Health-Promoting Buildings: The Future of Design

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The focus on what constitutes a "healthy building" is shifting from specifically looking at how the design and operation of buildings impact the global environment to also being concerned about how buildings impact the health of occupants who live and work in our built environments. Public health issues such as obesity, asthma, and depression, are issues that Architects, Urban Planners, and Interior Designers need to help solve. Architects have a responsibility to safeguard the health of the people that occupy their buildings/spaces. There is also a market-driven shift towards the creation of health-promoting buildings as is evident in the increased adoption of certification tools like the WELL Building Standard(TM) and Fitwel®. Our academic institutions need to recognize these trends, and work to provide a comprehensive education to students in order to facilitate the development of future leaders that are advocates for healthy built environments. This paper will focus on the "Why, What, and How" of providing education related to health-promoting buildings. It will discuss why health-promoting buildings are important from a public health perspective, what the current trends are related to "wellness" in the built environment, and how schools of architecture can play a role in advancing efforts to create health-promoting built environments.

INTRODUCTION

Interest in how the built environment impacts occupant health is growing globally. Thanks to the journey of its predecessor, the sustainability movement, the "healthy building" movement is quickly finding an audience in the building industry among developers, building owners, design professionals, and other stakeholders. Established sustainability champions are expanding their view of "sustainability" and redefining what constitutes a "healthy building." A shift is happening from a focus on how the design and operation of buildings can impact the environment (water/energy usage, refuse generation, etc.) to how the built environment can impact - positively or negatively - the health of occupants. (Jones, et al. 2016) This health-focus is a recent but fast-moving trend in the industry, with a steep learning curve for design professionals. Never before has there been this level of attention paid to the impact of buildings on human systems. In line with this trend, themes

of health in architectural education, beyond design specifically for healthcare, are slowly starting to appear in architecture programs around the country.

In support of this needed shift, this paper outlines the "Why, What, and How" related to educational opportunities that can better enable architecture programs to actively support health-promoting building design. Taking a Critical Inquiry perspective, this paper focuses on social transformation and social change (Crotty 2015; Bredo and Feinberg 1982). Adopting this critical approach allows for reflective opposition to stasis by examining the limitations and omissions of the status quo (Bredo and Feinberg 1982). Specifically, the questions addressed in this paper are:

- Why are health-promoting buildings important from a public health perspective?
- What are the current trends related to "wellness" in the built environment?
- How can schools of Architecture play a role in advancing efforts to create health-promoting built environments?

WHY ARE HEALTH-PROMOTING BUILDINGS IMPORTANT?

The American Institute of Architects (AIA) recently adopted new rules and ethical standards that specifically include providing "built environment(s) that equitably support(s) human health and well-being." (Tinder 2018) As such, current and future architects must expand their knowledge base to be able to meaningfully engage topics around the health impacts of buildings, in order to both address health outcomes from a public health perspective, as well as to uphold their ethical responsibilities as practitioners in the field of architecture.

Buildings that support human health and well-being are often referred to as "healthy buildings" for ease and simplicity, but this phrase does not accurately reflect the relationship of buildings to the people impacted by them. Buildings cannot be "healthy" or "unhealthy" as they are not living beings. They can, however, promote the health of the living beings that occupy them. This paper proposes that the term "health-promoting buildings" (HPBs) better represents the type of particular buildings that we are interested in addressing (Gordeljevic n.d.), similar to the "high performing building" terminology in the sustainability

realm. For this reason, the term "health-promoting buildings" or "HPBs" will be used for the remainder of this paper.

Despite the paradigmatic shift that will be required to situate buildings in a frame of health, linking the built environment to health is not a new concept. The late 1800's and early 1900's saw a growing movement to recognize urban planning as a pathway to improve human health.(VCU 2018) Since 1901 there have been various regulations adopted addressing the connection between the built environment and public health as shown in Figure 1. To develop and support these regulations, national organizations were created to focus on issues of public health, including the impact of buildings on occupants. The National Institute of Health (NIH) was established in 1887 followed the Center for Disease Control (CDC) in 1946 and the Environmental Protection Agency (EPA) and the National Institute for Occupational Health and Safety (NIOSH) in 1970. (EPA n.d.b, NIH n.d., CDC 2018a.)

