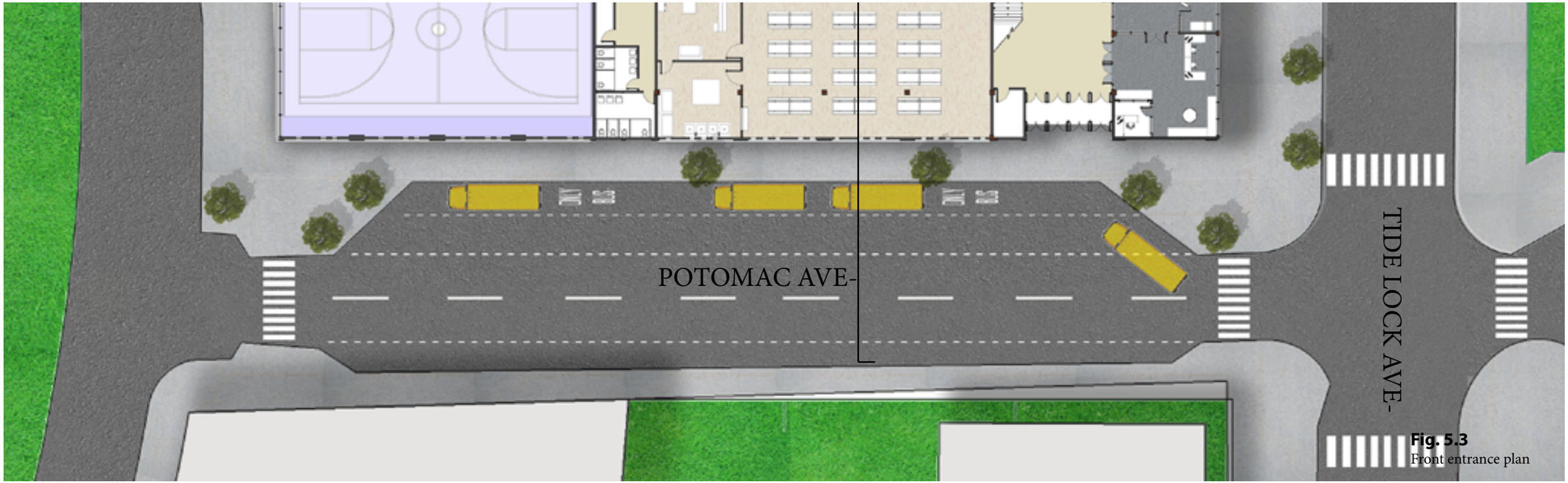


Fig. 5.3
Front entrance plan

POTOMAC YARDS COMMUNITY SCHOOL

In addition to being a leading example in elementary teaching and learning methods, Potomac Yards Community School serves as a demonstration to the field of architecture about user engagement throughout all parts of the design process. Both the interior and exterior of the school display evidence of the testing process that created its empathetic design. Throughout the school grounds, students, teachers, and administrators can see unique design decisions refined through empathetic and empirical testing of their needs. As users who had the opportunity to participate in the design process, they might even see something their own specific input had a part in creating.

ARRIVAL

Students arrive at Potomac Yards community school through a variety of methods. The Potomac Yards Small Area Plan designates a very tight-knit, walkable urban area. Many of the students will probably live in nearby apartment complexes, and will be a short walking distance from the school. For those arriving by bus, there is a designated drop-off area at the front entrance of the school.

WEST FACADE

The main facade is along Potomac Avenue, which will be one of the main streets in the planned development. This is the most important facade of the building, and so this opportunity is taken to show off some of the interior program, as well as display its international influence. The outdoor play areas are visible, but not accessible, and the vital circulation is visible through the articulation of solid columns breaking up the pattern.

In addition, horizontal elements and unique punctures in the concrete pay homage to the schools in Germany and Hong Kong that helped to inspire this design.

