

# **Materials and Digital Representation**

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## **1 Introduction**

The ability to make use of digital technologies has become second nature to young adults today. Unlike their middle-aged teachers, most recent students remember doodling on the computer as part of their kindergarten experience. These students, familiar with the digital techniques of drawing, erasing, and painting since childhood, can all explore new software playfully, quickly and with great ease.

This is in strong contrast to the poor knowledge of regulatory issues and construction techniques among students in undergraduate courses. Very few students have carried out activities such as working with concrete in their families' back yards and standard construction formulae well known to earlier generations of students, such as the 1:2:3 ratio mix of cement, sand and gravel, are unfamiliar to them.

In an attempt to address this situation the author – teaching in the traditional field of “Construction Materials and their Application in Landscape Design” at a Canadian university – is experimenting with basic concepts of both construction detailing and computer aided design. Student reflection on the inherent sensuous and vibrant qualities of materials and their digital representation plays a key role in this experiment.

## **2 Material Collection**

When working at the interface between conceptual design and detailed design it is essential to be responsive to materials, textures, colours, light etc. “Over the past decade ... many universities have built up material collections to provide students with access to material samples” (JOST, 2011, 126). Students “can touch materials, see how they react to light, examine their surfaces, and learn how certain materials might work in combination” (JOST, 2011, 124). Of course there is nothing like having the physical materials on hand, but as long as there are limitations on the establishment of a significant collection of real samples a digital material library can act as an effective substitute for hands-on learning to a significant degree.

## **3 Field trips as Source**

The author's course starts with research in the field. Trips to nurseries, quarries, lumber yards, and urban sites support lectures about materials in a demonstrative way and are themed “walk, observe and understand” (Fig. 1). These trips serve as a source of knowledge for students and also allow them to start developing an appreciation of the range

of materials used in construction today, such as natural stone, concrete, brick, asphalt, wood, plants, metal and water.



**Fig. 1:** Students attending field trip “Lawn and Meadow”



**Fig. 2:** Field trip journal “Lawn and Meadow” by student Nathan McLeod

## 4 Digital Material Library

When asked to collate impressions students do not carry back samples from the field but create image-based, archetypical textures by hand or by camera and store them digitally. The graphic work of the book “Miniature and Panorama” (VOGT 2006) serves as the inspiration for setting up and laying out the collected pictures. Field trip journals (Fig. 2), a written summary of the main characteristics of each material and a collection of precedents showing best practice are appended to the digital images. Students can then begin to build up a personalized library showing a wide range of materials, their manufacture and application in landscape design. By starting a digital material library in the early stages of their careers students can create an indispensable archive, which can be added to and developed as they go through their professional lives. This library will ultimately be as unique as a student’s own handwriting (Fig. 3).

