Effectiveness of Interactive Spaces in Schools

Ar.R. Swetha – II nd Year, M.Arch,
Department of Architecture, Faculty of Architecture and Planning,
Periyar Maniammai Institute of Science & Technology (Deemed to be University), Vallam, Thanjavur 613 403, Tamil Nadu, India.
email : swetharamamoorthi2020@gmail.com

Ar. Kavitha.V.S. – Associate professor,
Department of Architecture, Faculty of Architecture and Planning,
Periyar Maniammai Institute of Science & Technology (Deemed to be University), Vallam, Thanjavur 613 403, Tamil Nadu, India.
email : vskavitha@pmu.edu

***Abstract*— An Interactive space until twentieth century was around the marketplace, the church, the courthouse, the pub, the post office, the town hall, the train station, or the town or village centre. People used to sit on steps and porches of a building for interaction.The main purpose of the study is to acknowledge the interactivity spaces between the users of a school building that are purposely designed and informally created.**

Based on a series of data collection, exploring the literature studies and case studies, this study aims to determine the effectiveness of an interactive space influenced from various aspects of design and the environment of schools. Every interactive spaces in a school building are identified and sorted depending on the planning, type of users, type of spaces, usage period and the interaction rate. To examine these findings, case studies and literature studies are conducted in the context of India. The evaluation shows that in order to keep students safe and actively engaged, interactive spaces should be designed accordingly.

Keywords—Interactive Spaces, School

I. INTRODUCTION

In every type of structure, interactive spaces are crucial. These are the spaces where most community contact takes place. These areas provide people with a place to unwind, converse, engage in activities that interest them, hang out with friends, or simply sit and observe people. Sometimes a hearing problem might lead to difficulty sharing fully in conversations at work, home and in social situations. This might lead to moving back from situations which prove too interesting. But in these conditions, to avoid incidents of isolation and depression, human interaction is even more important. Different rate of interaction at different places of a building are made useful and attractive by using some elements. It also found out that all buildings have at least one design feature that allows peoples interact with one another.

II. BACKGROUND STUDY

A. Aspects of an interactive space

Despite its inability to influence the outcome, architecture has the potential to set the stage for chance encounters and social interactions, fostering community building and influencing the fabric of our social culture. The following investigates how architecture can improve the social capital of its surroundings through design strategies and thoughtful programming, thereby providing a fertile ground for social interaction among various groups of people.

Architecture can contribute to the development of social capital, and various design strategies can create fertile ground for social interaction and other unplanned activities. Architecture that encourages social interaction is a hot topic for a variety of reasons, from fostering social cohesion to promoting social justice to addressing loneliness and mental health. Given architecture's recognition of its potential to foster community building, it is worthwhile to investigate various ideas and projects that could help define a design method centred on fostering social interaction.

B. Design history

Natural gathering places abound in villages, towns, and cities up until the twentieth century. Life revolved around the marketplace, the church, the courthouse, the pub, the post office, the town hall, the train station, or the town or village centre, depending on the historical time and place. *(Fig. 1)* People sat on steps and porches or in the street, watching and conversing with their neighbours and passers-by. The primary way to communicate with others was face to face: there had to be places in the community where citizens could gather, or they wouldn't know what was going on in the community, or they wouldn't be able to buy everything they needed, or they wouldn't be able to find companionship or entertainment.

Integrating natural meeting areas and appropriate locations for interaction into the architecture of everything from cities to 10-unit senior housing complexes is one of the problems of community building in the twenty-first century. A community can work with developers, architects, and others to create spaces that bring people together rather than keep them apart if it engages in planning, which is not a given, and if it follows through on the plan it develops, making changes to meet the needs of citizens as they go, which is also not a given. As was previously mentioned, effective venues for interaction provide individuals reasons to visit, reasons to stay once they are there, reasons to feel safe and secure, reasons to feel welcomed, and reasons to be accessible to everyone. All of these are, to varying degrees, dependent on design.

