Medium-Based Design: Supporting Bricoleur Designers
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AudioExplorer

Designing systems that foster significant inquiry, enable meaningful artifact construction, and encourage useful interaction is fundamental to the field of learning sciences. In education, these types of environments have a substantial history going back to Fröbel’s gifts and Montessori’s prepared environment. We put forth a design method, medium-based design, to create such systems. We do not believe that MBD is a completely new approach to designing learning environments. Rather, we believe that designers have intuitively used similar methods, and that, by describing details of medium-based design and providing guidelines that follow this approach, we are showing support and value for this approach. Although other methods are effective in designing learning environments, these have concentrated on a top-down approach, neglecting the bricoleur designer. The bricoleur style of design values the concrete; the bricoleur explores concrete artifacts and builds the design up from there. Our method, MBD, is a well-formed method grounded in theory that offers designers an alternative approach to designing learning environments.

MBD starts with a medium that seems to address important learning goals. Next, the affordances of that medium for achieving those and other learning goals are explored. Then, MBD proceeds by investigating the environmental needs and social context necessary for making those affordances recognizable and graspable. Finally, appropriate tools are built to accommodate different learning goals. In a conventional approach, it is important to first clarify and investigate an important problem. Because MBD is bottom-up, this proves problematic. The designer may find that the chosen medium actually supports learning goals that are substantially different than that first intuition. Therefore, in MBD, it is important to first clarify and investigate the solution—the medium. Solving an important learning problem is still essential to the goals of MBD, but that does not necessitate that the method focus on the problem initially.

Yet to be determined was what else this inquiry tool could be used for or how, where, and if it would be usable in a learning setting. Based on a suggestion from a fellow student, the possibility for using the system to investigate the differences between instruments was researched and proved viable. In this way, AudioExplorer became a system that linked multiple representations of the sound input. Because the analysis tools (that showed the exact frequency) proved extraneous for this task, two became a system that linked multiple representations of the sound input. Because the knowledge of signal processing, Rick knew that AudioExplorer could demonstrate the relationship between the linear (harmonics have frequencies that are integral multiples of the fundamental) and exponential (frequency of the fundamental increases exponentially with each octave) properties of harmonic sound (as can be found in music). Yet, it was not clear how learners would use the system.

Creating a tool that the designer can use to demonstrate the learning concepts might be a necessary first step, but it does not complete a learning system. Others would have to be able to engage the system in a useful way. To test out how others could engage the system, Rick, inspired by Schön’s concept of reflection in action, conducted informal user testing. He sat down with several people and showed them the system; letting them play around and helping them when necessary. In the end, this format proved awkward. Users were more interested in Rick demonstrating the concepts than in being guided in figuring out for themselves. Yet, it showed that only a little bit of appropriate guidance was necessary to allow users to engage the system.

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