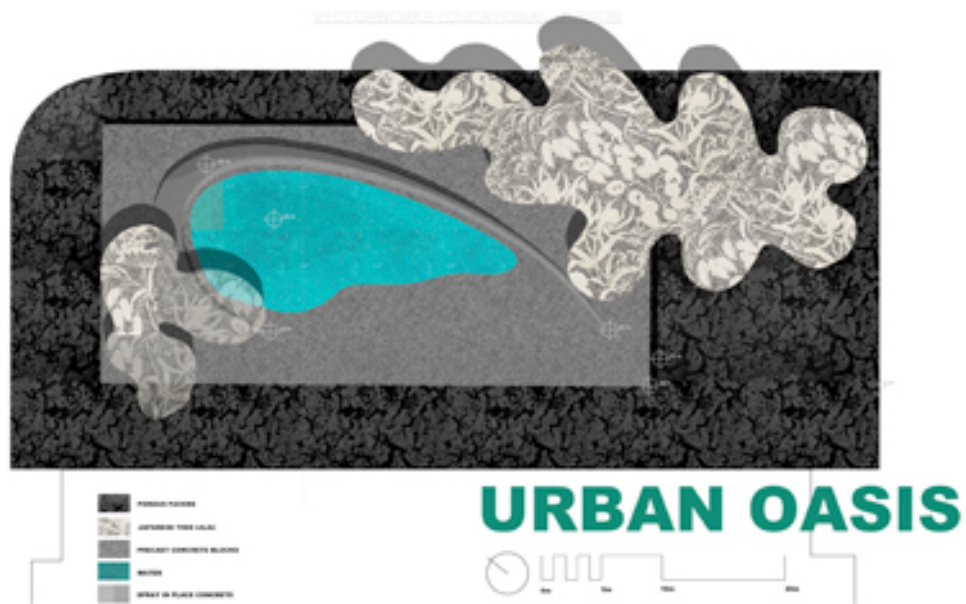


**Fig. 3:** Stone samples of the Material Library by student Bing Wang  
Lawn, plant, soil samples of the Material Library by student Bret Mack

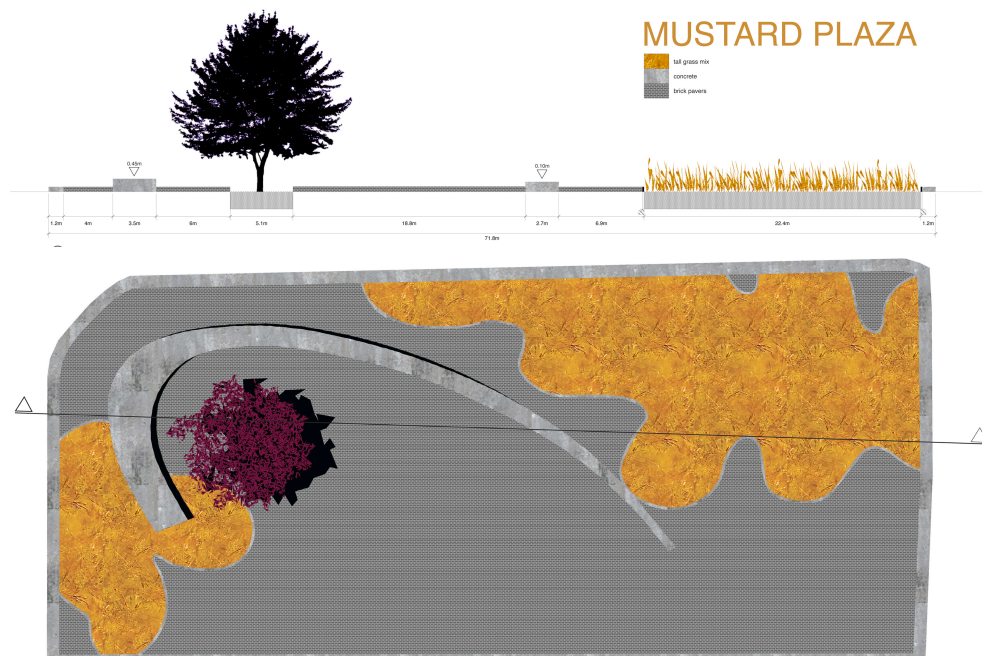
## 5 Material Rendering

The CAD software product Vectorworks, together with the fully integrated Renderworks developed by Nemetschek AG, allows easy interaction of CAD drawing with image-based textures from file formats such as TIF, JPG, GIF and BMP. This system is well known among professionals in Europe for its presentation capabilities in all phases of the design process, but is less developed in other parts of the world. Imported bitmap images can be





**Fig. 4:** Material Plan by student Carly Moore, based on a plaza design of Tedder Timmermanns, landscape architects



**Fig. 5:** Material Plan by student Patrick Oystryk, based on a plaza design of Tedder Timmermanns, landscape architects



applied to vector based graphics and subsequently repeated, reshaped and rendered in real time. The 3D modelling program SketchUp supports similar rendering possibilities and has found the way into many design offices worldwide. Anyone who ever spent time in the pre-digital era placing Letratone sheets by hand on manual drawings will understand the importance of these revolutionary software developments. Switching back and forth between basic CAD layouts and rendered drawings is now easily done so it is remarkable that Vectorworks unlike SketchUp is still playing a secondary role within professional CAD applications in Canada.

