Short Communication

Building Laws and Public Health: An undergraduate elective pedagogy for architecture students sensitising on the role of building practitioners in preventing disease through the built environment.

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This short communication describes an academic, semester-long, choice-based elective program that was offered to students of senior classes of bachelor of architecture at a renowned college in India. The intent of this communication is to document and share the work with practitioners and the academia. This way it can be replicated and students of architecture and planning be made aware especially as the world had a recent memory of the COVID-19 pandemic, when public health came into a renewed focus. The students who opted for the elective were taught the role of building laws which building practitioners can utilise in preventing disease causing conditions that may occur through the built environment. The basis of instruction was evidence derived from peer-reviewed scientific literature. Various class exercises were performed in order to train the students to develop a sensitivity towards the health of inhabitants while designing the built environment. The course was structured into six exercises which were taught over a semester. This was also followed by small scale research projects that students designed and undertook independently. This short communication is a description of the methodology of the elective. Further may involve replicating the elective and testing the effectiveness of the same with a separate methodology.

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Background

In the 1914 British India, the post of the sanitary commissioner was merged with the Director General of Indian Medical Service, which has been linked to the reduction in importance of public health. This was a change from the post-plague era where sanitary commissioners focussing on water quality, public sanitation and better housing were appointed. The sanitary commissioners' major job, when they existed, was to implement health measures establishing the link between environmental sanitation and diseases[1]. This merger as stated above, was not an isolated step in India where public health and health services were merged in one way or the other. A similar action took across the world where there was divergence in urban planning and health[2][3]. But as modern architecture became prevalent, it was clear that the sanitation influenced and played a key role in building design with wide windows, minimalist easy to clean design and a splurge of light and ventilation [4], which coincided with the development of sanatorium which was used to treat tuberculosis patients and had similarity to the modern architectural style[5]. The above as an example suggests towards the direction of clear linkage between public health and the built environment, which is not new, but may need to be reinvented and reused. The important aspect to note here is the role played by the building bye-laws which play a direct role in controlling the public health of a space. To begin with, the genesis of modern building bye-laws in India was after the All India Sanitary Conference held in 1914 which stated that there ought to be adequate provisions of light and ventilation in Indian Buildings and suggested a light plane of 63.5 degrees[6]. Outside of India, the 1901 tenement law of New York outlawed the type of tenements which did not cater to light and ventilation and mandated lighting, better ventilation and bathroom minimum design requirements.[7][2]

In the above, the role of the upper hand of the law was crucial as it dictated the need for public health and the way to achieve it was through regulation. Conjecturally, it may be pondered that mere assumption that people would automatically make houses which are suitable for them in terms of lighting, ventilation and sanitation may not have held true. Therefore, in most places, to incorporate sanitation and public health, legal enforceable methods in the form of municipal building bye-laws which control the height, habitability, ventilation, light and density in built environment were brought in to bring the changes required for the sake of public health.

Introduction

The built environment can be modulated for public health, especially if the laws related to public health are taught to the 'creators' of buildings and the built environment, the primary among them are architects. The concept of building bye-laws, its health perspective and other special laws in India aimed at public health are needed to be taught at the formative stages in architectural schools. This is part of the mandate of an Architect's professional duty[8] and is relevant all the more now, as the world renewed it's focus on health especially after coming out of the COVID-19 pandemic. The course was offered as an elective to undergraduate students of fourth and fifth year of bachelor of architecture and this paper describes the exercises done followed by some research projects that they undertook. It highlights the need for such work by architects and the need for training of students at undergraduate level so that they can play an active role in the multidisciplinary area of public health, which may otherwise appear as the exclusive territory of medical professionals.

Course Structure

The Context of the Course

The course was offered to students of the 4th and 5th year of the five-year Bachelor of Architecture students of the School of Planning and Architecture, New Delhi which is a leading architecture higher education institution and an institute of National importance created under an Act of Indian parliament. [9] At the end of the five year undergraduate program in architecture, the students are registered by the Council of Architecture as architects and are given a license to practice in India. 16 students chose to take this elective which lasted for a semester, which is 12-16 weeks long with classes happening for around 12 weeks, with lecture scheduled for two hours in a week. It is an internal-only course where students are marked based on the classwork-based evaluation only and there was no end-of-semester exam. The elective was among the many other electives that were available for students to chose from. The students made an active choice in opting for this elective.

The Building Laws Introduced

The major focus of this elective was to link the legal aspects of public health legislation and its implementation through design to meet the ends of public health. For this the major laws that were taught are the local building bye-laws, the national building code (which is recommendatory in nature,

and is selectively mandatory as ratified by various building bye-laws [10]) and other special or environmental laws which includes the anti-smoking law[11], and the noise pollution law.[12] A general overview of other laws having indirect connection with the built environment was also discussed.

