

## **'Beautiful, Historical, Artistically Subtle in a Way that Science Can't Capture'**

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Between 2006 and 2013 Gillian Crampton Smith and I taught an Interaction Design route<sup>1</sup> at Iuav University of Venice.<sup>2</sup> This essay describes its ingredients: the principles, priorities and prejudices which emerged from our previous teaching in Britain and Italy.

### **The great chain of design education**

Formal education in design, as opposed to apprenticeship, developed from pedagogic models which originated in schools of painting, sculpture, architecture and engineering established in the seventeenth and eighteenth centuries. They were then developed over the next two and half centuries, mainly in France, Germany and Great Britain.<sup>3</sup>

France pioneered both art-based and technical education in the Académies des Beaux-Arts (established in 1648 for painting and sculpture, and in 1671 for architecture) and the Ecole Nationale des Ponts et Chaussées, which also taught architecture (1747). German-speaking states later emulated France's more engineering-based schools, beginning with the Bauakademie (1799) in Berlin. The later Kunstgewerbeschulen (schools of applied arts) were established at least partly to compete with Britain's design and manufacturing strength, displayed in the Great Exhibition of 1851.

But Britain had in fact come very late to design education—and without much enthusiasm: it is symptomatic that its first design institute, the Government School of Design (1837), was soon renamed the National Art Training School (1853) and then Royal College of Art (1896). The Arts and Crafts movement of the 1890s typified Britain's scepticism about the value of academic education for designers. Its emphasis on making by hand led to the London's Central School of Arts and Crafts (1896) which only after seventy years was renamed the Central School of Art and Design (1966). A syllabus based on art and handcraft remained the basis of the Bauhaus (1919), a 'radicalized Kunstgewerbeschule',<sup>4</sup> although what most influenced later design education in both Europe and the USA was its commitment to avant-garde forms and, in its later years, technological innovation.

Over those centuries design education has swung with much argument between Art and Aesthetics on one hand and, on the other, Utility and Technology. Should the aspiring designer be 'educated' (a word connoting cultural nurture) as a free professional or just 'trained' for an occupation? Should he or she be educated/trained primarily as an artist, a professional coordinator, a technologist, or a craftsman? Answers to these questions

continue to depend on not only pedagogic theory but anxieties about social status and, perhaps most powerfully, national politics and available teaching resources.

### **What we learnt as students and junior teachers**

Gillian and I were educated at Cambridge University: she studied philosophy, then art history; I studied architecture. After several years as a professional graphic designer, Gillian taught graphic and computer related design at St Martin's School of Art (now Central St Martins) and, later, interaction design at the Royal College of Art. While practising as a professional architect, I taught architecture at several British universities, the Architectural Association School and, later, the Bartlett School of Architecture, University College London.

We claim only modest links with the 'great chain' which leads from the Beaux-Arts to the Bauhaus.<sup>5</sup> But we learnt from our early years as students and teachers at these British public universities, and tried to apply to our own teaching, the following principles:

- *Collegiality*: the personal and intellectual bond between teachers, junior and senior, nurtured by constant discussion—often when eating or travelling together. This ethos extends to teacher/student and student/student relationships.
- *Large-team teaching and examination*, where many teachers collaborate in designing their courses and assessing student work. This exposes teachers to conflicting teaching values and strategies, and allows junior teachers to learn from their peers and seniors. It also exposes students to a wide range of different opinions directed towards a single topic or project.<sup>6</sup>
- *Curricular cohesion*: the responsibility of the teaching team to construct a basically unified and logically sequential course of study which allows a student 'cohort', as a community, to develop together their skills, knowledge and insight.
- *Subsidiarity*. Senior teachers may indicate the overall aims of a degree programme, but junior teachers are responsible for devising the students' academic experience. Junior teachers devise the students' tasks, but each student is responsible for interpreting that task to suit his or her personal trajectory.
- *Centrality of the design studio*. A design programme teaches students how to design; it is not primarily 'about' design or how to 'facilitate' design by other people. To design well is difficult. So the students' energies, the whole programme, and the majority of its examination credit, focuses on the studio.
- *Fiction*. Design education has a training element. But if it tries to mimic life in the design profession it tends to stifle the freshness of approach which students bring to it, and to privilege current exigencies over

universalities. Each student design project is inevitably a fiction, and should display the inventiveness, clarity, drama and poetry of that art.<sup>7</sup>