Rather than comparing and evaluating programmes this paper aims to discuss teaching experience in depth from an expert's view. The author has been using Vectorworks for more than 13 years. But no hindsight is required either to appreciate the high value of an organized digital library using Vectorworks or to learn the application of materials. Following the first assignment students are asked to develop a rendered Vectorworks plan using their digital material collections. Since more than 30 students register in this course, it is not possible to explore detailing issues throughout a design process. Therefore a sketch design done by professionals is placed at the student's disposal for reference purposes. On the basis of this provided concept the students work out a material proposal (Fig. 5) and some construction details (Fig. 6). The final assignment in the course enhances knowledge about materials and their application and activates graphical experiments. This procedure also reflects a situation that is common in design offices as in most cases the responsibility for design and construction detailing is distributed amongst several people.

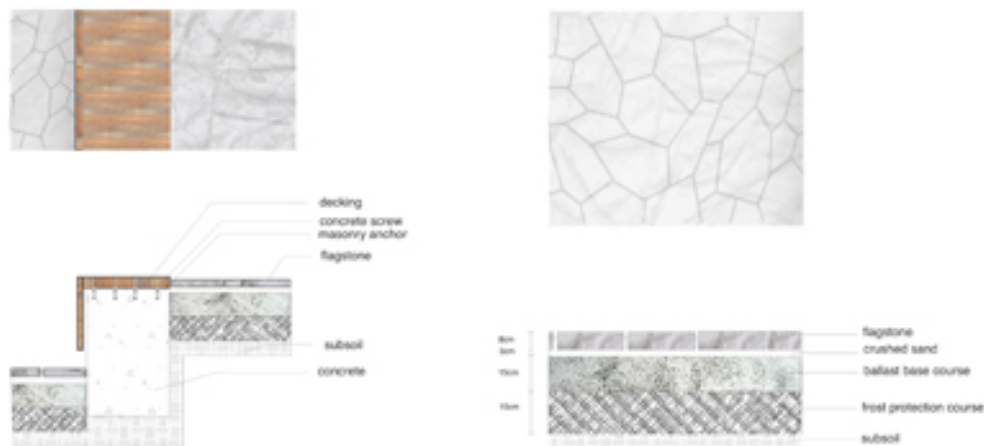


Fig. 6: Material Details by student Trent Workman

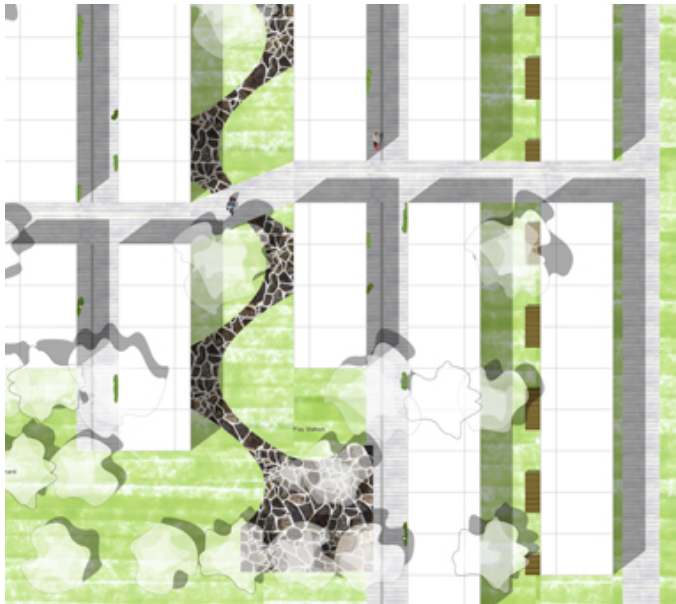
## 6 Results

When the author initially introduced this software into her teaching in a Canadian program of Landscape and Urbanism (three years ago) she received scepticism from both teaching colleagues and students. The author's colleagues were not convinced that the software was relevant to their own subject matter and students were unsettled as AutoCad is the

