

DOI: 10.24904/footbridge2017.09239

TEACHING ARCHITECTS TO DESIGN PEDESTRIAN BRIDGES

Christiane M. HERR

Associate Professor
Xi'an Jiaotong-Liverpool University
Suzhou, China

Christiane.Herr@xjtlu.edu.cn

Summary

This paper outlines the development of bridge design education for undergraduate students of architecture at an international university in China. Key steps taken in this process over the course of five years are analysed and discussed in terms of results obtained as well as feedback given by students. The analysis focuses on key questions facing educators with similar aims, such as: How do architects approach bridge design? How can bridge design be taught as a subject in architecture? Which aspects of bridge design are of greatest interest and of greatest challenge to architectural designers? The paper contributes an educational perspective for cultivating debate in an area of structural design education that is rarely discussed explicitly, and in which precedent literature is scarce. The paper is particularly relevant in the context of China, where bridge design is still mostly seen as an exercise in material and cost efficiency, with few precedents integrating architectural and engineering concerns to a notable degree.

Keywords: education; conceptual design; integration; architectural design; team working

1. Pedestrian Bridge Design Education in the Context of China

Pedestrian Bridge design is still a relatively new subject for the architectural profession globally and of growing importance not only in the developed Western world, but particularly in the large and increasingly dense urban environments of China. While the constantly growing Chinese megacities are steadily increasing the overall quality of their urban environments, the great potential for improvement in the rethinking of pedestrian crossings has not been realized yet. Chinese pedestrian bridge design remains under the exclusive purview of governmental transportation engineering departments who primarily aim for efficient use of resources. While several very recent pedestrian bridges in China have demonstrated innovative design strategies [1], a closer look shows that most of them were designed under the leadership of overseas designers.

Given this local background, the proposed paper documents the introduction of pedestrian bridge design into a structural design module in Year 3 of the BEng Architecture degree programme at Xi'an Jiaotong-Liverpool University (XJTLU). The paper analyses and discusses the development of the module's learning and teaching approach in order to cultivate debate on an issue that is often overlooked in architectural as well as engineering education. Core aspects of the pedagogy introduced include explicit discussion of the integration of architectural and structural conceptual design, conceptual design strategies, site visits, feedback from external professionals of both architectural and engineering disciplines, team working and design competitions [2]. While pedestrian bridge designs resulting from the module are constrained in scope by the limited duration of the module, students have reacted enthusiastically to this new type of design task despite the challenge it presents to undergraduate students in the second year of their subject studies. From the educator's viewpoint, the main aim of the module lies not in the design of one particular bridge. Instead, what is cultivated in students is a new perspective on pedestrian bridges as opportunities for innovation and creative experimentation. The module emphasizes the cross-disciplinary nature of pedestrian bridge design

and prepares students for collaborations among teams of future professionals by clearly outlining differences and similarities between approaches to conceptual structural design [3] and related professional ethics of architects and structural engineers respectively.

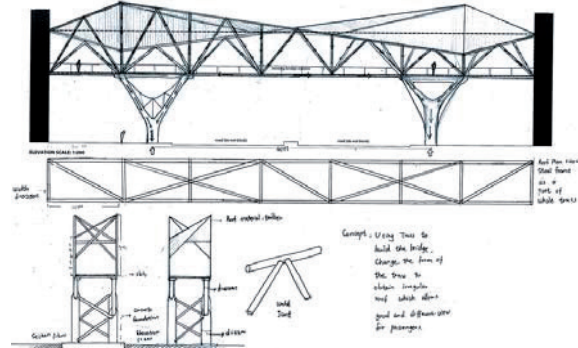


Fig. 1. Structural Design Pedagogy at XJTLU in a BEng Architecture Year 3 a) Freestyle Bridge Competition in progress, b) Pedestrian bridge across a major road designed by undergraduate architecture student

2. Towards a Discourse of Pedestrian Bridge Design Education

Based on the analysis of data collected over five years of teaching pedestrian bridge design, several findings are made in response to the questions outlined above, and summarised here in brief.

How do architects approach bridge design? Architects tend to approach bridge design visually and to a large extent through visual memories of case studies. Initial design ideas are almost always based on spatial and formal inspirations, and rarely derived from structural principles taught in class.

How can bridge design be taught as a subject in architecture? Taking up architecture students' specific learning approach, teaching focuses strongly on visual learning, the study of proportion and balance and discussion of case studies. This approach can be described as teaching students to 'see structurally', to encourage and support visual perception of structural elegance that can be integrated into students' 'architectural seeing'. In this way, structural design concerns can be merged with aesthetic concerns.

Which aspects of bridge design are of greatest interest and of greatest challenge to architectural designers? Architecture students tend to engage in rational analysis only after the main conceptual design decisions have already been made. In this context, it seems most appropriate to encourage design development through physical model making, thus allowing design constraints deriving from material and gravity to enter early into conceptual design decision making.

3. References

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