Fig. 5.4
Front entrance elevation detail

Fig. 5.5
West Elevation

0 16 32 64

WEST ELEVATION

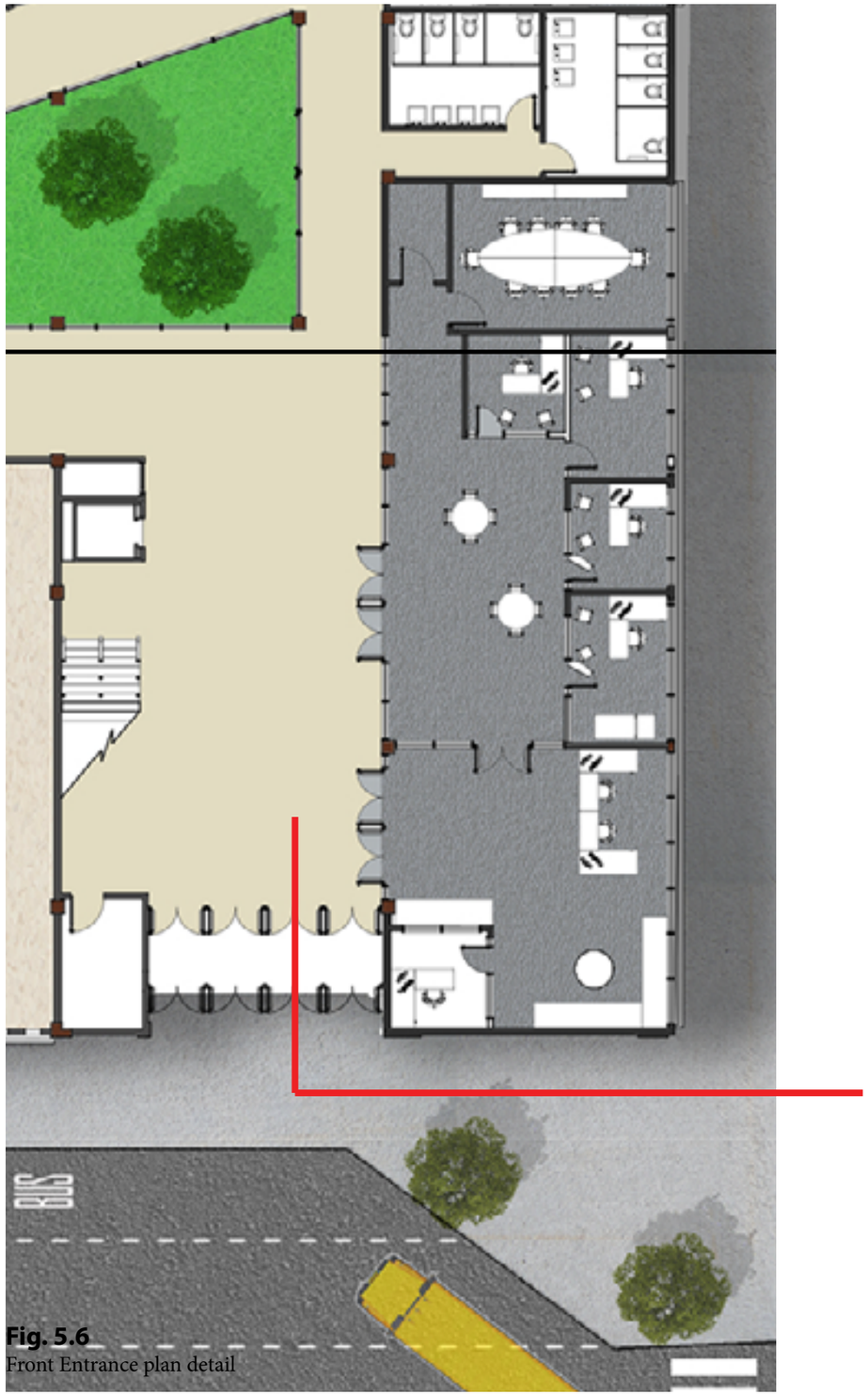


Fig. 5.6
Front Entrance plan detail

Fig. 5.7
Front Entrance interior render

ENTRANCE INTERIOR

The moment of entry is one of the most vital design spaces in any piece of architecture, and especially in schools. In the design of schools for children with special needs, special care is often taken at the moment of entry because it has the potential to be one of the most jarring and stressful experiences throughout a student's day. This moment is critical- it must simultaneously allow visitors to access administration and the front office, while giving them the opportunity to correctly orient themselves within the building so they can begin to go where they need to go. In addition, it is a vital first impression.

