



Introducing Modern Teaching into a Classic Course on Structural Art

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Abstract

This paper illustrates how a classic course on structural engineering can be enhanced with modern teaching methods (active learning exercises) to enhance a student's comprehension. The course emphasizes that design creativity involves both discipline and play, where discipline is related to 'technical skills' and play is related to 'soft skills' such as aesthetic sensitivity. The modern enhancements reinforce this concept and also retain a student's comprehension of the subject.

Keywords: structural art, active learning, teaching, pedagogy, creativity, design

1 Introduction

One of the most classic courses at Princeton University is one that argues that the best designed structures (bridges, buildings, and shells) are a work of art – structural art. The argument and course was founded by Professor Emeritus David Billington in the 1970s. The course illustrates how the best designers sought to integrate elegance and efficiency rather than superimpose one on the other. It teaches that engineering design involves both discipline and play, where discipline is related to 'technical skills' and play is related to creative and aesthetic exploration.

Structural art has been taught at Princeton University mostly in a traditional style where the lecturer speaks for 50 minutes without interruption. Most of us would be challenged to hold the student's attention for this long, especially when competing for attention with students' various personal electronic devices. Further, recent pedagogical research shows that interacting with the students during lecture (active learning) improves student attitudes and leads to a higher level of knowledge acquisition.

This paper shows how this classic course on Structural Art is being taught today with modern 'active-learning' activities embedded in the lectures. New technologies, such as internet polling, are being used. Short physical experiments, with simple accessible materials, are also being conducted by the students during lectures. The content and message of the course has not changed, and the lectures are still being delivered, but while engaging the student in active-learning activities.

2 Examples of Active Learning

The rest of this paper demonstrates only two of the active learning exercises that have been incorporated into the traditional course. More information can be found in [1]. A recent NSF grant has made it possible to disseminate all lectures and descriptions of active learning activities through a website that is under development: <http://www.teachstructuralart.org>

2.1 Reinforced Concrete

The structural art course is taught to all students, not only engineers. In fact, >75% of the students are not engineers. To learn about the genius of