

Rethinking Design of Learning Spaces in Higher Education Institutions

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Abstract

Institutional campuses are the most coveted projects – both for the Architecture students design thesis and the practicing Architects. Authors studied the arrangement of thirty instructional spaces spread over seven higher educational institutions in Rajasthan and found that the design of classrooms can only allow lecture method of teaching. In more than 80 per cent of the classes, the acoustics was poor and in many classrooms arrangements of the boards restricted teachers. It is observed that while there is accelerating pace of change in the way students learn, the campus designs especially the classroom designs continue to follow the conventional sage-on-stage approach to teaching. This paper, while discussing the rapidly changing teaching-learning process suggests that there is a need to develop guidelines and standards so that stakeholders can assess designs on qualitative aspects also. The educational campuses need to cater to students who have grown up hanging around in malls, reading in cafes and learning through u-tube, there is a need to rethink the ways we design and develop learning spaces.

Key Words: Acoustics, Classrooms, Seating Layout, Pedagogy

Introduction

Beautiful buildings just like any other art form are able to provide instant gratification and a sense of delight for the viewers. However, Architects need to go beyond visual aesthetics and create an ambiance that contributes towards human productivity and enhanced performance of users. Quite often the desire to create a unique visual experience overpowers the functional and operational nuances. Building typologies like hotels, hospitals and information technology offices have well established standards and operational norms that ensure compliance of operational and maintenance requirements at the design stage. Specialists like ‘hospital planners’ and ‘kitchen planners’ are now well recognised and effectively deployed to keep pace with modern technologies and changing user demands. The critical learning spaces like classrooms continue to be designed in an old-fashioned way. Many private institutions of higher education have developed campuses on an impressive scale to cater to students who demand a lot from their environment. However, quite often the external grandeur is given primacy over

functional aspects of learning spaces. The survey conducted by the authors covering thirty classrooms in seven different types of institutions in Rajasthan confirms that many technical nuances like acoustics and simple issues like seating layouts are ignored at design and implementation stage. These components seem to be a ‘blind spot’ for most designers and developers of educational buildings. An educational building is no good where a teacher has to shout to teach and if the student has to make an extra effort to listen and comprehend the lesson or if the classrooms do not correspond to the pedagogy that the teacher desires. This paper identifies different teaching methods used in higher educational institutions and their implications on design of learning spaces. The paper suggests few simple but effective measures that can help in improving the teaching-learning process that will eventually lead to better results of the students.

Changing Face of Higher Education

Gone are the days when the teachers addressed the classes and went out. Teaching is now becoming more learners centered where multiple teaching methods are used to teach the 21st century skills – creativity, problem solving, analytical thinking, collaboration etc. With e-learning technologies, teaching methods are changing. Teacher is becoming more of a learning facilitator. Even during the face-to-face classes, accomplished teachers using problem-based learning to produce graduates who can think critically, analytically and solve societal problems. Variety of teaching methods like case studies, group discussions, role-plays, etc. that have practical orientation help students grasp and retain the subject easily. Research to identify the performance of classrooms vis-à-vis the different possible spatial layouts is limited. Nevertheless, the results of the few researches conducted till date have been promising. (Amedeo & Dyck, 2003)

Educators look for flexibility in design of learning spaces. Seating layouts that encourage participation and collaborative work are in demand. Instead of fixed furniture that allows only lecture method of teaching the need of the hour is to have furniture that allows easy transition to suite different teaching methods. Not only there is need for good visual but also physical connectivity between the student and the teacher. Electronic media, projectors, interactive white boards, laptops, and spaces that encourage group discussion are now essential requirement of a classroom.

Need for Sensitive Design of Learning Spaces



The true victory of architects lies in enhancing the delight and productivity of the building occupants. Instead of designing primarily for eyes, all senses and functions should be taken into account. When issues related to the planning and design of an educational campus project are discussed, we often refer to planning regulations, design standards, building codes and other literature related to buildings. There is also concern expressed about the quality of open spaces, connectivity, exotic landscape, energy, water, food courts and the overall aesthetics of the campuses. With privatization of higher education there seems to be a race for creating 'high tech' institutes where exterior grandeur and air-conditioned classrooms overpower the functional aspects that contribute to teaching-learning processes. Parents feel privileged to send their children to such monumental campuses where there are lush green lawns, high equipment gym, coffee lounges etc. Very often basic requirements like appropriate seating layouts, acoustics, quality of air, thermal comfort, day lighting are paid much lesser attention that they deserve. Parameters reflecting the cognitive ability of the students also which are also missed as yet. (McCreery & Hill, 2008)