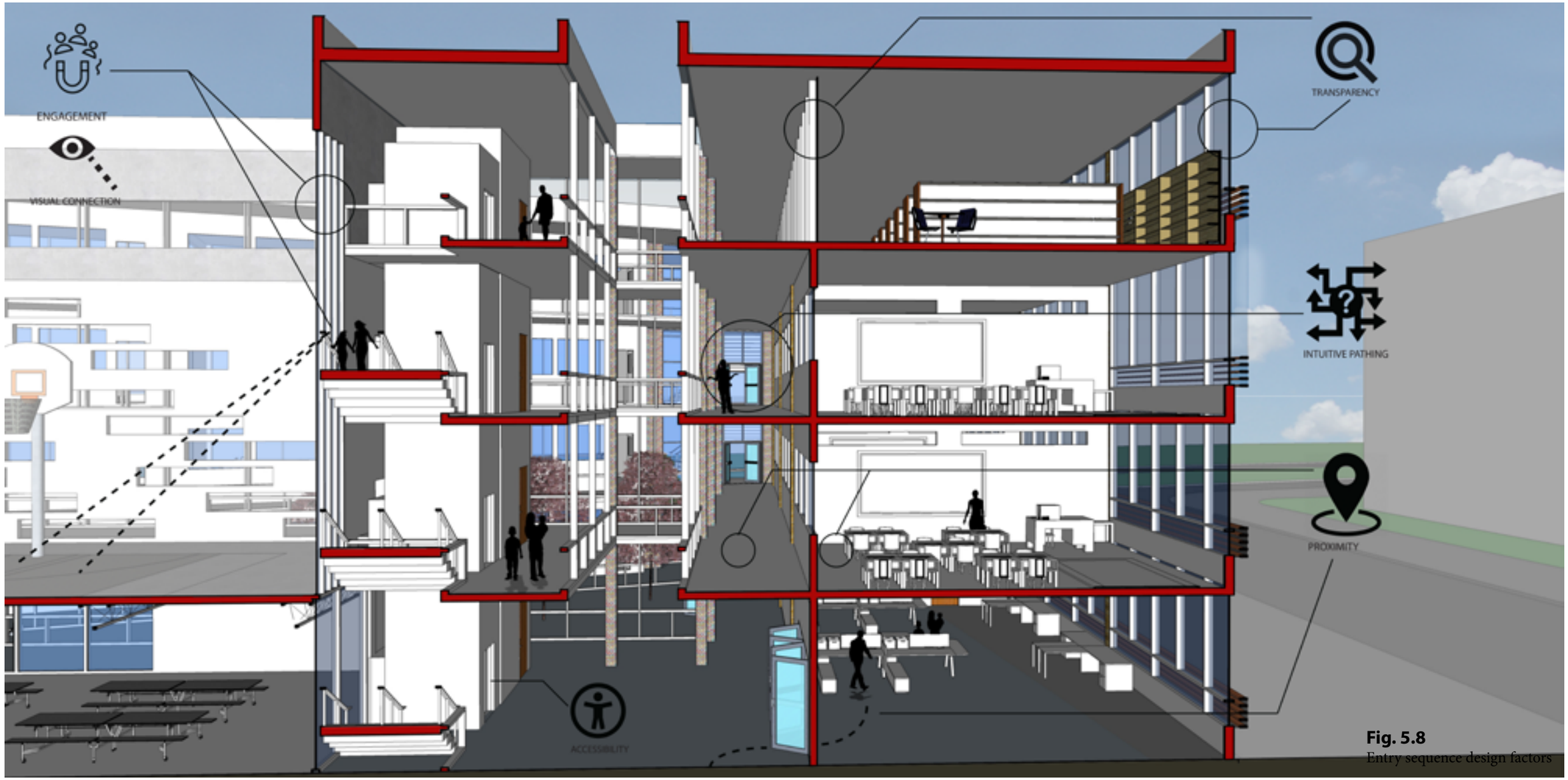


Fig. 5.8
Entry sequence design factors

Since the entry was deemed to be one of the most impactful user experiences within the building design, it was ensured that the designer paid attention to all of the factors the design process was supposed to test for. The use of VR simulations to test the design from a User Experience angle meant that the designer paid special attention to orientation, wayfinding, and visual engagement.

In the front entrance of a school, security is also a primary concern. Visibility, access, and proximity to the front office spaces were given special attention. However, wayfinding is also crucial at this juncture, so care was taken to ensure that the main routes of circulation were visible, and that the user had visual connection to several different landmarks. The landmarks visible from the entryway are: the main stair, the central courtyard, and the southeast stairwell.

COURTYARD

The interior courtyard is one of the most vital spaces in the building, by addressing several design concerns at once. First of all, it is a method of bringing light, air, and outdoor engagement-something vital for an elementary school, but difficult on a compact urban site.

In addition, it is one of the primary wayfinding devices along the circulation of the building. All main circulation runs adjacent to it, and its transparency means that users walking through the building are visually connected to all other parts of the building whenever they travel from one place to another.