In 2002, NIOSH launched the Total Worker Health® (TWH) program, a significant step towards recognizing the impact that physical work environments have on the overall health and well-being of employees. (CDC 2018b) In 2017 the CDC formed the Healthy Work Design and Well-Being Cross Sector Council to support efforts to create healthy-promoting work environments. The group facilitates research, and disseminates knowledge, related to improving the health of work environments with the goal of improving the physical, emotional, mental and economic health of workers. (CDC 2018c)

As previously noted, architects have an ethical responsibility to safeguard the health of the population occupying their buildings and spaces. Public health issues such as obesity, asthma and depression are increasing in prevalence (Hales 2017, Brody 2018, CDC 2012). Because of the sheer amount of time spent in designed environments, architects have the ability to help address these important concerns. Studies have established correlations between indoor environments and both mental and physical health. Built environment elements have been linked to unhealty characteristics like decreased cognitive function (DeAngelis 2017) and increased risk of respiratory and allergic conditions (ELF, n.d.), but also to positive health factors such as lower levels of depression and stress. (Singh, et al. 2010)

The primary professional organization serving architects, the AIA, has a long history of linking architecture with health. Currently, active AIA members are required to complete twelve hours of continuing education annually which are specifically related to Health, Safety, and Welfare (HSW) topics. This comprises two-thirds of the total continuing education hours required.(AIA 2018) HSW hours have often been addressed through education on code compliance, ADA accessibility, and sustainable design. Recently, both the national organization and local AIA chapters have been providing increasing offerings for

HSW education addressing HPBs. Highlights of educational opportunities held in the last two years include:

- 2018 AIA National released the "Prescription for Healthier Building Materials" handbook. (Yang and Tepfer 2018)
- 2018 AIA Chicago seminar entitled "Healthy Buildings: Is it the next big thing?" (AIA Chicago 2018)
- 2018 AIA Pittsburgh feature article "Evolution of Wellness Design" (Ryan 2018)
- 2018 AIA DC seminar entitled "Deciphering Healthy Building Certifications." (Rider et al. 2018)
- 2019 AIA National KnowledgeNet Webinar entitled "Our Buildings, Our Health" (Butterfield 2019)
- 2019 AIA New York seminar "Building Health: The Next Frontier" (Mears et al. 2019)
- 2019 National AIA Conference seminar "Architects are Public Health Workers-A Global Exchange." (AIA International 2019)

This list supports the notion that, as stated at the 2018 AIA Annual Conference, public health is emerging as a powerful tool for architects (Edelson 2018). The U.S. Green Building Council (USGBC), which has primarily focused on creating and maintaining buildings that do less harm to the environment in terms of resource consumption and emissions, also now supports the position that "designing for human health is the next frontier in sustainable design." (Bell 2018)

For future architects to be competitive in the market for both traditional architecture positions and for less-traditional positions outside of architecture offices (such as developers, consultants, professors, government positions, etc.), it will be increasingly necessary for graduating architecture students to have an understanding of HPBs with some depth. To optimize their employment potential, graduates will need to understand their responsibility to create health-promoting buildings, be able to demonstrate the design principles found in HPB design, and be able to evaluate and synthesize the various building rating systems as they relate to health strategies and outcomes.

WHAT ARE CURRENT TRENDS RELATED TO "WELLNESS" IN THE BUILT ENVIRONMENT?

One of the challenges related to creating, assessing, and recognizing HPBs, however, has been the lack of a clear definition for health-promoting buildings, and how they might be designed and operated. According to the World Health Organization, health is defined as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity." (WHO 1946) Until fairly recently, there was little guidance on how to design buildings to support this holistic definition of health.