*Fig: 1 India Gate Complex City Square (*Source: Wikimedia Commons)

C. Design elements at Schools

a) Natural light- Light and shadow give different type of soulfulness of different angle. And they are used to interpret the geometry and form of the buildings. Shadows in the building helps break up a vast amount of space. It also gives a building three-dimensional feeling. Natural shadow cast by natural light, create a space with dynamic appearance as the shadow changes as the sun moves, gives life for the space.One study of over 10,000 fifth-grade students showed that kids in schools with unrestricted views of nature tested higher in reading, math, and language arts than students in schools with urban views or no views at all.

b) Access- Design that help an individual to live or access spaces without any restriction. Creating a good ambience when entering a building.

c) Color and light- Color alone can make space look bigger and brighter. Painting walls is an inexpensive redesign. Children areas should use bright attractive and inviting colors.

d) Have flexible areas- Open spaces like seating area, multi-functional areas, etc. Larger, open areas allow people to rearrange space easier. Let the community define the space.

e) Views- Incorporating the natural environment into building can have a positive influence on psychological, physical and social well-being. Trees and outdoor gathering places framing the aim, objective and research question keywords selected and entered into the study literature, case study related to the study survey analyzing the study conclusion are associated with increase social interaction and sense of community in urban area.

f) Moveable furniture- Fun colors, using lightweight furniture (easier to move). Encourage people to rearrange the space to fit their needs.

g) Technology- Installation that gets the visitors to a different environment, where they finally interact with the product. It can be a light, sense of touch and feel or smell.

h) Landscape- Landscape is an active area, a unifier, a healer. It is where memories are made and life enjoyed. By leading with the landscape, and by adding people first, we create better connected, healthier and happier places where lives can easily join.

i) Connectivity and Circulations- The level of connectivity appears through the working of systems like streets, cycle routes and pathways, and how simple accessibility is so that users can reach whichever location they want.

j) Spatial Relationship- Spatial Relationship is an important component in designing spaces in a building. The connectivity between the spaces the efficiency of the planning relays on the spatial relationship between the spaces. Thus space within a space, spaces linked by a common space, adjacent spaces are the ways spaces are inter-related with one another in the design *(Fig. 2)*

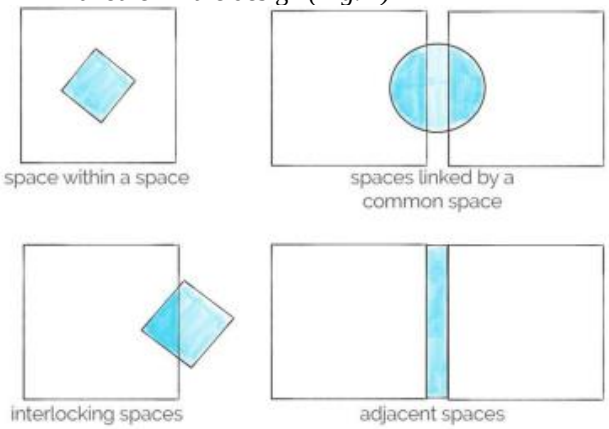

Fig: 2 Types of spatial relationship (Source: First in Architecture)

III. LITERATURE STUDIES.

A. Maya Somaiya Library school

Architect: Sandeep Pandora and associates
Location: Kopargaon, India
Year: 2018
Site area: 12,600 sq. ft.
Typology: School, library

a) Ideology and inspiration

The library was designed to be an attraction not only for students, but also for the general public after school hours, so the interior was designed to be a quiet place for study and concentration, while children could interact, play, explore, or simply rest on top of the building. They were captivated by the construction technique behind Catalan vaults of the 16th century and the work of Eladio Dieste after several studies with forms and materials. As a result, the project evolved into a collection of universal flakes of knowledge that resulted in a transmittable, 44-meter-long, undulating brick roof in the middle of the students' daily routine. *(Fig. 3, Fig. 4)*

Fig: 3 View of Maya Somaiya library. (Source: Edmund Sumner, 2018)

Fig: 4 View of the library roof. (Source: Edmund Sumner, 2018)

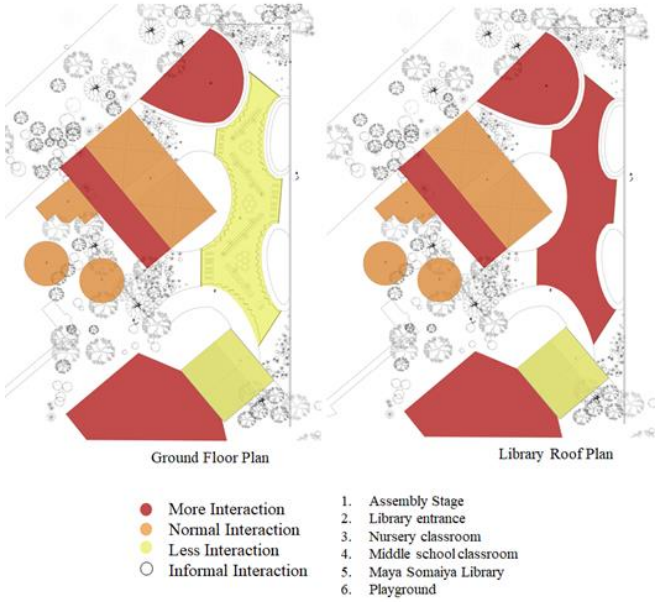

Fig: 5 Plan indicating interaction rate. (Source: Author, 2023)