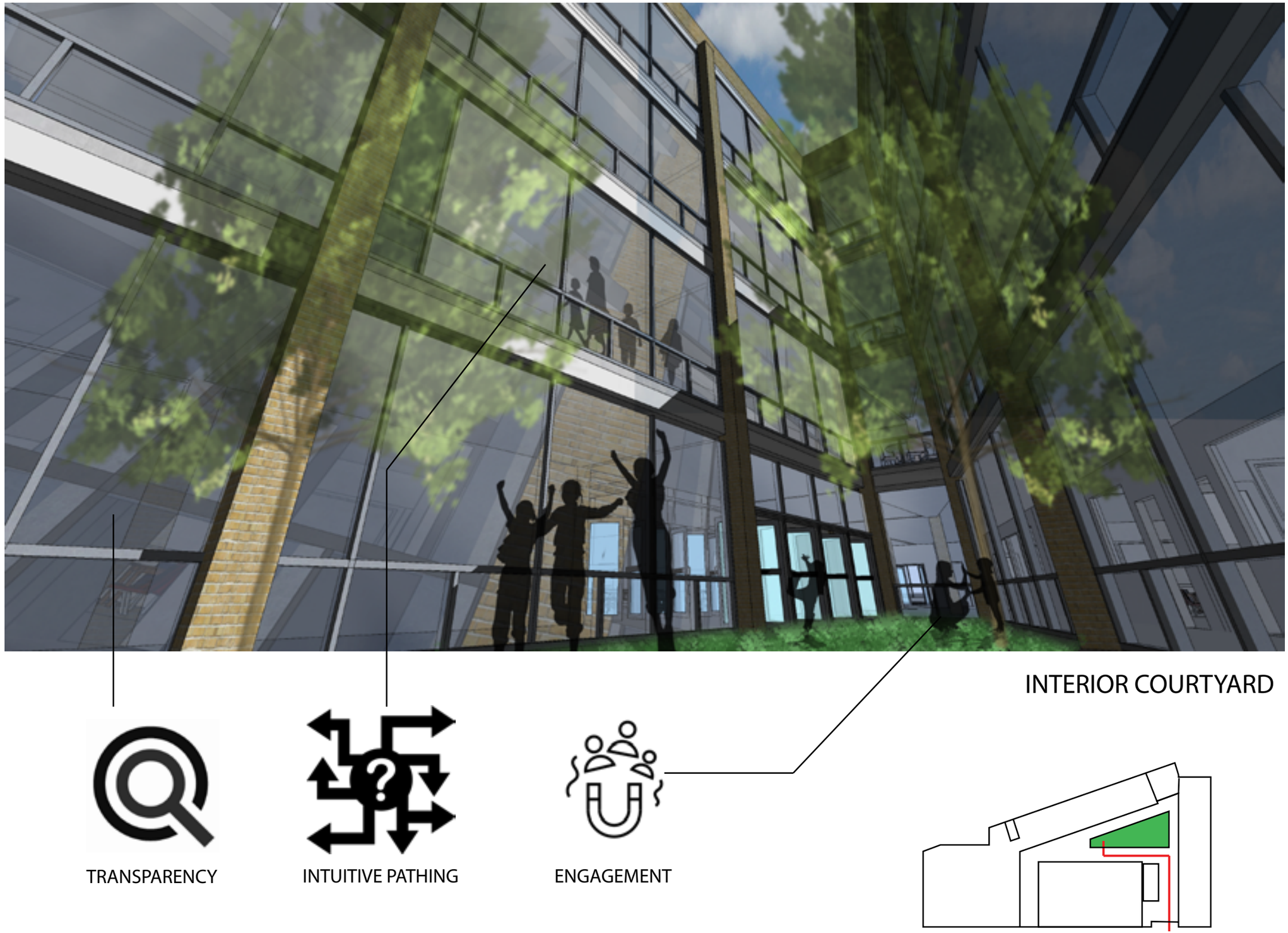


Fig. 5.9
Interior courtyard

Fig. 5.10
East-West Section

EAST/WEST SECTION

This section does a good job of demonstrating how the central circulation creates a visual and proximal relationship with other functions of the building. The two central columns flanking the interior coutyard are the hallways on the first through fourth floors.

Especially evident here is how a student walking on the hallways on the west side would be able to see a student walking along the east side, no matter what floor they were on, and vice versa. While it may seem minor, these sort of frequent informal interactions build a sense of familiarity and community in the student body, while also giving teachers and administrators the ability to be visually accessible and alert in the interest of student safety.

Fig. 5.11
Level 1 Floor Plan

OUTDOOR PLAY AREA

The outdoor play area is located on the third floor. Along with the interior courtyard, this is one of the primary visual engagement and wayfinding spaces. Like the courtyard, it has proximity to all of the circulation of the third and fourth floor, most notably the main stairwell.

The visual engagement of seeing children at play helps create a sense of community and ownership that can ultimately contribute to school safety. In addition, keeping the main stair's visual relationship allows users within the building to understand where they are located both inside and outside when moving from place to place.