In the profession: The learning curve to address health in buildings is very similar to the curve seen when green building

Date	Regulation	Relevance to the Built Environment
1901	Tenement Housing Act of 1901	New York law which required new buildings to have outward-facing windows, indoor bathrooms, proper ventilation, and fire safeguards.
1927	First Uniform Building Code Adopted	Provided minimum standards for the protection of public health, safety and welfare related to the construction and occupancy of buildings.
1968	Housing and Urban Development Act	Provided a significant expansion in funding for public housing and improvement of urban areas.
1970	Clean Air Act (Amended in 1977 and 1990)	Law designed to protect human health and the environment from the effects of air pollution, including pollution generated by buildings.
1970	Occupational Safety and Health Act	Required employers to provide their workers a place of employment free from recognized hazards to safety and health.
1972	Clean Water Act	Regulated discharge of pollutants from buildings into navigable waters.
1974	Safe Drinking Water Act	Established minimum standards for tap water.
2002	Delaware Clean Indoor Air Act (Senate Bill 99)	First state-wide legislation limiting the exposure to environmental tobacco smoke in most indoor areas open to the public.
2010	California Title 17-Public Health	Limited the sale of products that contain VOCs, including products used in the construction and maintenance of buildings.
2012	National Green Building Standard (ICC 700)	Encouraged increased environmental and health performance in residential buildings.
2012	International Green Construction Code (IgCC)	Provided standards for the construction of buildings specifically focused on environmental health and safety.

Figure 1. Regulations Related to Buildings and Public Health. Reference: EPA n.d.a, GPO 1968, CREIA n.d., VCU 2018, CARB n.d.

rating systems came into the industry; the HPB movement is benefiting from the history and journey of sustainability and green building with an increased understanding of outreach, education, market engagement, and stakeholder feedback. Since 2014, the use of certification tools addressing HPBs has increased exponentially, which has helped to address this gap. The success of tools like the WELL Building Standard and Fitwel illustrate the interest that both architects and their clients have in creating buildings that support positive health outcomes. In the five years since the launch of the WELL Building Standard from the International Well Building Institute (IWBI), 2,161 projects have registered for certification, encompassing over 389 million square feet across 51 countries. (IWBI 2019)

The Fitwel certification tool from The Center for Active Design (CfAD), in collaboration with the Centers for Disease Control and Prevention (CDC), was launched in 2017 and already has 790 registered projects in over thirty-five countries. CfAD reports an 80% increase in Fitwel projects achieving certification between 2017 and 2018. (Fitwel 2019) The interest in these rating systems, however, is only a limited indicator of the trends related to HPBs. Increasingly, companies of all sizes are working to create environments that support total worker health, even if they are not interested in achieving recognition through the WELL Building or Fitwel certification programs. Companies that are allocating funding specifically for the creation of health-promoting workplaces include United Healthcare, Shamrock Foods, Lenovo, and GE. Industry leaders in these organizations indicate that health-promoting environments result in tangible benefits like employee retention and positive public relations. (Healthiest Employers, 2018)

In the academy: Regarding the presence of these themes in architectural education, the broad notion of health is not notably addressed in most architecture programs. Because of the exploratory frame of this question, a basic internet search was used to begin to establish a foundation of knowledge. This approach will establish a frame for future research, such as targeted in-depth interviews. In a simple search of the keywords "masters of architecture health" or "undergraduate architecture health," the majority of the small number of programs returned focus on healthcare design, not on the larger relationship of overall health and the built environment; less than a handful addressed holistic health from an evidence-based perspective. There is no evidence that health impacts as outlined in public health literature, or in guidelines such as the WELL Building Standard and Fitwel, are popularly incorporated into architectural curriculum.