B. The Rajasthan school

Architect: Sanjay Puri
Location: Rajasthan, India
Year: 2020
Site area: 93,000 sq. ft.
Typology: School

a) Design Ideology

Multiple angular pathways connect the two parts of the school with landscaped play spaces that encourage engagement in the semi-sheltered courtyard. This focal area, which is traversed by a series of linear trapezoidal frames and sun-breakers, has a constantly changing shadow pattern depending on the direction of the sun throughout the day. The layout is purposefully fragmented, allowing open landscaped spaces to coexist with the school's learning spaces.

On the northern side, the entire school opens up to a multipurpose playground and athletics track. The entire circulation is via open, naturally ventilated corridors that traverse and skirt the central semi-sheltered landscaped court. Angled vertical walls act as sun breakers, reducing heat gain from the east, west, and south sides and resulting in cooler internal spaces.

b) Most Interactive space in the campus

The semi-sheltered courtyard are spaces which are used for multi-purposes where children used to play, interact, simple sit, rest and explore.

Other informal student-student interactions happening inside the buildings are in the corridor which creates an ample space with jaali walls allowing Natural lighting and ventilation into the space (Fig. 7). This character induces the occurrence of interaction between the students at higher rate. The corridors also doesn't create any privacy which helps in the monitoring with respect of a good interactive space.

Fig: 6 View of the Rajasthan School. (Source: sanjaypuriarchitects.com)

Fig: 7 View of the corridor. (Source: sanjaypuriarchitects.com)

Fig: 8 Plan indicating interaction rate. (Source: Author, 2023)

C. Yellow Train School

Architect: Biome Environmental Solutions
Location: Coimbatore, India
Year: 2013
Site area: 14,360 sq. ft.
Typology: School

a) Design Approach

Play is an essential component of the system. Because Coimbatore has a hot climate, play spaces have been integrated into the building, making them available to children at all times. Caves and unusually lit spaces, such as those found through jalis, allow for exploration and fantasy creation. An open-air theatre (Fig. 9) within the interior surroundings encourages children to perform impromptu acts.

While creating a learning space, we experimented with new ways to explore ecological issues. Because basements as classrooms were not permitted, we decided to build the classrooms and play areas close to 1.5 meters below the road level, where the soil for construction was sourced. The water from the entire roof is harvested, stored, and recharged. A ramp provides complete access to the building. It is naturally lit and passively ventilated.

Fig: 9 Image of O.A.T. and play area. (Source: Vivek Muthuramalingam)

Fig: 10 Ground Floor Plan indicating interaction rate. (Source: Author, 2023)

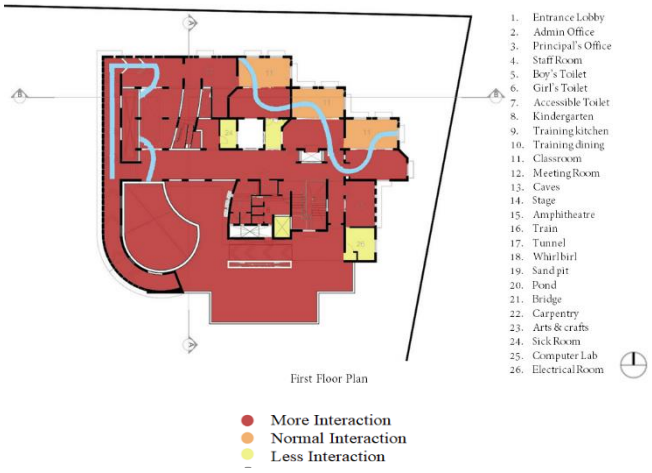

Fig: 11 First Floor Plan indicating interaction rate. (Source: Author, 2023)

Fig: 12 View of the school. (Source: Vivek Muthuramalingam)

IV. CASE STUDIES

A. Rane Vidyalaya school

Architect: Shanmugam Associates
Location: Theerampalayam, Trichy, India
Year: 2018
Site area: 50,000 sq. ft.
Typology: School

a) Indigenous techniques used

The architects were inspired by the walls of the sixth-century Thiruvellarai temple near Trichy, Tamil Nadu, as well as the walls of local homes in the neighborhood that are nearly 50 years old. The technique is distinguished by stacked layered cross-sections for structure stability.