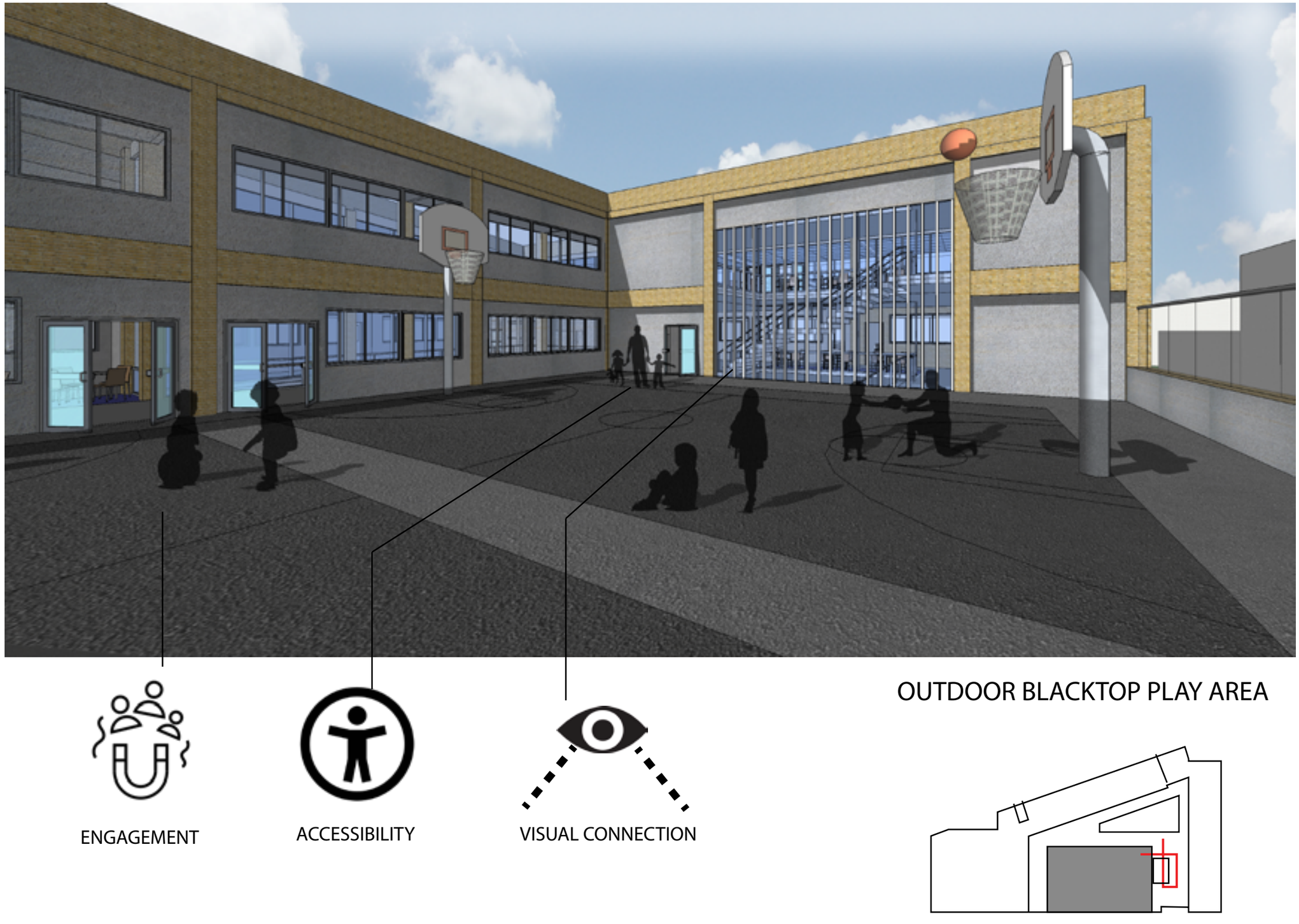


Fig. 5.12
Asphalt Play Area

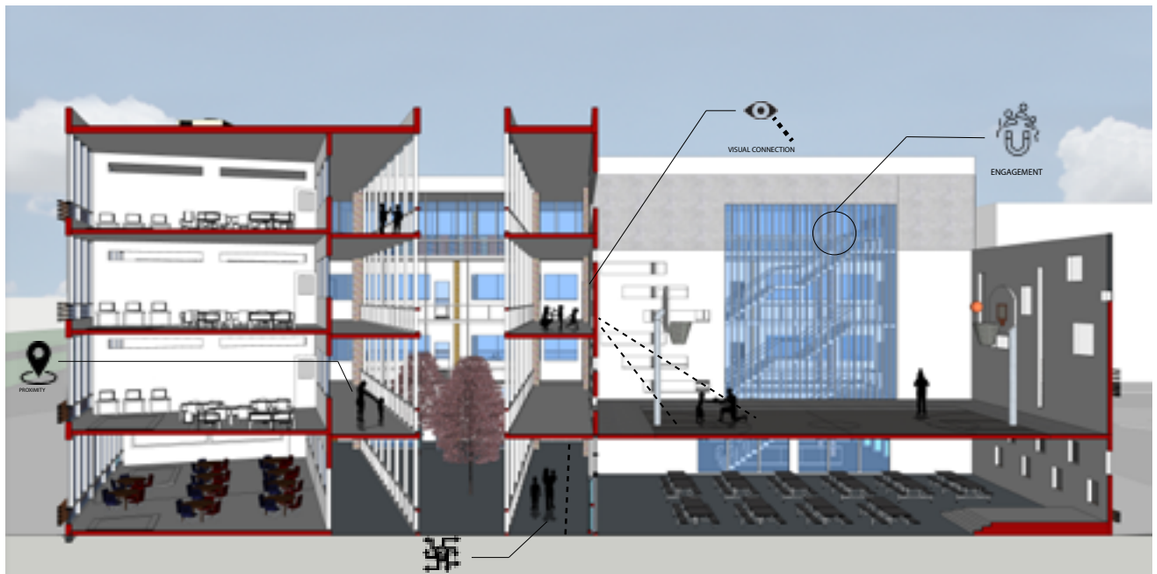


Fig. 5.13
Hallway Design Factors

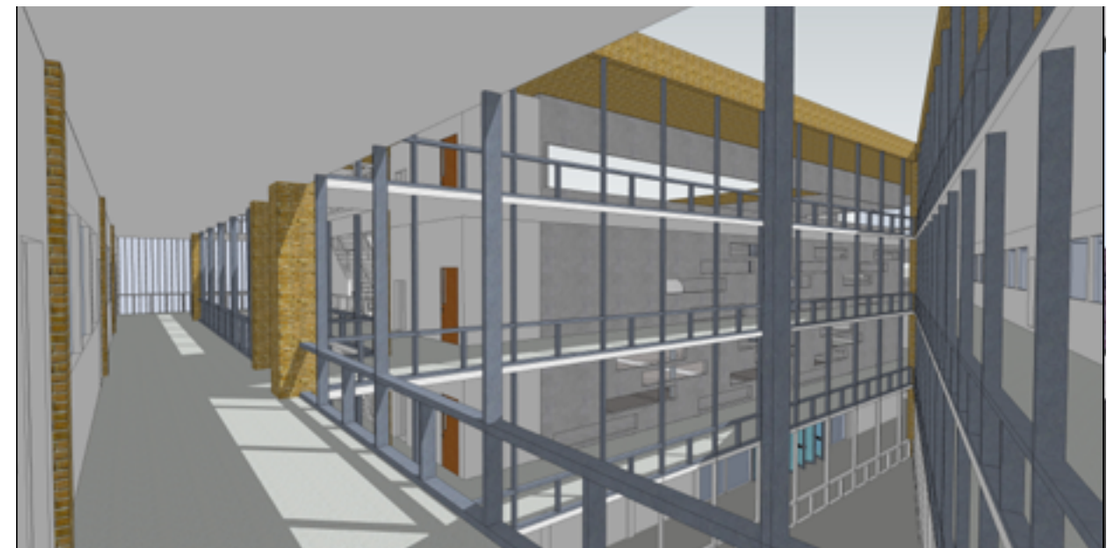


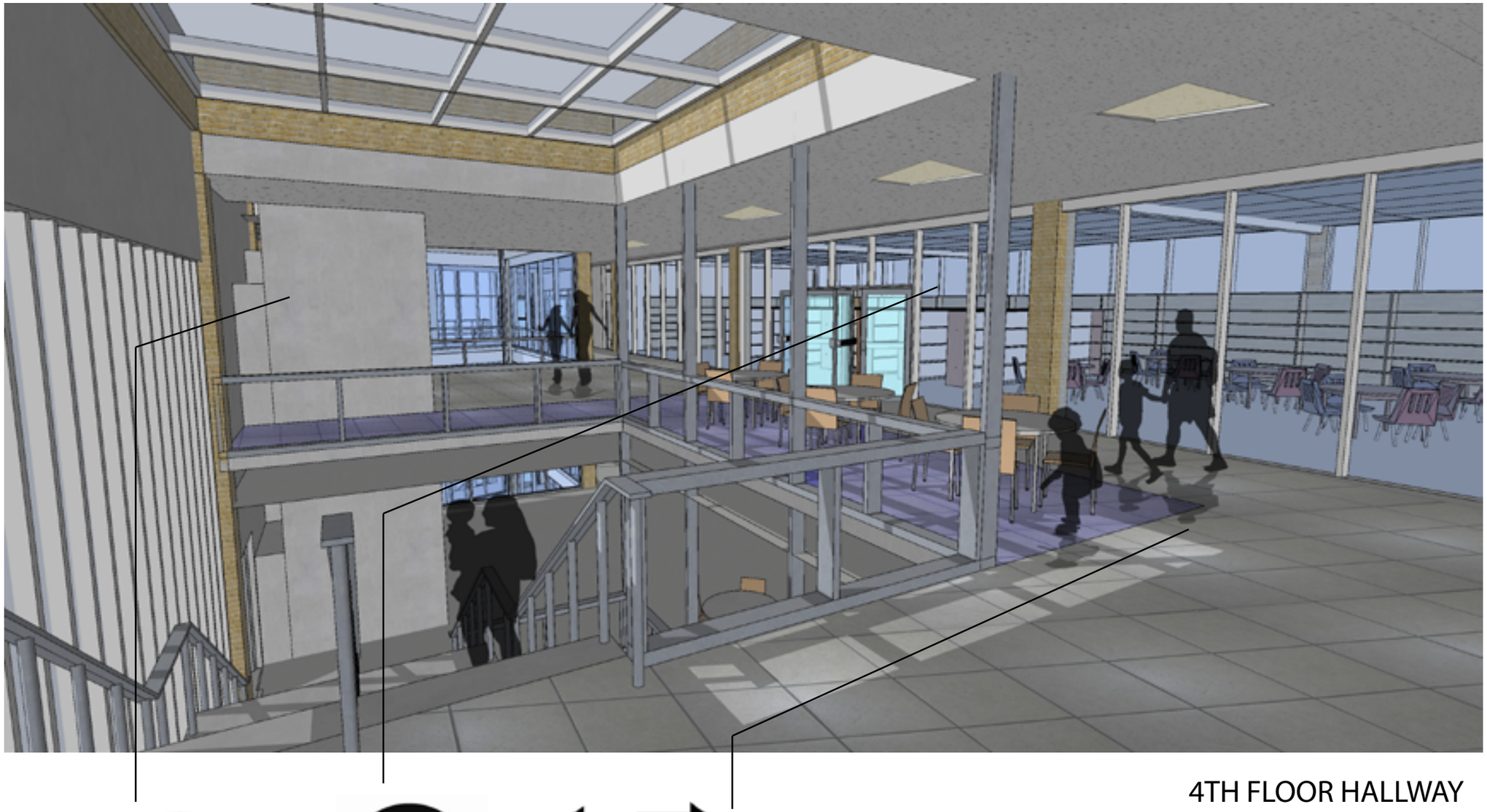
Fig. 5.14
Third Floor Hallway

Fig. 5.15
Outdoor Play area over-look, outside multipurpose activity rooms.

VISUALS ON PLAY

Visual connection on play areas and public function was important throughout the development of the design. In addition to building visual encounters between students moving from class to class, being able to observe students at play contributes to the notion that school is a place for fun.

Many schools nowadays have an almost prison-like structure to them, in the name of security. Visuals are restricted and students are moved from place to place on the interior, having no connection to the outdoors. In other countries, schools are structured so that the play spaces are central to the entire design, and students are encouraged to see what other students are up to while being trusted to behave themselves.