Classrooms however are spaces much more complex than that. Not only is an instructor teaching in the classrooms, there are also many students trying to learn. Thorough attentiveness can only be attained if body is calm to concentrate solely on learning. A student shouldn't need to put any sort of strain while trying to learn as it diverts the mind from focussing to adapting for the uncomfortable surroundings. If any of our sensory organs were uncomfortable, then one part of our brain would be working hard to get that at ease. Therefore, other than the facilities required for comfortable teaching, the furniture and layout should also correspond to careful and systemic teaching which has been missing for the present-day classrooms. (Betoret & Artiga, 2014).

The study discussed hereafter indicates that the design of instructional spaces does not quite respond well to the demand of contemporary teaching-learning processes. The study focused on two most critical aspects that have direct impact on teaching learning processes viz. acoustics and seating layout.

The Study

This study is a sample preview of the status of learning spaces in higher educational institutes in India. Rajasthan has emerged as an educational hub in last decade and experienced emergence of new educational campuses. Seven campuses designed by professional architects spread in Jaipur, Ajmer and Udaipur were selected. While the names are not divulged in this paper for the sake of anonymity, the sample included universities, management, engineering, and design institutes from both private sector and public sector.

The study covering 30 classrooms found that all classrooms in engineering institutes had fixed furniture arranged in column and row format. In one engineering institution, the classroom was fan shaped with curvilinear array of fixed furniture. Only in one premium management institute the classroom layouts were horseshoe shaped that could promote case study mode of teaching essential for management education. None of the classrooms studied had sliding system of multiple black/white boards. In 70% cases the location of white boards and projector screens clashed,' this leads to selection of one system as a forced choice between board and screen, whereas a regular discussion requires continual usage of board and screen.

In architecture and design institutes, the studio spaces were predominating place for learning. Here the seating arrangements were informal and, in most cases, not commensurate to spatial needs of the batch size. The design studios need a drafting board for every student and the classroom spaces are not aligned for that purpose, as the size of a drafting board is much different from the size of a regular classroom table and



the misaligned classroom sizes don't allow that comfortably.

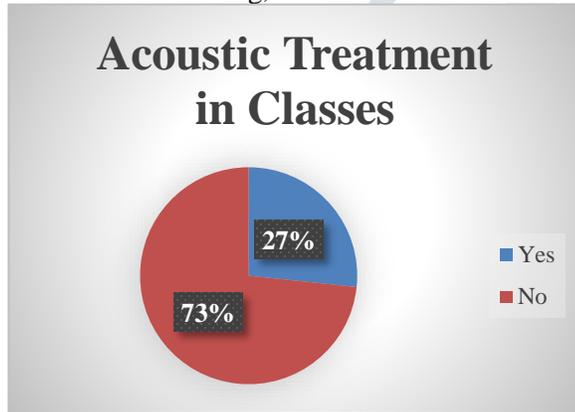
The tiered seating layout was used in a few lecture rooms in the institutes but in them the seats were overlooking the podium/teacher/board. This layout puts entire focus of the class on the teacher and doesn't facilitate discussion among students. Otherwise, the lecture theatres were not even conditioned separately and turned out to be like any other classroom with box array arrangement. The regular classrooms were

oriented towards blackboard where the faculty would stand and take the classes.

The classrooms were designed with the premise of teacher centric teaching wherein teacher was the key role of the class and entire teaching was oriented towards faculty wherein owing to the arrangement of the classroom, the teaching process was oriented towards a lecture-based approach and one-directional discussion. In order to focus on process-oriented teaching and multi-faceted discussions, the classrooms should be designed with multi-foci and not one focus as a teacher or classroom board.

Figure 1 In one of the respectable NIT, Acoustics

Ideal RT time in a classroom should be between 0.4-0.6. Reverberation interfere with speech intelligibility, resulting in reduced understanding and therefore reduced learning, which was quite



visible in the discussions that we had. More than 95% of the Students complained about legibility of discussions and lecture given by the teachers. The teachers complained that in order to maintain clarity they had to be louder and often suffered from throat infections. Those who were indifferent to that were not clearly understood by their students.