Most of these principles we tried to apply in Britain, and in Italy at Interaction Design Institute Ivrea and Iuav University. But existing academic structures and habits were not always helpful. It seems, for example, that Italian public universities tend to encourage each teacher—alone—to determine his or her course, and even to assess his or her students' performance at examination; this reduces opportunities for collegiality and informal 'teacher training'. A low teacher/student ratio and diminished resources make difficult the social occasions and study trips which foster productive teacher/student relationships. And some design curricula, British and Italian, are modular 'buffets' from which each student selects his or her courses, often regardless of a natural progression from an elementary to an advanced competence level, or of the appropriateness of the selection to the student's career; this dissipates the student's feeling that he or she is part of an academic community working together on the same tasks to build its shared future.

It is fortunate that such institutional obstructions can often be subverted or at least moderated.

### **Iuav's Interaction Design route**

Iuav's two-year Masters in Visual and Multimedia Communication was primarily a Graphic Design degree comprising a modular range of lecture/seminar courses and practical studio courses from which students constructed their 'route' to a degree. Although students also had to follow other courses, our Interaction Design route comprised:

- A sequence of two practical studio courses, at least one of which had to be taken twice
- A corresponding sequence of two seminar courses
- An internship and a final thesis, both in Interaction Design.

The route was not conceived as a 'taster', as part of a general education in design. It aimed explicitly to prepare its students for a productive career in interaction design and related professions. It did not intend (and had not the resources) to offer all the skills and knowledge currently needed in a professional interaction design studio.

True, it taught work methods particularly useful on this field, and a level of technical expertise. But its first aim was to arm students with an individual spirit of curiosity, adventure and creativity which would allow them to operate confidently in a fast-changing and unpredictable technological and cultural future. 'Stay hungry. Stay foolish' is wise advice.<sup>8</sup> Its second aim, because designing is a collaborative activity, was to teach them to work productively as team members.

The route's method was learning by designing. Although the route's ingredients have for many decades been found in design courses generally, its recipe was particularly devised for teaching interaction design in Italy.

## The ingredients and their origins

The practical Interaction Design courses were the focus of the students' experience. They resembled many other studio courses in Iuav and elsewhere, but it may be useful to identify what might be the origins, not always conscious, of their priorities and methods. Briefly:

- From the *Beaux-Arts*, the idea that design<sup>9</sup> has much to learn from art: a creative activity which communicates meaning and values by transcending instrumentality and verbal discourse
- From the *Beaux-Arts* too, the value of the *atelier*: a permanent group of students and their space where, supervised by their teacher, they work on design projects, partly collaboratively
- From the *Ecole des Ponts* and its many successors, the experimental method and the importance of not only knowledge of a relevant technical field, but of some experience in applying it
- From the *Kunstgewerbeschulen*, the idea that design is a social utility: a design product is validated by its response to social and commercial needs, particularly those of the surrounding region
- From the *Arts and Crafts* movement, a preference for practice over theory, and thus respect for the maker and the educational value of making, rather than just designing
- From the *Bauhaus*, a commitment to formal, programmatic and technological innovation.

The following sections discuss some of these ingredients.

### Art

Designing, says Herbert Simon, is 'changing existing situations into preferred ones'.<sup>10</sup> So design, unlike art, is by definition shackled to utility. However weak this link, as in some impractical fantasies of high fashion, design is disciplined and validated by its need to serve a function outside itself.