The courtyard is designed so that it is visually connected on all levels. All of these architectural elements, which include the use of red solid bricks, baked earth tiles, terracotta jalli, and grey fly ash bricks, contribute to addressing the microclimate, creating interesting light and shade experiences through roof perforations, providing safe green courtyards, and providing adequate ventilation. Inspired by temple mandapams, which hosted large gatherings, an enclosed central courtyard with perforated light wells in the roof is planned. This courtyard would be a multi-purpose gathering space for lunch breaks, school assemblies, exhibition space, co-curricular training, and small gatherings. (Fig. 14)

Fig: 13 View of Rane Vidyalaya School. (Source: Author, 2023)

Fig: 14 View of the central courtyard. (Source: Author, 2023)

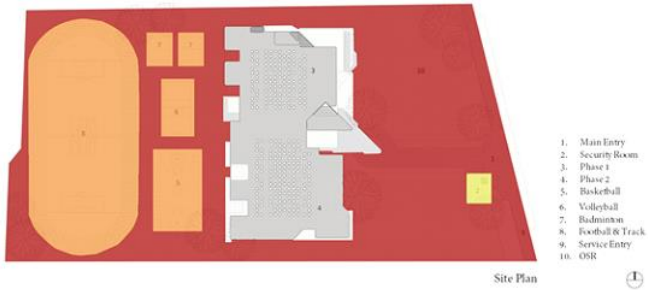

Fig: 15 Site Plan indicating interaction rate. (Source: Author 2023)

Fig: 16 Ground Floor Plan indicating interaction rate. (Source: Author 2023)

Fig: 17 First Floor Plan indicating interaction rate. (Source: Author 2023)

V. ANALYSIS AND RESULTS

A. Importance of an Interactive Space

An interactive space in an institution campus is as necessary as teaching space where the children are educated. An interactive classroom or an outdoor environment promotes Interactive learning.

a) Student Engagement: In contrast to children simply staring at a board and copying material into a notebook, the interactive aspect of an indoor or outdoor classroom engages students and makes learning more exciting. This promotes students' involvement in their education..

b) Provides Flexible learning: Secondly, interactive learning makes education more approachable for pupils. Lessons don't have to take place in a certain venue like a classroom; they can happen anywhere.

c) Childrens' engagement and fun: Children are more likely to like learning when it is interactive. Since the element of fun appeals to some of their fundamental human needs, it raises the chances that they will laugh, communicate, work together, and remain motivated.

B. Traditional Learning Environment Vs Contemporary Learning Environment

Table: 1 Comparison of traditional and contemporary learning

• The traditional translation classroom has drawn harsh criticism for being inflexible, teacher-centred, and unimaginative.	• In addition to being learner- centred, the modern translation classroom also empowers its students by developing their capacity for lifelong learning.
• Time constraint for memorization.	• Students' engagement helps in time-honoured scholarly knowledge.
• Strict compliance with a set curriculum.	• Following up on students' inquiries

• Creates more gap between peer-teacher learning.	• Helps in improvement of peer-teacher and peer-peer learning.
• Traditional blackboard learning can sometimes divert students' attention.	• Due of the excitement and fun that the environment fosters, learners tend to be more active.

C. Interactive Spaces For Kindergarten (Age: 3-5)

- ***Access*:** Should be easily accessible has it would help to decrease the distance and gap between a traditional classroom learning to an interactive learning environment.
- ***Flexibility*:** Space should be more flexible between learning with the nature at the same time utilizing of playful study tools.
- ***Form:*** As surveillance is a most important aspect of this age group of children, the form should provide affirmation of scrutiny by the teachers and the care takers.
- ***Light/Shade*:** More Shade should be taken into account than direct sun light as it could avoid dozing due to sensitiveness.
- ***Landscape:*** Landscape can be used for shading and also enhancing the microclimate of the surrounding environment. Not all grass species can be used, suitable groundcover landscape can be created in playing areas to avoid collision.
- ***View:*** The view between the outdoor and the indoor environment should not be obstructed in order to keep the kids engaged.
- ***Openness:*** Children should never feel claustrophobia or megalophobia in an enclosed space like classrooms. A sense of openness could help to keep them mentally balanced.
- ***Outdoor furniture*:** Temporary or permanent furniture could help the children to sit, chat and relax.
- ***Material:*** Choice of material for flooring and wall creates comfort. Also it's more important to make of material colour and texture. Colour of a material can also induce and promote interaction. Texture could help to assure safety and comfort.