Of the first three pages of returns from a basic search of keywords "masters of architecture health," only twelve of the returned thirty-seven entries substantially addressed health on the linked school or program website. Of those twelve, half specifically emphasize healthcare environments. Given that there are 156 NAAB accredited and candidate programs in 126

U.S. schools (ACSA, 2019), this preliminary search indicates that only approximately 9.5% of schools offer accredited architecture degrees with certificates or concentrations dealing with health in the built environment, both specifically for healthcare and more broadly. If we limit the number to those schools only addressing the broad public health issues and not focusing on healthcare projects, the percentage drops to 4.8%. The increasing urgency and pervasiveness of health issues linked to the built environment provides an opportunity, and a responsibility for architectural education programs to build a meaningful relationship between design and public health.

To begin to address this need in both the profession and the academy, the AIA and the Association of Collegiate Schools of Architecture (ACSA) have worked together to establish the Design & Health Research Consortium (DHRC) "to advance university-led research in the area of design and health." (AIA 2019) This group hosts twenty-five member institutions with an architecture program as a partner; only six from this member group are duplicates from the results of the web search reviewed earlier. This indicates that there is a group of architecture programs where research and initiatives exist regarding the design for health, but they are less formalized. The members of the Design & Health Research Consortium may not have program-level engagement, or certificate programs related to health. Instead, there may be individual researchers or initiatives that are participating in the DHRC, functionally separate from the goals of the program.

Additional stand-alone initiatives, offerings, and education regarding health can be found by searching specifically for these topics, and include workshops such as Healthy Buildings: Unlocking Value through Design, Implementation, and Analytics at Harvard in March 2020, and Building Health: the Next Frontier hosted by The Parsons School of Design Healthy Materials Lab in October, 2019. These offerings also support the notion that there are events and activities addressing health impacts of the built environment, but they are not integral to programs and may instead be insgular events.

HOW CAN SCHOOLS OF ARCHITECTURE PLAY A ROLE IN ADVANCING EFFORTS TO CREATE HEALTH-PROMOTING ENVIRONMENTS?

As concerns and awareness in society shift to focus on newly emerging issues, the curriculum delivered in higher education must evolve to address these issues. To understand the opportunities for architectural education to more fully engage themes of health, it is helpful to review curriculum design and assessment literature to establish a framework for potential integration.

A curriculum assessment framework for integrating health themes across the curriculum. In order to meaningfully address this content and establish health considerations as foundational in architectural education, issues of designing for health

need to be integral to the curriculum and its delivery. As with structures, materials, and sustainability, social responsibility and health should not be a special topic for students to option into; all students should be provided the knowledge and tools to support work that integrates health-promoting strategies. Ideally, these themes are addressed across all core and elective course offerings. For example, while studio projects may not require a stated focus on creating HPBs, they should actively encourage the inclusion of health-promoting building strategies. This cross-cutting approach is illustrated in Figure 2. One framework addressing this type of course and content development is the concept of Backward Design as outlined by Wiggins and McTighe (2005). The approach of clarifying content priorities outlines three levels of content important to establishing foundational ideas: (1) big ideas and core tasks, (2) content important to know and do, and (3) content worth being familiar with. Wiggins and McTighe (2005) describe a "big idea" as something that "connect(s) the dots for the learner by establishing learning priorities." This idea of nested levels of awareness and knowledge is shown in Figure 3.