The focus was not only on the theory of the law, or the jurisprudence, but on the implementation of the law from the perspective of the built environment, that too by building professionals like architects. While explaining the exercises, the laws were very subtly introduced to the students and not taught separately as theory. This enabled the students to imbibe text-heavy legal jargon when made to integrate it into design.

About the Course

There was an initial plan which was updated and improvised with the final exercises that were developed based on the various factors. The various exercises performed in the semester are detailed in Table 1. The various reasons why these activities was developed is as follows:

1. The activities needed to relate to students pre-existing and current training, which includes a strong sense of design and drawing as the mode of representation of the design.
2. Many students were keen on learning the various intricacies of the building bye-laws as it would be of immediate use in the practice of architecture.
3. Students were already doing a studio on Urban Design on rehabilitation of urban villages of Delhi. The exercises to be suggested needed to be in sync with the studio work of the subject urban design.

S. No.	Title of the Exercise	Description of the Exercise
1.	Health in the House: Draw your house design	Students were asked to sketch the building plan of their own house and mark all the possible interventions that will be helpful from the public health point of view. This includes setbacks, the natural light intake, the ventilation status, and window wire mesh, etc.
2.	Habitable Spaces and Setbacks: Upload the Building Bye-Laws.	In this students were asked to a). Upload the building bye laws of their city/state. b). From the bye laws, write the definition of habitable room/space as in the bye laws. c). Find out the offsets for residential plotted development on the fronts and sides.
3.	Light Plane	Students were asked to pick a street/multiple streets in a 'urban village' based site they were already familiar with and measure the dimensions of the street width and the height of the buildings to find out the angles at which the light will reach the lower most point of the building on the street.
4.	Three Epidemics: The College Canteen Assignment	Students were asked to sketch their canteen building plan. they were then asked to visualise spatial factors that contribute of transmission of several air-borne, vector-borne or water-borne diseases, which have led to epidemics in the past. They were asked to suggest methods where building level interventions (taken from peer reviewed science) could be integrated into design for prevention of the transmission of these diseases and their future similar transmission of disease causing mechanisms.
5.	Search Terms for Review research.	The students were trained on finding out the latest evidence from databases on a topic of their interest related to built environment and public health. Certain topics related to concurrent public health matters were taken and by students and they were trained to make appropriate search terms so that they can write narrative reviews, scoping reviews and systematic reviews in the future.
6.	Research Work	Students were asked to perform field research studies on topics related to the relation of buildings to public health. They were asked to use a research project format to frame their questions and perform a study and post it on an open peer review based portal.[13]

Table 1: The title and the description of the various exercises performed by students in the semester.

The Exercises

The First exercise under discussion was taken in the introductory class, where students were made to draw their own house plans and specific focus was made for them to highlight the possibility of interventions that may already be there or may be added, in order to improve the public health conditions for the inhabitants. Students highlighted the presence of doors, windows and other features included in the design of the building envelope. This is useful for the sake of finding out the state of entry of light, ventilation and whether the window had a wire mesh or not. An open window may allow entry of sun and natural light, openable window is useful in ventilation and the wire mesh helps in prevention of vector-borne diseases. The students were asked to state whether there were openable areas for exercising around the house and whether there was general sanitation outside and within the house. Students marked their house building plans and made overlays as drawings with the interventions present.

The second exercise was about building bye-laws and the local changes made to them, if any, in the various cities from which the students came. Building bye-laws owe their genesis to public health and sanitation[2]. The measures like setbacks, habitable dwelling units requirements, appropriate openings through doors and windows are in the same direction of sanitation and public health. Students were made to go through their local building bye-laws and had to write the setbacks that existed along with the definition of ‘habitable space’ from these bye laws. This not only was intended to serve as a ready reckoner for the students as they graduate and undertake building projects soon afterwards, but was also useful to compare between the different cities which the students studies and their different values for setbacks, as a general activity for class discussion where students discussed the context of each city whole byelaws were analysed.

The third exercise was about measuring the light plane angle in an urban village setting. An urban village in Delhi is an area, for the limited purpose of our discussion, where the otherwise city-wide applicable building bye laws do not apply[14]. These areas are former village residential areas whose agricultural land was procured by the government in the process of urban development around these villages, but whose residential portions were retained as it is. Being the centre of otherwise regulated urban space, these urban villages became hubs of economic activity and the traditionally modest single or double storey

houses had became multistorey without any widening of the roads or the addition of any substantial civic infrastructure or utilities. These urban villages often have narrow streets abutting tall buildings on both sides, leading to a compromise on natural light reaching the lower most points of the buildings. Students were asked to do a calculation of the street width and the relation of the same with the height of the building. A standard light plane was made to show that the light may not reach the depths of the street.