D. Interactive Spaces For Primary (Age: 6-14)

- ***Access*:** Should be easily accessible has it would help to decrease the distance and gap between a traditional classroom learning to an interactive learning environment.
- ***Flexibility*:** Space can be flexible as an assembly, meeting, play area or an interactive space.
- ***Form*:** As more surveillance could make them feel uncomfortable, the form should be in order to avoid negative space and also create safety with less surveillance.
- ***Light/Shade*:** Sunlight and shading can be playfully used to keep the space more interesting.
- ***Landscape*:** Landscape can be used for shading and also enhancing the microclimate of the surrounding environment. Not all grass species can be used, suitable groundcover landscape can be created in playing areas to avoid collision as the primary kids could be harsh sometimes.
- ***View:*** The view between the outdoor and the indoor environment should not be obstructed in order to keep the children engaged in interactive learning.
- ***Openness:*** A sense of openness could help to keep them more active.
- ***Outdoor furniture:*** Temporary or permanent furniture could help the children to sit, chat and relax.
- ***Material:*** Choice of material for flooring and wall creates comfort. Also it's more important to make of material colour and texture. Colour of a material can also induce and promote interaction. Texture could help to assure safety and comfort.

E. Interactive Spaces For Secondary (Age: 15-18)

- ***Access* :** Should be accessible in a way it would help to decrease the distance and gap between an traditional classroom learning to an interactive learning environment at the same time shouldn't make them separated from the learning space. The student of this age group used to be more playful and easily get distracted from studying.
- ***Flexibility:*** Space can be flexible as an assembly, meeting, play area or an interactive space.
- ***Form:*** As more surveillance could make them feel uncomfortable, the form should be in order to avoid negative space and also create safety with surveillance in order to avoid bad behaviour.
- ***Light/Shade*:** Sunlight and shading can be playfully used to keep the space more interesting.
- ***Landscape:*** Landscape can be used for shading and also enhancing the microclimate of the surrounding environment. Not all grass species can be used, suitable groundcover landscape or sand can be created in playing areas to avoid collision as the students could be harsh sometimes.
- ***View:*** The view between the outdoor and the indoor environment should not be completely obstructed in order to keep the children engaged in interactive learning and also to avoid distracted from listening to the teacher.
- ***Openness:*** A sense of openness could help to keep them more active.
- ***Outdoor furniture:*** Temporary or permanent furniture could help the children to sit, chat and relax.
- ***Material:*** Choice of material for flooring and wall creates comfort. Also it's more important to make of material colour and texture. Colour of a material can also induce and promote interaction. Texture could help to assure safety and comfort.

VI. RESULTS

The analysis's overall findings tend to imply that, through interaction in various campus locations, design aspects make the meeting space effective and appealing these spaces are used to sit, chat and relax. The structure or a human behaviour are not altered by these interconnected places. Though interactive spaces are public, users need some privacy to feel comfortable, however at the same time interactive spaces should be designed adjacent to common or circulation spaces to make the children safer and formally active. Poor planning approach or use of design elements results in negative spaces that promotes in informal activities of the students. Design consideration should also be focused on these aspects.

VII. SUMMARY

The table consists of the Inference of the elements to be included in the spaces of the campus for creating an interactive environment.

The elements which has been derived out from the study are surveyed to be used at appropriate distance, as it is involved in the interactive status and activity of the particular space. The spaces considered are both indoor and outdoor environment of the school campus.

Table: 2 Inference of the elements

	ACCESS	FLEXIBILITY	FORM	LIGHT/SHADE	LANDSCAPE	VIEW	OPENNESS	OUTDOOR FURNITURE	MATERIAL
COURTYARD	♦	♦	♦	♦	♦	♦	♦	♦	♦
CLASSROOMS & TOILET	♦	♦	♦	♦	♦	♦	♦	♦	♦
CORRIDOR	♦	♦	♦	♦	♦	♦	♦	♦	♦
PATHWAYS	♦	♦	♦	♦	♦	♦	♦	♦	♦
PLAY GROUND/ GREEN AREAS/ PARK	♦	♦	♦	♦	♦	♦	♦	♦	♦

♦ Adjacent
♦ Around
♦ Not Far off

VIII. CONCLUSION

The research shows that either the design elements or spaces makes the interaction formal and informal. Interactive spaces are allowed to be used or controlled by the school authority. A designed interactive space is also been prohibited and an impelled interactive space is also allowed to be used for interaction. More formal the interaction is more the safety and healthy environment is created in the interactive spaces. Informal interactions can only be avoided by the school campus authority in case the aspects are less focally planned.

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