The 'big ideas' concept can also be applied to skill-focused courses and programs, such as architecture and engineering; Wiggins and McTighe (2005) provide suggestions on how to implement 'big ideas' in these types of structures. They suggest that 'big ideas' can be found in different skill-based elements: (1) the value and desirability of the skill; (2) underlying concepts that support and defend the use of the specific skill; (3) strategy and tactics about when the skill is applicable; and (4) the underlying theory about why the skill is successful.
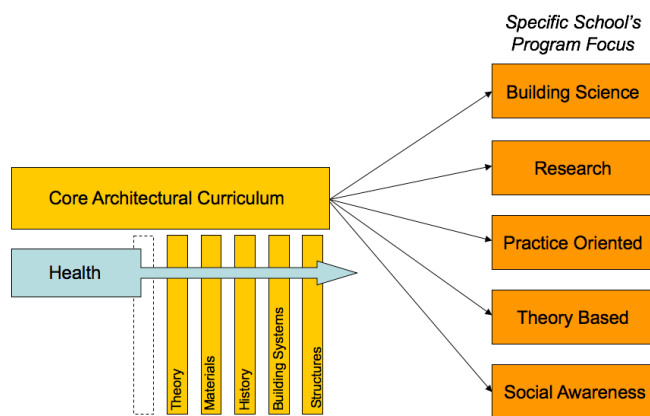
A series of others in the literature of curriculum assessment echo the importance of established core values within the curriculum, tiered information, and clearly establishing larger goals within programs. Helm (2000) notes the importance of clear goals in the curriculum. Widrick, et al. (2002) outline the three aspects of design, conformance, and performance in curriculum assessment. Quality of design speaks to how well the curriculum is addressing consumer requirements, which in this instance would be design firms and the user population. Quality of conformance addresses how the curriculum design may compare with other programs; this looks at the service being provided as illustrated by the ultimate position and pay achieved after graduation. Finally, the quality of performance explores the student's satisfaction with their overall education. Clarity of program goals as noted by Helm (2000) and Wiggins and McTighe (2005) would support each of these three perspectives of quality in curriculum.

SUGGESTIONS FOR IMPLEMENTATION: THREE TIERS
Given the reviewed background and literature, including the increasing emphasis on public health across the general population, special attention within disciplines, and as larger global concerns, there are a number of opportunities for architectural education to address this pressing issue in its delivery: (A) establishing specific courses early in programs that can provide a foundation for additional exploration across other courses such as studio; (B) integrating health themes across the curriculum; and (C) establishing dual-degree programs with schools of public health.

Figure 2: Illustration of Cross-Cutting Approach to HPBs Education. Reference: Modified from Rider 2010.
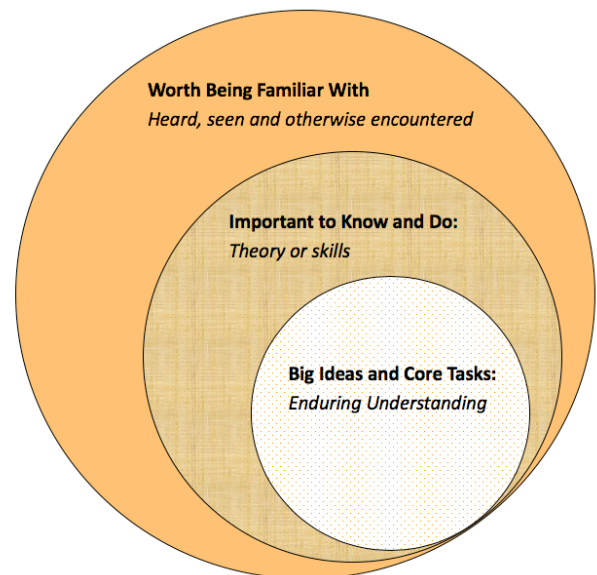

Figure 3: Clarifying Content Priorities. Adapted from Wiggins and McTighe 2005.

Tier one: Classes that focus on providing foundational knowledge related to designing and maintaining HPBs should be created and implemented. Much like focus classes on "sustainability" now exist to provide basic knowledge, when they were not popular twenty-five years ago, classes need to be created to focus on HPBs. Areas of specific focus for these courses may include: designs for active use, indoor air quality (VOCs, particulate matter, natural ventilation, etc.), biophilic design, lighting design impacts on health, design for equity, environmental psychology and mental health.

Many of the programs found in the keyword search reviewed earlier indicate that they start to address these topics at the graduate level, which negates the notions of both holistic incorporation and Wiggins and McTighe's (2005) "big ideas." While each of the topics listed above could be addressed in focused, individual courses, it would be likely be more beneficial to provide an initial survey course early in the curriculum that establishes a framework for all considerations given the complexity and breadth of the subject. This course could use one of the healthy building rating systems like WELL or Fitwel as a more digestible framework for students new to the information.