The college canteen assignment was next and it was of particular importance where the students were much familiar with the canteen design as they used it everyday. The students had been taught the various evidence-based design interventions through peer reviewed literature. They were then asked to imagine if three epidemics were to happen, what interventions were most important for a particular space, in this case, the canteen. The first was an epidemic which would spread through the airborne transmission route. The second one was an epidemic which spread through vectors like fleas, mosquitoes or rats. The third one being an epidemic spread through water. The canteen being a place involving eating and drinking, the students had access to the water cooler, the cleaning area, the cooking area, etc. and they could include into the drawings, the interventions that could prevent epidemic scale events that may spread in the space. For example, a cleaning area may need an efficient way of preventing water stagnation, which otherwise may become a breeding point for mosquitoes. For airborne diseases, the openings and the ventilation could be prescribed[15][16], which the students made a note of in the sheets. Additionally for vector-borne diseases as described before, wire-mesh on openings[17][18], lack of food source for vectors, and methods for their eradication could be included in a built-space design and maintenance plan, both of which an architect can impact.

The next exercise involved drafting search terms for appropriate searching from peer reviewed databases like PubMed. The students were asked to choose topics that they had to perform a short research on by doing a literature review[19] They were taught operators such as AND, OR and NOT and were asked to make a comprehensive list of keywords which would include all facets of the work, including allied areas and also including adjectives, different spellings for the same things and differents ways of referring the same topic or keyword.

The last exercise was research work. The students took some topics where some relation between built environment and public health was to be performed. They were appraised about research limitations and to take up studies which do not involve any human participants, including no questionnaire and no communication with any human subject due to ethical concerns. They were also asked to only look at

buildings, or locations and collect performance based observations. The students took some projects are listed in Table 2 below:

S. No.	Title	Description	Remarks
1	Research question: What effect does vegetation have on sound pollution in Delhi?	The paper was intended to see the relation of vegetation based buffer between a road and an educational building.	The work requires further fundamental changes.
2	Study of diffused light levels in an institutional common eating area in New Delhi	The paper used smartphone based lux meter to create a grid based analysis of the light levels within the canteen of the college in order to find out the relation with window distance and such basic inferences.	The work is not fully complete and requires further improvement.
3	The Condition of Cigarettes and Other Tobacco Products Act: Case Example of IP Estate Precinct, New Delhi	This study used a map to point out the tobacco vendors in an institutional area in Delhi, as there were many higher educational institutes in close proximity. This was to check the compliance of the anti-smoking law in India. [20]	The study needs further work by authors as it needs to be detailed out and proximity analysis needs to be done.
4	Insufficient Daylighting in a Residence in New Delhi	This was a basic study performed in the room of a student by using a smartphone based lux meter.	The study requires a more detailed methodology and further work.

Table 2: The list of the projects performed by students independently which were submitted to Open Peer Review platform-Qeios for initial peer review for students to make improvements.

The students were asked to put the projects on an Open Peer Review based publication platform Qeios[21]. This gave students early access to peer review as most may not, at this stage of career, may be inclined to post a paper to a traditional journal. Most posted papers got critical comments, with some comments challenging the structure and the fundamental methods of the study. This was important as a

pedagogical method by exposing students to real world peer review, where the scope of improvements and academic rigour is of utmost importance. The students posted the papers on Qeios at the end of the semester with minimal discussion so that they could get early training in independent execution of research and were encouraged to keep improving the paper. This also highlights the fact that the chosen peer review platform has certain advantages in terms of providing expert feedback to students.

Discussion and Endnote

The semester long progam is a starting point for more such related programs that may be performed by architecture colleges across the world. This is all the more so important as we have dealt with the COVID-19 pandemic and post pandemic design which requires a multi-disciplinary approach with architects being an essential part of the process.

What is important to note is the building laws perspective which is included in the title of the course. In all the exercises performed by the students, the compenent of law was taught to the students along with its design integration. For example, with respect to light levels, the National Building Code 2016[22] and SP: 41-'Handbook on Functional requirements of buildings'[23] was taught and its integration at various points in the building bye-laws was explained. With respect to noise and the effect of vegetation, performed as a project, the students needed to know about the gazette notification made to the environmental law which has prescribed legal limits to sound levels around educational institutes [12]. For the smoking compliance, the anti smoking law[20] [11]with its various notifications related to educational institutions was taught. Through subtle, non extensive ways, the students were taught about few laws that had a direct connection with the built environment as well as public health.