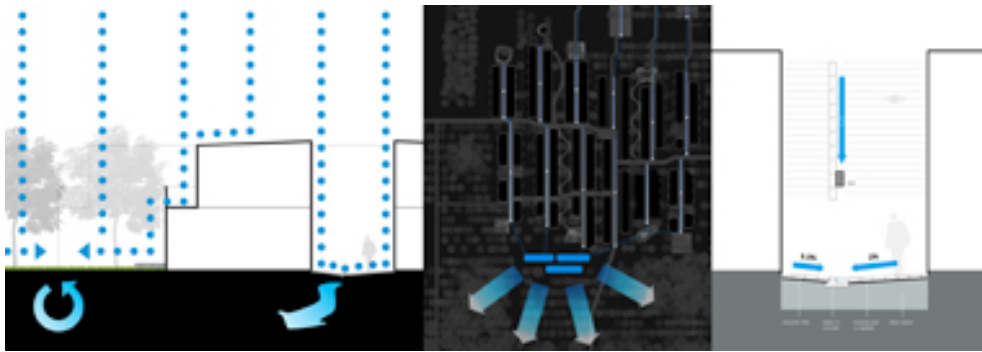
predominant software in Canadian practice. But exceptional work has been submitted over the last three years and more and more students articulate their interest in Vectorworks today. Students who went through the course and who are now attending graduate courses also value their training in Vectorworks components and libraries, since “it has translated to other programs and been very helpful” (Carly Moore). These results and continuing feedback are encouraging the author to pursue this experiment and to try to establish it further.

As it is imbedded in a Vectorworks file the digital material library allows endless rendering possibilities, which are not only to scale but can also be used for the development and representation of further design projects. Thus, a construction material course that includes the application of this software functions as an excellent foundation for design studios and/or seminars (Fig. 7).

The sense that the author tries to instil into her teaching is that the art is to mediate between the greater whole of the original idea and the specific material. As the architect Peter Zumthor puts it when describing the music of Johann Sebastian Bach: “Its construction seems clear and transparent. It is possible to pursue the details of the melodic, harmonic, and rhythmical elements without losing the feeling for the composition as a whole – the whole makes sense of the details” (ZUMTHOR 2010). It applies to music as well as to landscape design that the knowledge of notes and accordingly materials does not necessarily result in successful work. The question is how to compose, how to realize an idea. If we succeed in this, projects can be made to shine and vibrate.



**Fig. 7:** Studio design: Site plan by students Yuanchenxi Gao and Bing Wang



**Fig. 8:** Studio design: Idea and Detail by students Yuanchenxi Gao and Bing Wang



**Fig. 9:** Studio design: Perspective by students Yuanchenxi Gao and Bing Wang

The work of the students Yuanchenxi Gao and Bing Wang exemplifies how both the concept and the details can be developed concurrently and consistently throughout the project. In an undergraduate design studio these two students were asked to develop student housing and its layout in a rural setting. The concept of living in an orchard was the starting point (Fig. 8). The drainage and irrigation details were a logical consequence of the concept and subsequently, the overall site plan became a meaningful composition of details, illustrated by perspectives (Fig. 9).



Reflection on materials and the study of construction details help students to both build ideas and illustrate their own designs. The beauty of this method of study is that whilst keeping track of the original idea they can consider what is possible and focus on what makes sense in relation to a specific design goal. They learn that the original design idea influences the selection of construction materials as much as the material selection can influence the design.

## **7 Conclusions & Outlook**

This paper illustrates, with reference to students' work, that the construction of a design idea and the principles of Bach's music composition are following similar rules in order to achieve convincing results. Placing as much value on the reflection of details and materials as one does on design ideas and representation results in convincing projects due to the inherent coherence that results.

Applying digital drawing techniques to material proposals and construction drawings in a Canadian context not only matches what is common practice in other places, it also embraces the distinct willingness and exceptional ability of students to learn by and with computers. Digital sketching within CAD software is an upcoming research field and the more skilled software users become the more potential they see in using these programs as a sketching type tool. The profession needs software developments supporting this demand thus allowing advanced doodling, the easy and smart interaction of bitmap and vector images in 2D and 3D.

## **8 References**

- Jost, D. (2011): *Material Evidence*. Landscape Architecture Magazine Aug 2011: 124-134
- Vogt, G. (2006): *Miniatur und Panorama: Vogt Landschaftsarchitekten Arbeiten 2000-2006*. Lars Mueller Publisher, Baden
- Zumthor, P. (2010): *Thinking Architecture*. Birkhäuser Verlag, Basel, Boston, Berlin:10