



Thinking critically about structural engineering through role-playing games

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Abstract

Education plays a major role in the development of a sustainable environment. Therefore, structural engineering education should pay considerable attention to the technical aspects, but it should also try to build a more sensitive general public and engineering profession that values sensible and exceptional designs.

This paper presents two experiences developed at Princeton University (US) and at the Universitat Politècnica de València (Spain) aimed to build critical thinking. In these experiences, the students analysed critically the suitability of two bridges (the Streicker Bridge by C. Menn and HNT, and the Assut de l'Or Bridge by S. Calatrava) based on the ideas of Structural Art. To do so, a debate was held with one group of students supporting a specific bridge design, a second one arguing against it and a third one playing the role of the judges to determine the final verdict. The paper provides the details of the organization of the debates as well as evidences of the success of the approach.

Keywords: education; Structural Art; structural criticism; critical thinking; role-playing game; C. Menn; S. Calatrava.

1 Introduction

Structural Art was formally defined by Professor David Billington in his book "The Tower and the Bridge. The New Art of Structural Engineering" [1]. According to Billington, the best works of structural engineering such as the Maria Pia Viaduct (see Fig. 1) become works of Structural Art when they meet the ideals of economy, efficiency and elegance. Economy is the analysis of the costs

of the structure as compared with the usefulness of the forms by the society. Economy is related to the preservation of public and private money and constitutes the social dimension of the structure. Efficiency is the scientific dimension of the structure and means the making of safe and durable structures with the minimum amount of materials. It is related to the preservation of natural resources. Finally, elegance refers to the search of the maximum aesthetic expression