# Digital Technology: Building Pedagogical Bridges Between Secondary and Higher Education with a Focus on Architectural Engineering Technology

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Abstract

Digital technology is rapidly changing the way teachers teach throughout academia. The effect of technology on teaching falls into three areas:

- How traditional subjects and methods are affected by technology
- How technology provides new ways of teaching and learning
- New curriculum developed directly attributed to technology

This is a continuation of research, dialogue and collaboration by the author with a local school district on this issue as well as the evolution of technology inclusion in the AET program at the University of Hartford. The collaboration, advanced study and research provide a better understanding for the critical need to build curricula and pedagogical bridges with K-12 school districts.

## Introduction

### The Technology Influence

There are three ways that technology has influenced curriculum and instruction: *Curriculum Supplement*, *Curriculum Enhancement* and *Curriculum Specific to Technology*. These influence all levels of education whether at the K-12 level or in higher education. The level at which they influence and the depth of the instruction necessary to respond to the influence, however, varies greatly as one progresses from K-12 through higher education. A brief description is required to provide a framework to review the transitional effect of these influences between K-12 and college environments.

*Curriculum Supplement*: Technology has already had a significant impact in this area. Technology supplements current and traditional curriculum in such technical subjects as statics, structural

design, contract documents (working drawings) and mechanical systems. Its enhancements revolve around the application of programs to re-present information in new ways.
In this scenario the technology is used to *supplement* the teaching and learning of information that, prior to technology, was done using manual techniques. Technology is improving the delivery process but is not extending the knowledge base nor changing the pedagogy. It is helping, but not enhancing.

*Curriculum Enhancement*: Here, technology provides new ways of illustrating current curriculum and takes the curriculum further in the process. The technical subjects are very much the same – statics, structural design, contract documents (working drawings) and mechanical systems. In this case, however, the re-presentation of information is also reformatted and enhanced.

*Curriculum Specific to Technology* : This is the new area of focus even in instances where technology has been incorporated for a significant time period. Due to the ever evolving, ever changing nature of technology, there are new technology-specific curriculum topics on a regular basis. The curriculum must address this.

Illustration 1, found on the next page, is a synopsis of the above arguments.

Illustration 1: Three Alternative Paradigm Scenarios of Curriculum, Pedagogy and Technology

**(1) Supplement Curriculum Paradigm:**

TECHNOLOGY CURRICULUM

Traditional Learning
- Drafting
- Writing
- Math/Physics

Technology used to SUPPLEMENT teaching/learning
Supplemental to Traditional Pedagogy

**(2) Enhancing Curriculum Paradigm:**

CURRICULUM TECHNOLOGY

ENHANCING Curriculum
- Data base management
- Multi-media presentations
- Interactive documents

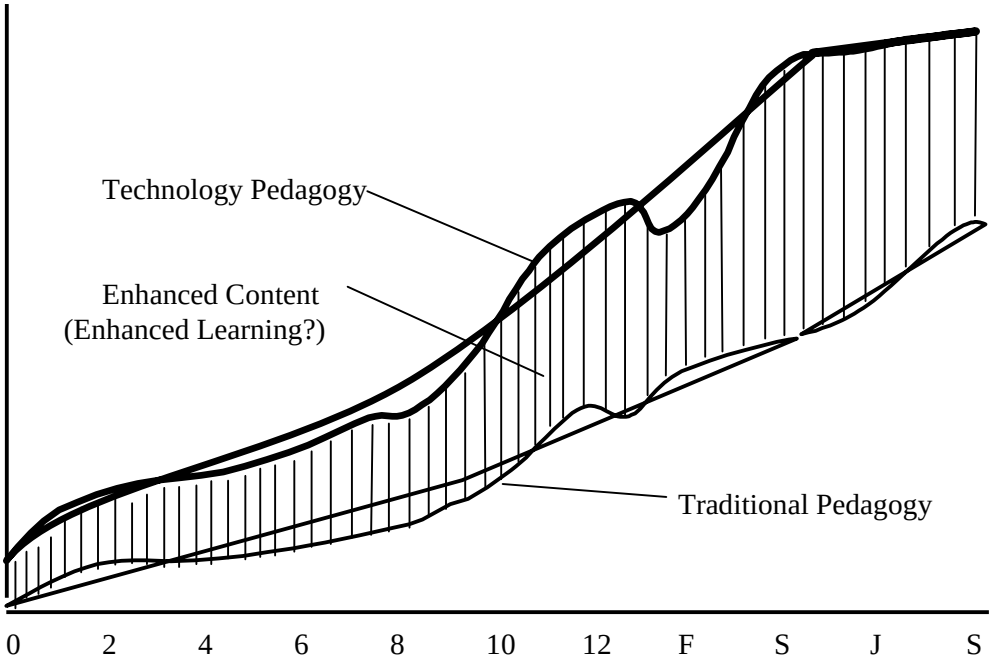
New curriculum due to the presence of technology

New Pedagogy required to integrate curriculum and technology

**(3) Parallel Paradigm – Additional Curricula – Pedagogy of Technology:**

TECHNOLOGY ADDITIONAL Curricula
- Hardware
- Software
- Input/Output devices
- Internet

