

The Student, The Master and The Computer

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Abstract. Architectural education has often been criticised for producing students that seem to lack the practical knowledge needed to create architecture that is fit for purpose, safe and a delight to users. Unfortunately, owing to the complexities of society, technology, practice and academia, design teachers are struggling to balance the teaching of basic practical concerns for making architecture with teaching students how to think critically and abstractly.

This paper suggests a resolution that places the computer at the center of the relationship between student and tutor. It suggests a digital teaching tool that detects and interprets the marks students make when sketching. The digital design coach then presents the student with related issues allowing a comprehensive reading of the digital sketch. The student, more aware of the issues involved, engages in more intelligent and well-informed dialogue with tutor.

Keywords. Digital Sketching; Design Education; Design Computing

Introduction

Architecture today is an increasingly complex affair. New social and cultural norms, new materials and building types, along with the current trends of sustainability have contributed to its complexity. As a result, schools of architecture are under pressure to provide graduates of architecture with the requisite skills that characterise good design thinking strategies as well as support responsive design.

Redressing this situation is the aim of this paper. It is proposed that by using the computer in tandem with the studio master[1] and the student, it is possible to provide students with the skills to produce culturally and socially significant architecture that is safe, purposeful, sustainable and a delight to users. The paper proposes this by identifying the critical components of the student/master discourse; demonstrating the value of the sketch to the discourse; examining the fea-

sibility of digital sketching as a means of support and finally defining a digital teaching tool that uses sketching as its interface. The end result, a “design coach”, would support students (who have limited design vocabularies) with practical (and poetic) issues while designing; consequently enhancing the comprehension of practical design ideas. In turn the student should make more intelligent, well-informed and confident decisions raising the quality of the dialogue between student and master.

The challenge

Among the most persistent criticisms of architectural education is the claim that graduates seem to lack the skills needed to make the transition from academia to practice less arduous (Crosbie, 1995). The challenge therefore is to provide an innovative and effective way to facilitate, within the context of the design education, a bet-

ter balance between the study of design and the study of practical issues like sustainability, energy conservation and community. The main instrument for the dissemination of design knowledge, and the vehicle for meeting this challenge is the design studio.

The design studio

The design studio socially, physically and pedagogically occupies premier position in design education. Despite changing educational and professional attitudes, the design studio has retained its historical roots in the lodges of the Middle Ages. A significant component of this tradition has been the dynamic relationship between student and master.

The student and the master

Whereas design studio is the most important element of design education, the student-master discourse is the linchpin that gives the design studio definition and validation. Architecture today entails greater sensitivity to the needs of building users, society and the environment. This “social” sensitivity, coupled with the technical complexity of buildings, can only be achieved with more than a passing knowledge of the issues. Unfortunately, this master-apprentice model has been unable to keep pace with the changing context of society and practice.

The zone of interaction

Assisting students to gain more than a passing knowledge of the practicalities of architecture requires the reconfiguration of the mental and physical “space” where the student and master interact. This space – the “zone of interaction” or I-zone – has always been a part of the master/apprentice model of teaching. On the sites

of antiquity this zone would have been located on or in the building itself. The apprentice learnt through direct exposure to the connection between design ideas and their built consequences. Today, the contemporary studio cannot

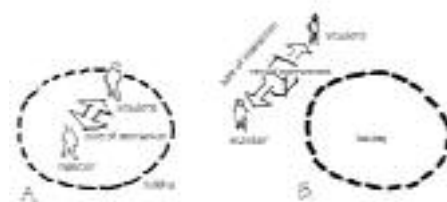


Figure 1. The sites of antiquity (A) provided a context for the I-zone while today, (B) the zone exists most times outside of the reality of the building.

always provide students with an actual building to test and experience first hand and so the I-zone occurs in the virtual world of drawings and models (Figure 1).

The virtual world, while having a clear advantage over real sites (they allow experimentation and focus), displaces the student’s learning from the realities of architecture. In it, the student struggles to define a realistic model of the problem and is willing to suspend “physical rules” and ignore limitations. It is therefore left to the master to reveal the realities lacking in the students’ proposals subsequently reducing the time afforded to other aspects of teaching design.

