Do Today's Learning Aptitudes Have to be Digital/Technology-Based?

When discussing the notion of design through the process of architectural education, previously, many techniques professed by the Ecole des Beaux-Arts were demonstrated without the use of advanced technologies and computer support. The argument is not should schools venture towards only digital or only analog but rather how to mix the methods to provide a stronger balance of knowledge. As educators, we should consider what role hands-on making, manipulating, testing and understanding have in the computer-age classroom/design studio. Have new technologies changed the way we teach and learn the basics of natural systems, craft, materiality, and physical or spatial perceptions, etc.?

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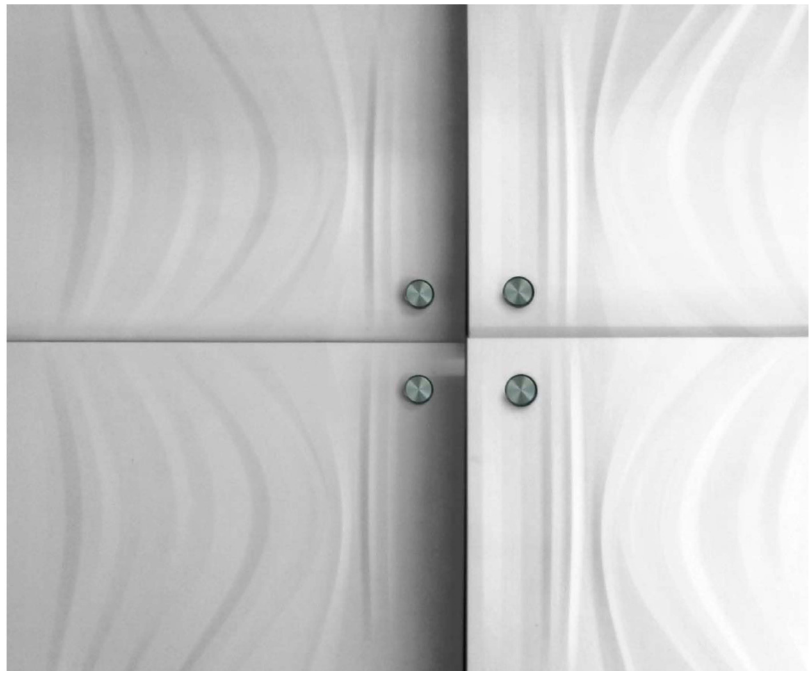
This paper starts with questioning teaching effectiveness by considering "do digital technologies make low-tech, hands-on activities and manipulatives outdated?" If the answer is no, then are there benefits to incorporating both high-tech and low-tech methods? We have to wonder what questions we should be asking ourselves when making decisions about effective integration of technology and hands-on activities in the architecture design studio!

HIGH-TECH VS. LOW-TECH

An unpublished study out of the UCLA Teacher Education Program on high-tech versus low-tech teaching in the urban classroom shows increased student engagement with high-tech teaching strategies. However, the project results also show an equal understanding of the content between both strategies. The project continues by implying that teachers who primarily use low-tech strategies are more able to present information in multiple ways, enabling students who possess less logical and mathematical or spatial intelligence to benefit from the presentation of information in various formats such as white- and black-board lectures.

Likewise, simulations versus hands-on activities have been considered. Simulations are less costly and time consuming than hands-on due to the volume of participants able to perform activities simultaneously. A study by G.Baxter[1] mentions that computers offer better opportunities for students to access the content, because it "provides an open-ended,unconstrained environment for ... investigations." However, in design thinking, the limited volume of available information is not always the issue. Often, we see the repetitive process and various ways of problem solving benefitting the students most.

1 

The purpose of this paper is to compare and evaluate examples of learning exercises, teaching methods, and tools. With the ever increasing abilities of the computer and software, students are often left relying on digital output rather than the manual process of achieving a desired solution. Calculating sun angles, developing compound curves, selecting materiality and understanding accessibility have now been reduced to the click of a mouse and have removed students from hands-on exercises that previously fully immersed them in the design experience.

The process of laser cut models, 3-D printing, CNC fabrication, and animation/rendered graphics is often preferred by the students and can be a very strong supplement to the long-hand method of basic material manipulations. This paper does not argue against the computer, but rather for the fundamental tools and methods that demonstrate effective integration of technology into hands-on activities. Architectural design and technology professors contribute with suggestions for the future of this hybrid teaching/learning process.

CONCLUSIONS

Evidence from this collective teaching and learning process is demonstrated through student work in the Craft and Tectonics (design/make) studio. Project outputs include handcrafted and digital outputs, large and small. Evidence through pre-tests and post-tests comparing lecture topics on construction material to physical hands-on material investigation concludes the interactive experience was much more successful.

Figure 1: CNC Routed Corian Panel. (Brian Ziff)

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Figure 2: Columns & Beam Display (ARCH728)

Figure 3: Beam Construction

Figure 4: Laser Cutting Materials

Figure 5 Hand Manipulating Corian Materials

ENDNOTE

1. Baxter, G. P. (1995). Using computer simulations to assess hands-on science learning.*Journal of Science Education and Technology*, 4(1), 21-28.