That said, designing usually fails its function if it is seen as only problem-solving. This is partly because, except in trivial cases, no totally rational procedure can lead from a stated problem to its optimal solution.<sup>11</sup> The intended use of a proposed artefact is typically defined initially, if defined at all, by many criteria (mechanical efficiency, material costs, ease of use, ease of manufacture, marketing appeal and so on) which are fundamentally incommensurable and, where it depends on social or aesthetic values, unstable.

A more useful definition of design's purpose is therefore John Heskett's: 'to shape and make our environment in ways without precedent in nature, to serve our needs and *give meaning to our lives*'<sup>12</sup> (my italics). This opens a role in design for the antennae of art: creative imagination and an intuitive understanding of how human meanings, positive and negative, are embedded in the form of every artefact.

To develop these antennae at Iuav we found ourselves frequently referring to, for instance: collage, for its ability to construct meaning semi-accidentally from found elements; Surrealism, for its unexpected juxtapositions, which jolt a work from the rut of what is expected by convention or pseudo-rationality; poetry, for its semantic economy; and cinema, for its sequence-based similarity to interaction design, and its sensitivity to small variations of emotional mood as protagonists interact with their context.

### **Experiment**

One teaching strategy for encouraging 'divergent' creativity—the ability to generate many possible solutions—is the 'counterfactual' design brief. Students must imagine a fictional context, however unlikely, then design within it while rigorously respecting its logic. This strategy owes something to so-called 'speculative' or 'critical' design.<sup>13</sup>

There are parallels with scientific experimentation. To test a hypothesis, a small number of probably significant variables are identified and their quantities manipulated, sometimes to extreme values. Combinations of these values are tested to discover their outcome. Applied to a design project, an extreme hypothesis can be surreal or absurd, although this is not necessary. But to learn from it there should be a logically coherent relationship between the initial hypothesis and its outcomes, however fantastic.

In certain circumstances students, temporarily free from the constraints of commercial life, can increase the sum of knowledge by telling their fellow-citizens: 'We have no expertise in philosophy, sociology or politics. But we are designers, and if in the future you change society in such-and-such a way, these might be the design consequences. Are you sure you want them?'

Here is one of the Iuav briefs: 'Design and prototype an interactive service, accessed by mobile phone, for a past or future "hypothetical" Venice [resulting from] a situation which could have occurred in the past (but did not) or which possibly (even if improbably) might happen in the future'.<sup>14</sup> One project, for instance, hypothesised that Napoleon had won at Waterloo, that France's technological dominance had invented a kind of iPhone in the 1920s, and that Venice was a French colony; another imagined a Venice, destroyed by war and rebuilt by Le Corbusier, which fostered a slightly sinister cult of heroic modernist dynamism. These speculations encouraged the students to 'entertain the outrageous', to reach solutions not easily accessible by accepting the inevitability of present-day conditions and needs. By upturning 'realistic' assumptions, they also exposed how the choice of a technology or design style inevitably embodies, often unconsciously, the ethos of its social and political context.

### **Locality**

The prevailing ethos of interaction design is international but, to simplify wildly, shaped by its American roots: the technical empiricism of 1980s HCI (Human-Computer Interaction), a powerful consumer-market stress on 'user-friendliness', and of course the linguistic dominance of English.<sup>15</sup> We suspect that this homogeneity reduces interaction design's responsiveness to local values and therefore its future potential to develop an expressive range as

rich as—why not?—that of architecture and film. At Iuav, therefore, we set most of the design briefs in Venice and encouraged students to concentrate on what is unique to that city and how it operates.

This site-specificity, constructed by video observation and user interviews, allowed students to base their invention on precisely experienced particulars, not vague generalities. It also meant that the students—predominantly Italian, but from many regions—often interpreted the briefs and refined their interactions with a special care for distinctively Italian qualities such as conviviality, social relationships, and a love of theatricality, music and (of course) food.

