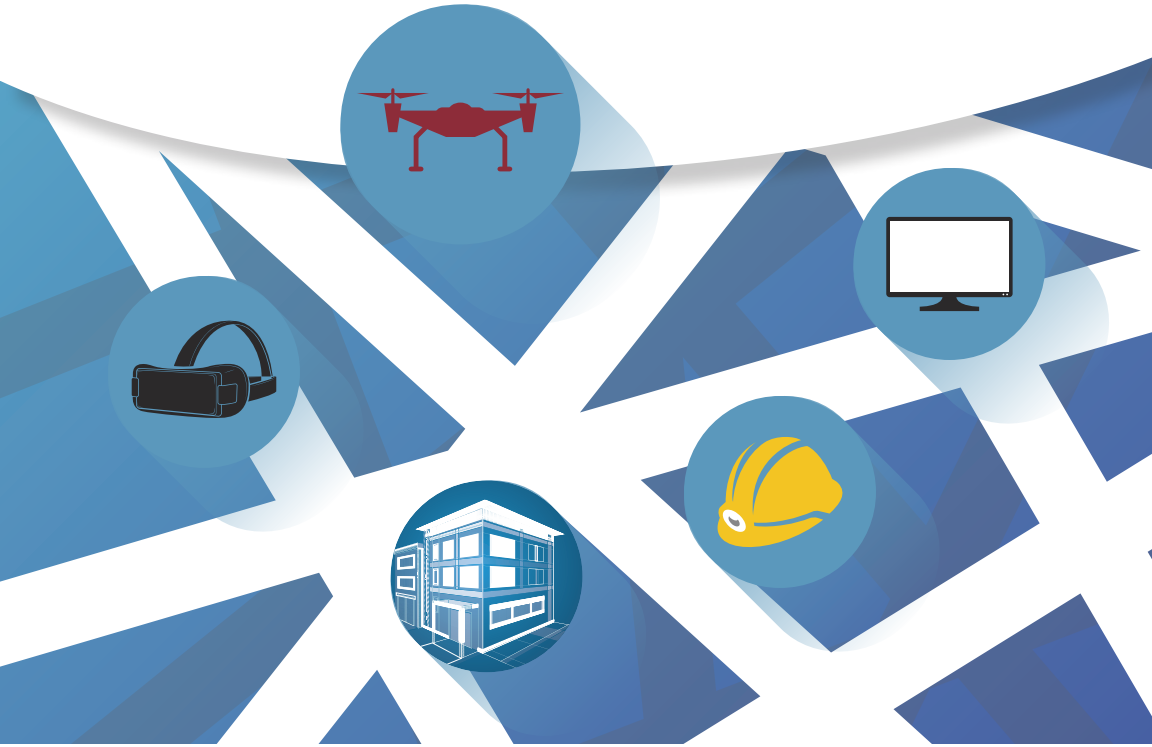
# Transforming Engineering Education

## Innovative, Computer-Mediated Learning Technologies



Edited by **Ivan Mutis**
**Renate Fruchter**
**Carol Menassa**



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## *Innovative Computer-Mediated Learning Technologies*

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# Contents

# Preface

It is with great pleasure that we present to the community this publication on transforming engineering education. The editors envision this document as a foundation for the movement toward transforming engineering education—a continuous effort where participating scholars steer advancements in the use of innovated, computer-mediated learning technologies in engineering education. We invite readers to be champions of this transformation by implementing the theories, technologies, and approaches presented in this publication to broadly and highly impact future generations of engineering students.

Through an international call, the editors surveyed the work of scholars, researchers, and scientists around the world to consolidate their knowledge about advances in the use of information technologies in civil engineering education. Each contribution— and there were many—was put through a rigorous blind peer review. We would like to thank all contributors and reviewers for their cooperation in this effort and their commitment to assisting us in making this publication reach the highest quality. The result of this endeavor is the 10 chapters published in this edition.

Ivan Mutis
Renate Fruchter
Carol C. Menassa
*Editors*

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# CHAPTER 1

# Introduction

Ivan Mutis*

With the intent of positively influencing and inspiring future studies, this publication addresses challenges related to securing new knowledge about learning and its implementation.

The contributing authors present technology applications that have made critical and far-reaching improvements in learning outcomes, including their alignment with curriculums. They also include discussions of instruction and assessment. The contributions also embrace new fundamentals in learning, based on research on foundational knowledge, that can be used to implement new forms of learning in engineering education, particularly in the field of civil engineering.

The contributing authors were asked to address the following research questions when developing their chapters, each of which was strategically chosen by the Editors to help showcase three main components of this publication: foundational understanding of learning and education in civil and construction engineering and management, advances in BIM curriculum, and augmented and virtual reality applications.

- How does the mediated learning technology improve instructional practice?
- How does the technology innovation promote new opportunities for learning?
- How does the mediated technology enhance, develop, and create new approaches to teaching practices?
- How does the innovation impact a program, curriculum, or course?
- Does the intervention have any assessments or metrics that demonstrate its validity for learning and instructional practice?
- How does the mediated learning technology lead to the formulation of new questions that would enhance our foundational understanding of learning or education?

The resulting contributions and approaches recognize the dynamic and evolving landscape of the fields of civil engineering and construction engineering

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and management. A thread common to each of these studies is the realization of new and creative uses of technologies in formal and informal learning environments. Having explored technologies that range from augmented reality to virtual reality, virtual rooms and avatars, the contributing authors strive to understand these rapidly changing technologies and determine how they respond to the needs of learners. The goal of each of individual study is to use these technologies to enable critical and far-reaching improvements in learning outcomes in engineering education.

With this publication, the Editors foresee even greater growth in our communal knowledge of computer-mediated learning technologies. We challenge our readers and our community of scholars to incorporate the innovations to transform current educational practices into new pedagogical experiences. We anticipate that these contributions will serve as ideal steering mechanisms to enhance future use of technologies in engineering education.

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