IMPLEMENTATION OF “STRUCTURES AND THE URBAN ENVIRONMENT” AT SMITH COLLEGE:
DEVELOPMENT OF A DIGITAL IMAGE DATABASE

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INTRODUCTION

In 1999, Smith College positioned itself as a leader in engineering education by establishing the Picker Engineering Program. The first engineering program at an all-women’s college, the Picker Program was motivated by a growing sentiment articulated by former President Ruth Simmons, “Engineers literally design and build much of the human environment. Women must not accept so marginal a role in so important a field.” The program offers a course of study leading to a Bachelor of Science degree in engineering science, and the first class of twenty engineers graduated in June 2004. The program is notable for its integration of the liberal arts with the technical rigor of engineering, as expressed by the program’s vision:

Smith’s Picker Engineering Program will be an exemplary program of national stature, emphasizing a unity of knowledge across all disciplines. The program will be marked by faculty excellence and innovation in both scholarship and engineering education, with an emphasis on students’ active participation in the learning process. Graduates will be confident and creative women who bridge the traditional boundaries between the sciences and humanities as leaders in both the profession of engineering and in society as a whole. As critical thinkers and socially responsible decision-makers, they will help to engineer a sustainable future for the global community.

In support of this vision, William Wulf, the President of the National Academy of Engineering stated, “Smith College is a pioneer in the diversification movement – helping us not only diversify our ethnic and gender representation, but also diversify the intellect of the individual engineer through a broad and rigorous education.”

A course like Professor David Billington’s CIV 262: Structures and the Urban Environment finds a natural home in such a program, and I have taught my version, EGR 101: Structures and the Built Environment, at Smith since 2001. Drawing on our common visual experiences with bridges, towers, and long-span roofs, images are used to explain the scientific meaning and symbolic importance of significant engineering works. Following the evolution of ideas and materials, EGR 101 introduces students to the interpretation of common landmarks such as the Brooklyn Bridge and Eiffel Tower along with lesser known works such Robert Maillart’s Schwandbach Bridge and Felix Candela’s Xochimilco restaurant. Designed for a general audience, this course attracts students from a range of disciplines: from first-year French majors to sophomore engineers to senior chemistry majors. This interdisciplinary mix creates a richness that greatly enhances the value of the course. The history major provides insight to the impacts of the Spanish Civil War on structural designers, while the engineer helps to explain the bending moment that arises from wind effects, and the visual nature of the course provides a common experience that connects all students.

USE OF INSIGHT® FOR IMAGES OF STRUCTURAL ART AT SMITH COLLEGE

Upon completion of my EGR 101 course at Smith, I expect that each student will come away with

1. a firm understanding of the scientific principles underlying the conceptual design of structures
2. an expanded vocabulary, including precise definitions of the following terms: force, stress, moment, load, column, cantilever, arch, cable, beam, etc.
3. a working knowledge of a canon of structures, which are presented over the course of the semester
4. a clear and compelling term paper that addresses the scientific, social and symbolic components of a structure of interest
5. an ability to interpret structures with respect to their efficiency, economy, and elegance

These outcomes are achieved through lectures, in-class demonstrations, structural design case studies, and an individual research paper and presentation. In addition to my evaluation of the research paper, the outcomes are assessed via a midterm exam (which focuses on outcomes one and two) and a final exam (which focuses on outcomes three and five).

Images have been critical to the success of EGR 101; the visual display of bridges and structures tie together all components of the course. Unfortunately, the use of 35 mm slides has some limitations: images are static, annotations
are not possible, and the images are not available to students outside of the lecture. These drawbacks are eliminated if the images are converted from analog to digital format. Luna Imaging, Inc.’s Insight® (http://www.lunaimaging.com/insight) is software for digital image management and delivery. Images and their associated metadata (creator, location, date, material, etc.) are stored in a relational database, which enables easy searching and organization. Insight® also enables the user to build presentations with multiple images, notes, links, and zoom capability. By creating specific groups of images, faculty can provide an easy means for students to preview or review images shown in lecture. Insight has been adopted by a number of colleges and universities, including Smith College, Brown, Cornell, Duke, Stanford, and Yale.

I anticipate that the integrated use of Insight® in my class will have an immediate impact on the lectures, term paper, and final exam. Since the images are stored in an on-line database, one has the capability to allow access to the images and lectures to multiple users from various locations around campus at all times. Additionally, using the presentation tool enables me to zoom in and out on images in real time, and multiple images can be displayed in the same window (see Figure 1). Annotations can be added to the images (see Figure 2), and the metadata associated with a particular structure can be recalled with a click of the mouse (see Figure 3).

![Figure 1: Insight® presentation view showing how an image can be paired with a detail.](image-url)
Figure 2: Images can be annotated with notes pertaining to the scientific, social, and symbolic aspects of the structure.

Figure 3: Metadata can be accessed with the click of the mouse.

In addition to enhancing the lecture component of EGR 101, Insight® will also aid students as they prepare their term papers. One important component of the paper is an aesthetic comparison of the structure in question with other similar structures. At Smith, Insight® provides access to a number of image libraries, and students will be able to search a vast number of images to find structures for visual comparison.

My final exam requires students to identify, discuss, compare, and contrast works of structural art with respect to their efficiency, economy, and elegance. In past offerings of this course, students have commented that while we spend time in class discussing these points, they would like more opportunities to practice these analyses and comparisons on their own. With Insight®, I intend to create homework assignments that mimic the kinds of questions I expect the students to
be able to answer on the final exam. For example, I may create a small group of images, such as of Maillart’s Stauffacher, Zuoz, and Tavanasa Bridges, and ask the students to compare and contrast them and discuss the validity of each as a work of structural art.

3 DISSEMINATION

Another significant advantage of digital images is their easy transferability. We at Smith are very interested in making our database of images and metadata available to other users. Before doing so, however, there are a few logistical questions to be worked out. First, how best to share the images? Second, who should get access? Third, how will this image collection grow and evolve, and who will ultimately be responsible for its maintenance? The first question is one that is being worked out by the staff at the Smith College Imaging Center. The second question is not so straightforward. The real value of the images from CIV 262 is in the way they have been woven together through David Billington’s rich narratives. Without the organization and thoughtfulness of the lectures, the value of the images drops considerably. Therefore, it seems unwise to make the images available without a corresponding commitment to the lecture notes. I intend to work with Prof. David Billington to find a suitable answer to this question. Lastly, if others are interested in not only sharing the images from CIV 262, but also continuing to develop new lecture and image materials that could be used in a similar course, there will be a need for maintenance and management of these materials. It is worth keeping this issue in mind as we move forward.

4 CONCLUSION

The visual nature of structural art compels the use of images to explain the scientific, social, and symbolic themes of the course, and Insight® provides a powerful tool for managing, editing, and disseminating digital images. Use of this tool will enhance EGR 101 at Smith and has the potential to lead to beneficial collaborations among faculty offering similar courses.

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