Here is another Iuav design brief: 'Identify (or design) an example of people acting together in a structured manner in the *calli, campi* or canals of Venice. Then design a mobile phone service or application which supports this behaviour, and prototype its interaction with users ... "Structured" here means "designed" or "scripted" in the sense that theatrical roles are pre-planned. But it does not exclude extemporizing within a loosely scripted structure'.<sup>16</sup>

### **The atelier**

As in all educational institutions, the teaching methodology of the Ecole des Beaux-Arts changed over its long history. But especially in the nineteenth century its core was the atelier, which in some ways mimicked a Renaissance artist's studio with its master, apprentices and assistants. Each of several Beaux-Arts ateliers, of art or architecture, was a space where a class of students worked under the eye of the *patron*. Senior students (*anciens*) would each design a response to a competition brief. Helped by their junior colleagues (*nouveaux*), they then produced exquisitely elaborate drawings of the project and submitted it by a strict deadline to a jury of professors.<sup>17</sup>

Exquisitely elaborate drawings are not needed for interaction design projects. But we do value other aspects of the atelier system:

- *A close and extended relationship between a small group of students and their design teacher or teachers.* At the Bartlett I established 20 as the maximum population of students in a studio or 'unit', this being the maximum number of students who could reasonably eat together with their teacher in a pizzeria, and the maximum number of projects the teacher could mentally review before falling asleep at night. At Iuav the atelier populations were greater (typically 25–35) but the principle applies.<sup>18</sup> A relatively small atelier population allows students to build social and intellectual relationships with each other, thus gaining the confidence to freely critique each other's work and develop a critical stance independent of their teacher.
- *A permanent communal workspace.* To build and maintain a creative studio culture, the students of an atelier need a permanent space in which they design together, constantly aware of what each other are working on.

- *A mix of generations.* When students of different 'years' share an atelier—especially if, as at Iuav, they usually work together in teams except for the final thesis project—the juniors learn from their seniors, and the seniors are spurred to demonstrate through their work that their seniority is deserved. A unique 'studio culture', a commonwealth of values and methods, gradually accumulates and is passed from generation to generation. This happens only with difficulty in a one-year course, which must begin every year from zero. It requires a multi-year course.
- *Constructive competitiveness,* the desire to excel and be seen to excel, is a powerful motivator of invention and industriousness. But the atelier and its teacher must ensure that competitiveness does not become destructive, discouraging weaker students and encouraging stronger ones to work secretly; competitiveness may be more productive when directed to competitors outside the atelier or school. Our experience is that the social acceptability of competitiveness within a student group varies surprisingly.<sup>19</sup>
- *Deadlines.* Students often lack the experience to timetable their designing in a sequence which suits their individual work style, so absolute deadlines are essential. At Iuav we usually scheduled some form of presentation deadline every one or two weeks.<sup>20</sup>
- *Critiques ('crits')* are regular presentations where students present their current work and invite comments from their colleagues, teachers and sometimes external guests. This ensures that all are aware of what everyone else is doing and usually generates helpful advice. It also develops the skill, needed by all designers, to present proposals persuasively and to respond to criticism in public.

When we first arrived at Iuav, our students tended to work, each at a desk, and to relate individually to their teachers. So we recall with pleasure the day when we entered our atelier to find that, unasked, the students had clustered all the desks together and surrounded them with their arms around each other's shoulders. From that day the atelier accelerated as a generator of energy and ideas.

### **Technical competence**

Interaction designers may not need advanced competence in programming or electronics, any more than an architect needs advanced knowledge of construction engineering or acoustics; for complex tasks both will rely on experts in those fields. But without some practical experience of programming and of designing and connecting circuitry, interaction design students will almost always lack the confidence and terminology to collaborate with those experts. Without some technical competence, that is, they can neither test their ideas in practice nor move beyond inventing concepts which others must implement. At Iuav we therefore required all design projects to be developed as working prototypes. Bright ideas were not enough.