Pedagogy of Technology
Skills required due to technology • Interface
Specific "technology-tasks"



Time (Grade Levels)

Influences on Technology Curriculum and Pedagogy

There are six primary influences on the effective use of technology, the appropriate effective pedagogical decisions and the K-12 connection. These are, in no particular order,:

1. *The K-12 base knowledge and skills*: What do the incoming students have in the way of useable knowledge and appropriate skills from their first twelve years? Are there deficiencies? There are bound to be discrepancies and disparities between students. How do we address this inequality without hindering the curriculum?
2. *Technology Resources*: Do we have the appropriate hardware, software and training to effectively use the technology? How do our systems compare with those used by K-12 students?
3. *Project Structure*: Can we update curriculum to take full advantages of new learning opportunities or is the change so dramatic we need to start from scratch? Can we develop dialogue with K-12 educators to better coordinate those aspects of their curriculum with the needs and requirements of higher education?
4. *Curriculum Linking*: The curriculum must become more seamlessly linked throughout the education process in order to take full advantage of the potential of technology. How can this be done? What are the steps? What are the priorities? This process could start by developing a curriculum map of current courses, faculty assignments, goals and resources. The process needs to start at the beginning: the bridging the K-12 and higher education gap.
5. *Students Assessment:* With more work being done electronically, how do we adjust the assessment tools and the assessment process? The learning process becomes more complicated and the assessment process must be capable of accurately and effectively showing the level of comprehension. We need to help educate the K-12 educators in the use of portfolio assessment. Many districts are implementing this new, and to some educators, confusing and strange assessment tool and method. Architects and architectural students have used this method since the profession established itself. We need to assist those in the K-12 grades to gain the understanding and methodology of portfolio development and assessment.
6. *Goals and Vision:* We must develop compatible goals and visions to help faculty understand the process and desired outcomes as well as providing a clear and attainable set of goals for students currently within the program and those considering this program of study.

Pedagogical, Curricular and Professional Links

Links can and must be developed between the K-12 environment, including curriculum, pedagogy and assessment, to:

1. smooth the transition, culturally and technologically, between secondary education and higher education;
2. create a professional connection between K-12 educators and those in higher education;
3. create a connection between students in K-12 and between K-12 students and students in higher education.

In my school district the superintendent created a technology committee under the support of the Board of Education. His first goal was to have the committee composed of parents, educators, technologists and administrators. He succeeded with a diverse yet harmonious committee. His second goal was to have the committee take a close look at:

- *what is technology with respect to K-12 education?* Even though our district covers K-6 his desire was to look at the total picture. By understanding the role of technology at the upper grades one could then back down the grade ladder and develop an approach to technology inclusion in K-6.
- *how could and should technology be incorporated in the K-6 curriculum?*
- *when should this inclusion be introduced and when should it be developed?*

As one member of the Technology Committee, I wanted to have technology thought of as not just a tool to help students learn (if indeed that was a given fact that it could do this…) but look at the broader understanding of the role of technology in society. By shaping this understanding and shaping our approach we would be developing curriculum and pedagogy for the long-range picture. It's the difference between *training* and *education* – training provides instruction on one subject while education provides an *approach* to learning that can be applied to *anything*. We strive to do this in education, we should strive for the same when dealing with technology. This approach will give students in K-12 the foundation for any dealings with technology.

The Approach in Relationship to AET

The specific needs of the AET program reflect back on the transition between grades 9-12 with primary focus on grades 11-12. The courses covered during this time should be leading students to a direct transition to a program of study in an institution of higher learning. Technology's primary effect has been on the sciences and CAD and these are areas that we need to concentrate on to improve the transition.

Conclusion

One fact remains constant regarding the use of technology in education: it will always be changing. By recognizing that the effect of technology on curriculum can be categorized into the above three

influences, we can begin to address the issues more directly. Our primary goal, indeed our mission, is to prepare our students for the profession and for living in a technological world. Developing a set of professional skills, specific to their discipline, will provide a base for their success in their chosen discipline. However, we must also engage them in a commitment to understand the external factors, tangential to their profession, which impact their ability to succeed. Technology is prime among many external factors and its influence on students begins well before we have them as students. It begins with the initial introduction and integration of technology in the K-12 curriculum. When we create linkages with the students, educators and parents of K-12 age students we can better prepare them for the challenges of higher education. We can also make a significant impact on our ability to assimilate the post-secondary students into the focused architectural education they will face throughout their University life and beyond.

Bibliography

1. Boyer, Ernest L. and Mitgang, Lee D., ***Building Community: A New Future for Architecture Education and Practice,*** The Carnegie Foundation for the Advancement of Teaching, 1996
2. DeStafano, James R., Van Hook, Mary Ann and Draht, Sally, *The Future Connection*, American School and University, January 2000
3. Gates, William H. III, *The Road Ahead*, Viking Press, 1995
4. Gross, Martin, *The Conspiracy of Ignorance*, HarperCollins Publishers, 1999
5. Healy, Jane M., *Failure to Connect*, Simon and Schuster, 1998
6. Kennedy, Mike and Agron, Joe, *Bridging the Digital Divide*, American School and University, October 1999
7. URL: http://www.

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