Tier two: Rooted in Wiggins and McTighe's (2005) "big ideas" concept, this approach calls for the clear identification of health themes as a core value of the program, independent of the building types that may be emphasized. By establishing health-promoting design strategies as a key element and core idea within the program, each individual course within the curriculum can establish its own way, appropriate to its focus and subject content, to address and integrate these ideas.

This holistic approach would require that each course add health-promoting verbiage to at least one of the learning outcomes and supplement the course with content acknowledging the importance of the role of health-promotion within the subject area. This would not require existing courses to be restructured or re-written, as health themes could be addressed at various points within the duration of the course to illustrate how this wicked problem can take many shapes and forms within the design process and product. This approach is illustrated in Wiggins and McTighe's conceptual diagram, modified for health-promoting design in Figure 4.

Tier three: Dual-degree programs should be developed between architecture programs and schools of public health to provide increased depth on topics of health and ultimate design efficacy. Dual-degree programs would allow interested students to further develop knowledge surrounding the impacts of the built environment on public health, and embrace public health literature, frameworks, and approaches.

A significant number of dual-degree programs already exist that engage both urban planning and public health (Harvard, University of Colorado, UC Berkeley, Columbia, etc.). It is not
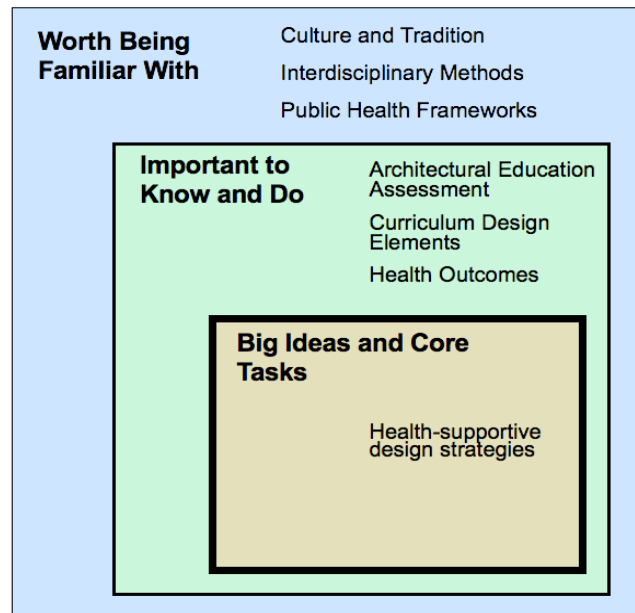

Figure 4: Clarifying Content Priorities. Reference: Modified from Wiggins and McTighe, 2005

a far jump to understand the potential benefit for architecture programs to collaborate with public health programs in a similar manner. Given that 90% of our time is spent in buildings, building design - not just infrastructure design - should be tied more directly to public health as urban planning has been for centuries. (Erickson, 2012)

OPPORTUNITIES FOR COLLABORATION AND INTEGRATION.
This paper has reviewed why HPBs are important, current trends related to "wellness" in the built environment, and how architecture programs can increase their role in advancing efforts to create health-promoting built environments. Given architecture's identification with both art and science, in addition to the hours of daily exposure to our built environments, the field is positioned to play a leadership role in addressing some of the most daunting public health issues of our time.

An initial framework has been proposed to illustrate how architectural education can begin to modify its offerings to play a critical role in advancing public health efforts. Each tier of integration proposed has available variations in depth and extent; while one program could establish one survey course in the second year to situate the students' knowledge in the realm of health, another could craft a series of foundational survey courses, from the different perspectives of planning, physical activity, landscape design, material considerations, etc. All programs wishing to meaningfully engage health-promotion in the design discussion should declare their intention, and follow through with implementation and evidence in the majority of the courses. The training of our future architecture practitioners needs to recognize these trends, and actively

work to enable future architects to be leaders in the design industry, as advocates for health-promoting buildings and healthier populations.

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