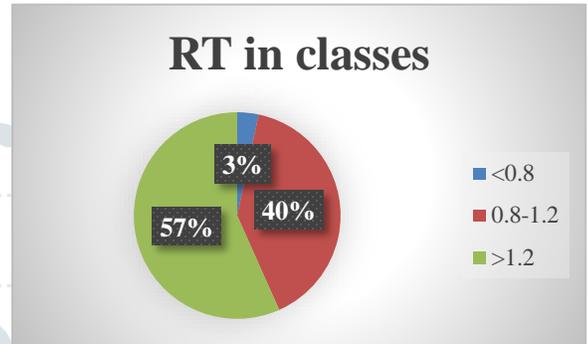
Of the 30 classrooms studied, only 1 classroom had Reverberation Time less than 0.8 which could be considered in the desirable range, rest all of them had a higher Reverberation Time (RT).

The study also showed that almost a quarter of the classrooms studied had a form of panelling on the walls, however, it was not placed effectively. Hence, the required RT was not achieved. It was observed by the authors that these classrooms can easily be redeveloped with better acoustics with minor tweaks in their systems. By singularly, changing the material in wall panels, we were able to reduce the RT in a pvt. Management college from 0.9 to 0.5 and substantial improvement in overall acoustics was observed by the students.

Discussion

Acoustics

In Broadway, it is commonly said that if one doesn't see your face but can hear you completely, one can understand your expression, however, if one can't hear but see then it gets worthless. Similarly, acoustics plays a very important role in classrooms also. In the inter-noise conference in Lisbon, it was established that listening capabilities of children are much more delicate than adults. Stress for listening can cause long lasting effects in their hearing competences (Smaldino,



2012). Moreover, they also found out that our current classrooms world over doesn't fit the needs of proper acoustics for a classroom environment. Quoting from the paper, "it was discovered that the children from classrooms with poor acoustics performed worse in a phonological processing task assessing auditory-verbal precursors of reading, reported a higher burden of indoor noise in the classrooms, and judged their relationships to their peers and teachers less positively than children from classrooms with good acoustics. Furthermore, one in every eight students regularly suffers from diseases says as hay fever, asthma, ear-infection etc. where hearing ability is compromised." (Klatte & Hellbruck, 2010).

Effective classroom speech communication is necessary for acquisition of academic skills along with social and cultural abilities. In research it has been found that perception of spoken language is the foundation for the aptitude to read and write and more



than 85% of classroom learning involves spoken exchanges between students' and teacher. Moreover, in order to enhance legibility

and voice volumes, teachers have to put extra strain for the student which leads to higher absenteeism. This can be directly overcome by putting an extra effort in working out the classroom acoustics at design stage itself.

NRC values and Reverberation time should be looked into by the architects while designing these rooms. The shape and size of the rooms play a role in improving architectural acoustics. However, given the constraints of space it may not always be possible to create trapezoidal shapes where no hard surfaced walls face each other. Many cost effective acoustic finishes are available that can greatly help improve speech intelligibility.

It is a well-known fact that boys don't hear as well as girls since listening to instructions activates only one side of the male brain. Therefore, it should be made sure that audibility is sufficient for all (Gurian, Stevens, & Daniels, 2010). Moreover, when an instructor has to teach loudly one gets more impatient and easily fatigued and teaching is then compromised (American Speech Language Hearing Association). It is also possible that teachers used to speaking with raised voices may start speaking loud permanently. Annoyance level of both children and teachers under poor acoustics increases. This, thus surely affects students' language and reading acquisition. It can be achieved using appropriate reverberation time, sound absorbing materials on ceilings and on the upper levels of walls in the rear and high reflectance materials near the instructor. (Thurnquist, 2003)

In order to combat this issue, the institutes where (less than 9% of institutes of higher learning have recognized it as a problem, (American Speech Language Hearing Association, n.d.)) Acoustics are accepted as a concern do away with their responsibility by installing a false ceiling in their classrooms. While recording observations¹, authors found out that more than 80% of the classrooms, which have false ceiling, don't still perform satisfactorily. Quite clearly NRC value of the material was not considered while drawing out the specifications. There as a resolve, it should be put in the classroom design charter that while planning the classroom itself, the due NRC and RT tests should be made and acoustic design should be taken up thereafter in the required scientific manner only.