Since, in most instances, it is physically impossible to teach within an actual site, the alternative would be to embed the rules of reality in the virtual environment, which is usually manifested in the form of sketches.

The Sketch

It is widely recognised that the sketch is an important design tool (Herbert, 1993). Design decision-making relies on the skill to identify and recognise the multiple design issues embedded within a sketch. As a passive tool, the sketch

relies on initiative from the designer. It cannot tell the student any more than his/her limited knowledge about the design situation embedded in the sketch, thus hindering flexible decision-making and progress.

It has been empirically demonstrated that students respond well to an “expert” that looks at their sketch, asks the right questions or provides the right clues that makes the design situation more legible (Bailey, 2000). Since it would be expensive and time consuming to provide such a person for every student, it would be prudent for this ability to be embedded in the design tools of the student. This suggests that the sketch should move from being less passive to an interactive position where it prompts and cues the student about aspects of the design situation. This is possible through the use of digital technology.

The Computer

The computer has a ubiquitous presence in design education and practice. Despite this, current digital tools, while being excellent at the communication and visualisation of ideas and concepts, have not been able to facilitate the kinds of design thinking enhanced by the sketch.

Research attempts at digital sketching have resulted in applications that recognise sketch diagrams made on screen and provide analytical tools or generate three-dimensional form (Do, 1998; Gross et al, 2000). Regardless of all this innovation, however, it seems that much effort has been concentrated on making the products of sketching digital. Using digital technology to boost the process of sketching (i.e. thinking by drawing) can take better advantage of its ability for visual thinking and – by extension – teaching.

The Design Coach

The implementation of a digital teaching aid to the I-zone could help students develop reconcile disparate elements into a habitable, environmentally friendly and architecturally responsible whole. While there could be many ways of implementing such tool, the direction advocated by this paper infers design intentions from the sketches students use when designing. The system (the Design Coach), then presents the student with issues related to that particular sketch. The student reads the sketch in conjunction with this and is made aware of the implications, and practicalities of his/her moves. The student then meets the master with an acute awareness of the issues involved in the task, allowing a higher quality of student-master discourse where the student asks relevant questions.

The design coach would comprise of two main components. The first (a sketch recognition component) involves recognising the sketch and inferring an intention or issue under investigation and the second (an information component) involves relating specific information to the inference and the communication of such information as clues about the design situation. The digital sketching and intention recognition component of the tool has already been demonstrated by the Right-Tool-Right-Time system developed by Ellen Do (Do, 1998). It is intended that the RTRT system (or similar technology) could become the “engine” or software architecture on which the tool will be based.

While it is crucial for the tool to recognise architectural intent from a personal sketch, the structure and content of the information determines the tool's value. It should relate to the structure of design problems; expose students to the kinds of issues that are involved in the design of real buildings; and be consistent with theories related to computer assisted teaching and learn-

ing. A prototype has been built to investigate the information content and structure of the tool. Two experiments using this prototype have received positive responses from students.

Conclusion

It has been stated that the practical knowledge base acquired by students of architecture is inadequate to deal with the rapid changes in technology and society in the 21st century. Meeting this challenge can only occur through the interaction between studio master and student. At the centre of this relationship is the virtual environment of the sketch. It has been proposed in this paper that by using digital technology to empower the sketch we can enhance the I-zone and students' awareness of the practical issues of design.

The use of the sketch as interface is the most efficient and effective way of compelling the student to directly engage with the design information. This allows the student to read into sketches the questions and issues embedded in the visual image and perceive the sketch as more than a representation tool. When designing, the student begins to The sketch, for the student, becomes an intelligent tool that supports and informs exploration. It becomes a ladder or scaffold that supports the student and allows meaningful critical dialogue between student and master about the design process. The student has the opportunity to meet the master on terms rarely existing at present. With an awareness gained from the coach prior to the meeting, the student is cognisant of the issues involved, asks the "right" questions and understands the criticism and advice on the issues. The digital sketch acts as a mediator in the relationship. In the end the student gains adequate critical thinking and problem-solving skills while using fitting and innovative technology to learn about the things that

make architecture appropriate.

Notes

[1] The word master is used in this paper to mean male and female studio teachers creating a closer connection to the medieval masters who tutored their apprentices or students.

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