The exercises were intended to captivate the design-centric minds of architecture students and introduce them to laws related to public health and also to elements of basic research.

This work may be replicated across architecture colleges in India as an elective so that this work can be made available to architecture students, who after graduation also have a key role to play in building healthy spaces. Further work is required to test the effectiveness of this pedagogy to further enhance it and validate it.

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Declarations:

No specific funding was taken for this study. The author declares no conflict of interest. The study is exempt from ethical clearance as there was no human participant, questionnaire, human tissue, animal tissue or animal is involved. Further the study describes a pedagogy technique and is therefore exempt from the same.

References

1. ^*K. Sujatha Rao. (2017). Do We Care?. doi:10.1093/acprof:oso/9780199469543.001.0001.*
2. a, b, c*Russell Lopez. (2012). Building American Public Health. doi:10.1057/9781137002440.*
3. ^*Jason Corburn. (2004). Confronting the Challenges in Reconnecting Urban Planning and Public Health. Am J Public Health, vol. 94 (4), 541-546. doi:10.2105/ajph.94.4.541.*
4. ^*Monroe C. Beardsley, Ulrich Conrads, Michael Bullock. (1976). Programs and Manifestoes on 20th-Century Architecture. The Journal of Aesthetics and Art Criticism, vol. 34 (4), 516. doi:10.2307/430599.*
5. ^*Margaret Campbell. (2005). What Tuberculosis did for Modernism: The Influence of a Curative Environment on Modernist Design and Architecture. Med. Hist., vol. 49 (4), 463-488. doi:10.1017/s0025727300009169.*
6. ^*(1914). Proceedings of the third all-India sanitary conference held at Lucknow, January 19th to 27th 1914.*
7. ^*L. Fisher, Lawrence Veiller. (1910). Housing Reform: A Handbook for Practical Use in American Cities.. The Economic Journal, vol. 20 (79), 413. doi:10.2307/2221038.*
8. ^*Council of Architecture: Comprehensive Architectural Services.*
9. ^*Department of Architecture, School of Planning and Architecture, New Delhi. Syllabus for Bachelor of Architecture (Effective from Academic year 2016).*

10. ^Singh, Raja; Mathur, Manoj; Dewan, Anil. (2022). Analysis of the Delhi-Unified Buildings Bye Laws 2016 with respect to the integration of provisions of the National Building Code. Shelter, vol. 23 . HUDCO HSMI.
11. a, bGovernment of India. (2003). The Cigarettes and other Tobacco Products (Prohibition of Advertisement and Regulation of Trade and Commerce, Production, Supply and Distribution) Act, 2003.
12. a, bGovernment of India. The Noise Pollution (Regulation and Control) Rules, 2000.
13. ^Tony Ross-Hellauer. (2019). Open Peer Review (OPR). Qeios. doi:10.32388/002217.
14. ^How Urbanisation Went Wrong in Delhi's Lal Dora Villages. The Wire.
15. ^Dr. Raja Singh. (2022). [Commentary] India's steps towards carbon dioxide monitoring in public assembly spaces for ventilation measurement for airborne infection control and other factors. Qeios. doi:10.32388/SQ03IV.
16. ^Raja Singh, Anil Dewan. (2022). Using global research on ventilation and airborne infection control for impacting public policy through the Indian Judiciary. Indoor and Built Environment, vol. 31 (5), 1438-1440. doi:10.1177/1420326x211061997.
17. ^Raja Singh, Nirupam Madaan, Ashwani Kumar, Jugal Kishore, et al. (2022). Mosquito control interventions in the built environment: how the Delhi High Court supported the first step towards the wire mesh policy. Cities & Health. doi:10.1080/23748834.2022.2102179.
18. ^Raja Singh, Anil Dewan. (2022). Openability of windows and presence of wire mesh in residences in a New Delhi neighbourhood as a factor of dilution ventilation required for prevention of airborne diseases and vector borne diseases. Cities & Health. doi:10.1080/23748834.2022.2036003.
19. ^Indian Council of Medical Research. Beginner's Guide for Systematic Reviews.
20. a, bDr. Raja Singh. (2023). Signboards Prohibiting Tobacco Sale Within 100 Yards of Educational Institutes: The Appraisal of Prohibition Compliance and On-Ground Status of the Anti-smoking Law in New Delhi's Major Administrative Precinct. Qeios. doi:10.32388/KU2Z0X.3.
21. ^Alberto Bedogni, Giorgio Bedogni. (2018). Qeios. Qeios. doi:10.32388/873811.
22. ^Bureau of Indian Standards. National Building Code 2016.
23. ^Bureau of Indian Standards, Government of India. (1987). SP: 41 Handbook on Functional requirement of Buildings (Other than Industrial Buildings).

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