Classroom Layouts

Teaching as a medium to transmit knowledge has always existed since the dawn of civilization. As read in our scriptures, the system of teaching surpasses the time immemorial, be it listed in legendary texts of Ramayana and Mahabharata or in the ancient texts of Panini and Kalpasutra. Though very different from the current mode of education, the system of Ashramashiksha (apprentice training) had created its own share of legends in the history. This mode of teaching revolved around an intense system of togetherness wherein students lived with their mentor, the teacher, the rishi which became their family. Classes there used to conduct under a tree wherein the sage or the teacher

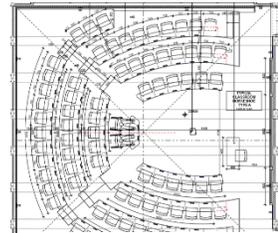


Figure 3 Layout of a management institute's classroom

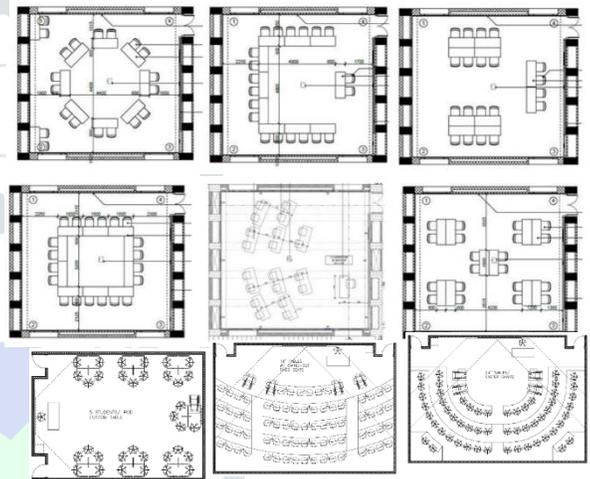
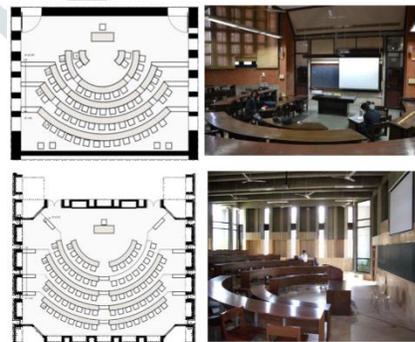


Figure 2 Layout and design of classrooms

would deliver his lesson/lecture to the group of students directly. These classes used to happen under a tree or a courtyard in an informal seating but ensuring a lot of interaction of the students with teachers.

This was surpassed then by the classroom teaching which started in confined setting. While the 'sage-on-stage' mode of teaching continued, the intense interaction was lost in the arrayed arrangement, wherein the focus is not on teacher but the board. With strong emphasis of memorising the text



we observe that teachers' notes are transferred to student's notebooks via the blackboard. This simple example demonstrates the importance of classroom layout in teaching. The regular row seating layout was

¹ The names of the institutes cannot be disclosed considering the repute and consent to privacy

earlier adopted because it reduced interaction and communication between people in the room and focussed their attention on the front of the room, (Norum, Russo, & Sommer) however, this is not the case anymore. In fact, on the contrary, we need the classrooms which enhance and promote classroom interaction between the students. The horseshoe arrangement that promotes group discussions and interaction among students remains exclusivity for some of the management institutes only. Except for a



Figure 4 Furniture design doesn't satisfactorily correspond to the pedagogy and students' comfort

premier National level management institute, the management classes in all other institutes had classing column and row seating arrangement.

The management institutes which have the horseshoe arrangement in classrooms operate differently than the regular row-based systems but not understood by the faculty as established in a survey consisting of 300 students from 3 different institutes. In a study it was also found that in the horseshoe arrangement, those students in visual contact with the instructor participate more than those at the sides, while in the straight-row arrangement, those students in the center participated more than those at the sides of the rows, which if not perceived by the faculty, will lead to pre-occupied notions continuing from the straight row classrooms and thus due focus is not given to the required students. (Norum, Russo, & Sommer) The faculty has to realize that visual contact between people facilitates interaction and communication. (Koppel, 2011)



In order to substantiate the argument if we consider different classroom layouts and their impacts, we can consider an engineering college, an architecture

institute and a management institute. Engineering and management institutes requires formal classroom setups whereas architecture institutes can manage in unceremonious settings also. Among the engineering institutes surveyed as part of this study, 90% had an arrayed seating layout and 10% had an arched seating layout with fixed furniture. Thus promoting lecture method of teaching only. These trends clearly demonstrate how classroom layouts can influence the learning and interest mechanism of students. Learning process in higher education focuses on engaging students and integrating their beliefs with new ideas.