ACCESSIBILITY

TRANSPARENCY

INTUITIVE PATHING

CENTRAL STAIR

The central stair is located in the entrance corridor, right across from the main office. In addition to being the main method of circulation between floors, it also is one of the most important wayfinding landmarks in terms of getting from place to place within the school.

Visible from almost all hallways within the school, it allows students, teachers, and visitors to be able to orient themselves at a moment's notice. In addition, it is a source of engagement, and effective location from which to observe and wonder at the other functions of the school day and look upon them as you ascend or descend between floors.

4TH FLOOR HALLWAY

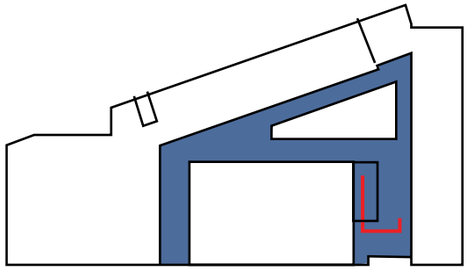
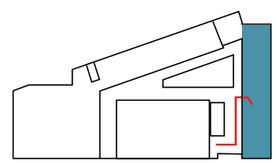


Fig. 5.16
Fourth floor stairwell, outside library.

MEDIA CENTER



MEDIA CENTER

The library and media center are always some of the most important spaces in a school. Here, their status is shown by their elevation to the fourth floor. While being a symbolic gesture, it also places them in closest proximity to the oldest students, who are the most likely to make the greatest and most frequent use of them.

Fig. 5.17
Media Center

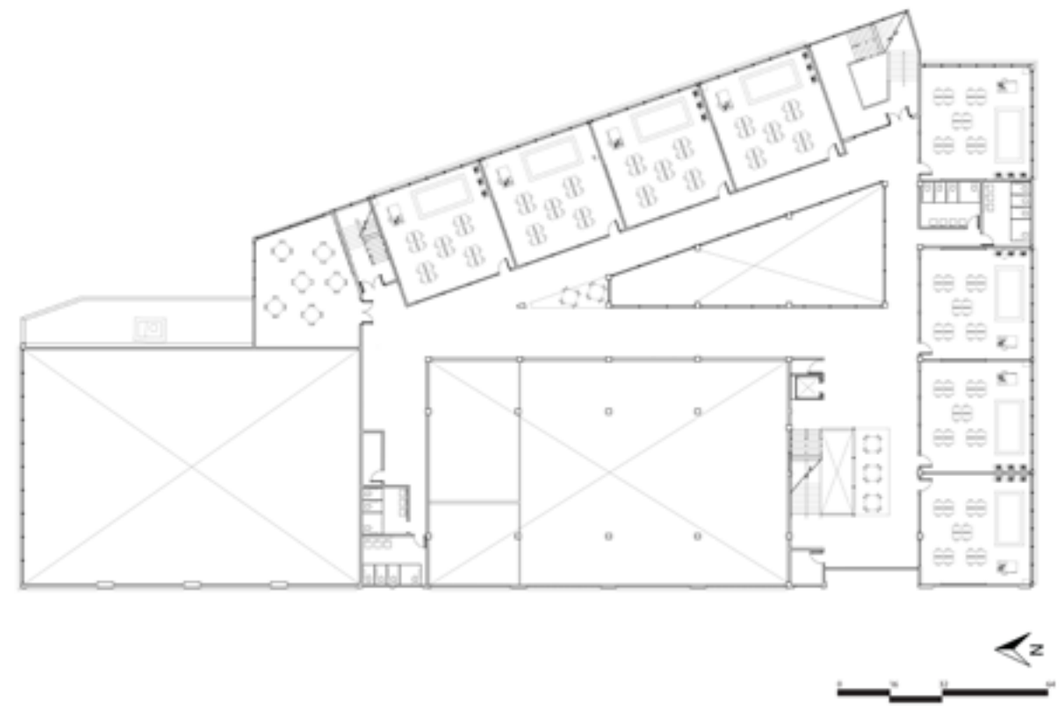


Fig. 5.18
Second Floor Plan

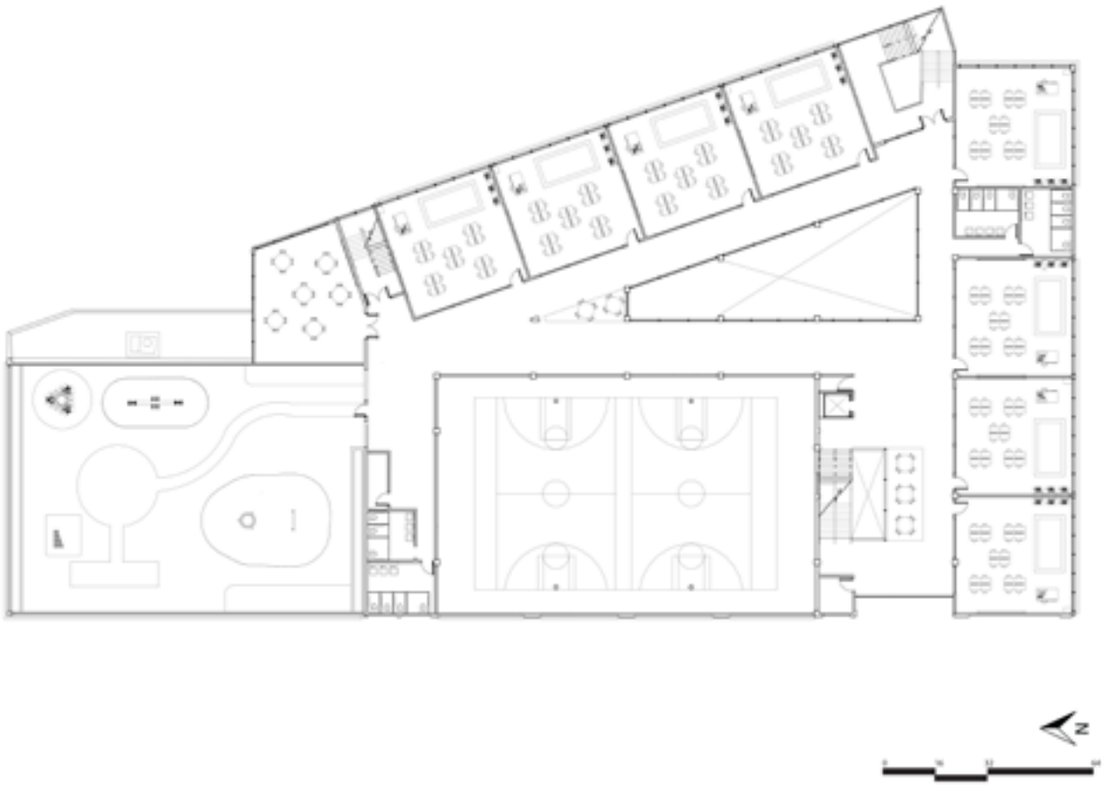


Fig. 5.19
Third Floor Plan

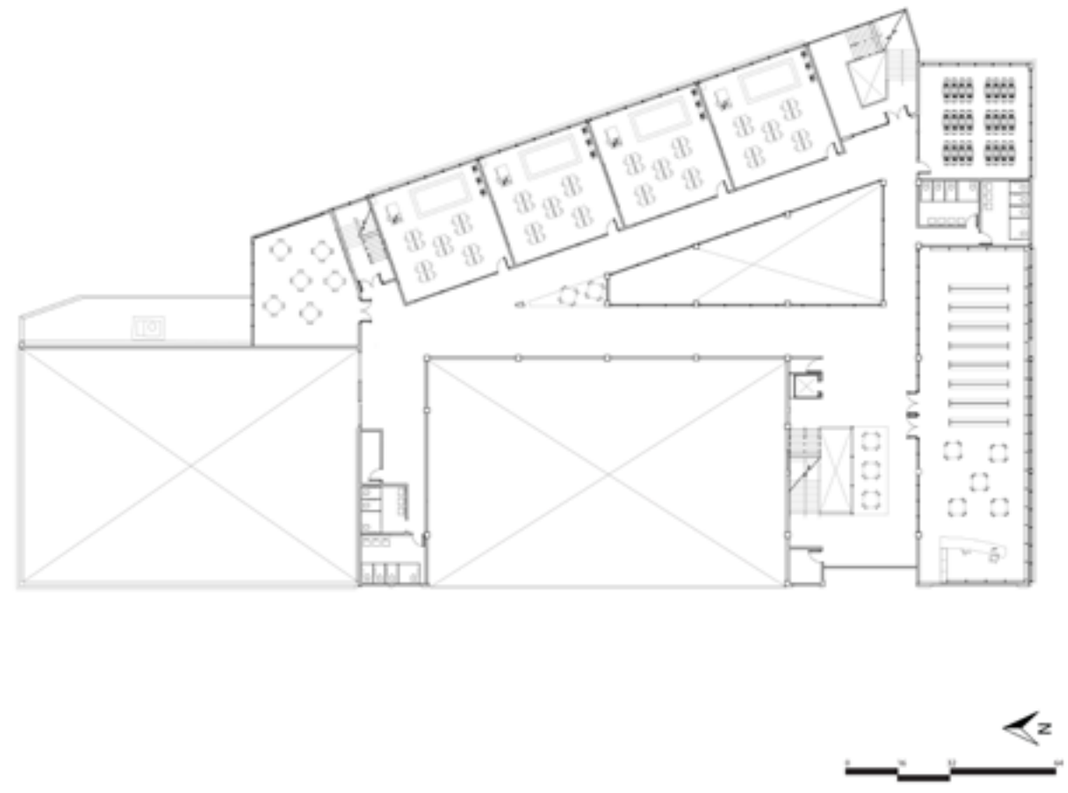


Fig. 5.20
Fourth Floor Plan

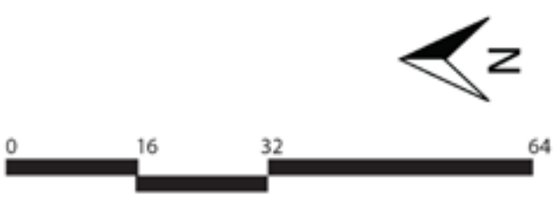


Fig. 5.21
Longitudinal Section

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