During the study it was also found that most of the teachers were using lecture methods as it was found to be most efficient way of covering the course contents in the given time. Unless the faculty receives training regarding students' perception and behaviour outcome in such classrooms, they won't be able to provide desired results in the spaces. (Koppel, 2011) It has also been found out that in the classrooms where moveable furniture is provided seldom see their usage, it continues to be mostly stuck in regular row arrangement thereby restricting participation and improved learning. (Norum, Russo, & Sommer)

The management institutes have been able to make some progress over their undergraduate counterparts and have disclosed a classroom layout, which leads to better teaching making it the more effective and priced education course. They try have a horse-shoe type of an arrangement wherein focus is more on the interaction. Students are enabled to look more at other students than solely on boards leading to enhanced interaction and thus improved learning wherein they are able to discuss their cases, interpretations and discourses. This analysis helps us establish the importance of a classroom layout for different teaching techniques and courses. Unlike a standardized arrangement for all the classes, effective systems and layouts need to be explored for fruitful teaching and learning alike. (Betoret & Artiga, 2014)

Furniture in the classrooms should be aptly designed for the students considering their specific requirement. An uncomfortable chair can cause a lot of discomposure where one would lose all the will to concentrate. Proportions in the classrooms should be kept the age-group of students in mind.

Conclusion and Recommendations

Design, since inception, should be done for all senses. In institutes, where we have young brilliant minds who are entering the new world of reality, it becomes of paramount importance that they focus and learn on opportunity vital that they experience the best they can.

This would evolve them with an inherent empathy. (Arens, 2012)

In order to create classroom with a stress-free environment for the body as a whole, design should take care of the experience that a student undergoes in the class. If one is listening, one shouldn't be putting any extra stress to hear, the spatial layout must ensure visibility from all corners while supporting discussions, and collaborative work.

In the era, where students are demanding 'customers', and information is available on fingertips, the designers and developers need to align their design with the emerging educational technologies and learning behaviour of graduate students. The educational campuses need to cater to students who have grown up hanging around in malls, reading in cafes and learning through u-tube, there is a need to rethink the ways we design and develop learning spaces.

Thus Sensitive buildings for Institutes

Institutes designed sensitively, keeping students and sustainability in mind, function more efficiently, creating better learning environment for all (Langdon, 2012). If a building is able to enhance human productivity, it would pay for the extra cost, if any, many times over its lifespan. Designed classrooms have numerous advantages like - ability to attract and retain teachers (74%), reduced student absenteeism (72%) and improved student performance (71%). These institutes increase teacher retention as the overall environment is more desirable and thus their satisfaction. Considering this, it becomes the responsibility of client/institute committee to ensure that their institute entails these principles which are not only vital for students, but also would aid in proper functioning of the institute.

There is a need to develop guidelines and standards so that stakeholders can assess designs on qualitative aspects also. This will ensure that the design of learning spaces is in tune with the modern teaching-learning processes. This will help in increasing student's engagement and consequently enhancing their performance. In the era, where students are sophisticated and demanding 'customers' the approach to the design of educational institutions need to change. The educational campuses need to cater to students who have grown up hanging around in malls, reading in cafes and learning through u-tube, there is a need to rethink the ways we design and develop learning spaces. Design principles, imbibed in the institute itself, would create future citizens more sensitive and responsible who will in turn create this world a better place to live in.

Abut the Author

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Prof Neeraj Gupta, is an Architect, Town Planner, and Management Graduate with more than 35 years of multidisciplinary experience of professional work, academics, and educational administration. As an architect and urban planner, he has designed more than 300 projects of medium and large scale. He has facilitated nearly 1500 learning events and training workshops for professionals and students in the last two decades. He has served as consultant and advisor to IITs and IIMs and helped establish many engineering colleges and architecture schools in Rajasthan. His publications include training modules and papers in the field of architecture, management and education.

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Akshya Singhvi is the Principal Architect at The Team Architects specializing in sustainable and green architecture. He graduated from School of Planning and Architecture, New Delhi and has worked with IIM Udaipur as the project manager for their entire campus development. He has worked with natural materials like earth and bamboo for building structures and was working with Olam International for ensuring environmental sustainability in their SEZ project. The author holds extensive experience in designing sustainable learning spaces and has worked in India and Gabon (Africa).

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