Most of our Iuav students had studied humanities at high school, however, and began the course with little or no experience in programming or electronics. So we inserted into our preliminary studio course (about screen-based interaction) a practical introductory workshop on programming, and into the advanced studio course (about physical interaction) a similar workshop on electronics. The first workshop focused on Processing, a programming language particularly adapted to visual and spatial outputs; the second, on Arduino, a simple and inexpensive microcontroller.<sup>21</sup> Even an elementary competence in Processing and Arduino was enough to create functioning interactive applications and devices.

We should note that over the eight years of the Iuav course the market gradually introduced software and hardware which greatly facilitated consumer-level programming and electronics. We should also observe that it took some time before we convinced some of our teaching colleagues that Interaction Design was not primarily a type of engineering but instead an activity with all the aesthetic and cultural potential of other design fields.

### **Making**

Anglophone culture tends to suspect theorizing and to trust actions rather than abstractions, deeds rather than words. A common opinion—not confined to the Anglophone world, nor to just the world of design—is that theorizing inhibits creativity and intuition, and that too much 'school learning' encourages a snobbish distinction between those who design things and those who must make them.

We value ideas and research. But so much education outside the design studio encourages students to theorize and discuss before they commit themselves to act, that at least in the studio our advice is 'Walk before you talk'—or rather, 'Make something, consider the result of your deed, then adjust it, and continue this cycle until you are satisfied'. Fear of the blank canvas is only overcome by making a mark, however clumsy or random, because this jump-starts a critical dialogue between the designer and whatever solution finally evolves.

Donald Schön describes this 'acting in the world', rather than observing it from outside, as a 'reflective conversation [in which] the practitioner's effort to solve the reframed problem yields new discoveries that call for new reflection in action. ... The unique and uncertain situation comes to be understood through the attempt to change it, and changed through the attempt to understand it'.<sup>22</sup> Henrik Gedenryd calls this process, achieved by making sketches and prototypes, 'interactive cognition'.<sup>23</sup>

Making does not preclude verbalisation, which remains a powerful tool for communication and criticism. But in our experience a productive dialogue between the interaction designer and the evolving project is greatly accelerated by predominantly bodily activity: performing improvised user-interaction scenarios, or making 2D images (diagrams and pictures) and 3D objects, especially if these activities are mostly manual rather than represented on the computer screen. Physical making also counteracts a

natural inclination, in students attracted to interaction design, to use computers where more traditional tools might be simpler and faster.<sup>24</sup>

At Iuav we encouraged the continual production of prototypes, starting early in the project with 'quick and dirty' sketches, card and sticky-tape models, unedited mobile-phone videos, and crude circuitry. This allows interactions to be simulated and tested as soon as they are imagined.

Designing and making things fast is important, partly because it prepares for the stressful time budgets of the professional design studio, and partly because, as in speed-dating, the designer can efficiently survey many possibilities. It is also instructive because deadline-induced panic not only energises students but, by discouraging leisurely reasoning, reveals the often surprising power of the intuitive 'leap'—another tactic, borrowed from art, for ambushing and redirecting a thoughtlessly conventional or narrowly convergent design process.

For this reason, our Introduction to Interaction Design course at Iuav, though supposedly a theory seminar, was mostly a sequence of in-class exercises—each very fast, stopwatch-controlled, and with a graphic or modelled outcome.<sup>25</sup> Action precedes and constructs concepts, not vice versa. So these exercises usually followed, rather than preceded, a discussion of the theory they exemplified. Here, for example, is the course's first exercise:

- 1 Quickly form teams of four people. Each team must then:
- 2 In 3 minutes, choose a machine or device (electronic or not) used in everyday life
- 3 In 5 minutes, list its main input and output activities
- 4 In 5 minutes, imagine each activity is a very simple and everyday mechanism (e.g. a switch or light bulb) and represent it by a Post-It. Identify each mechanism by a symbol, or a symbol and a word
- 5 In 5 minutes, place these Post-Its on one or more A3 sheets, and draw links between them to indicate their interaction. Do not indicate your chosen machine or device on your display
- 6 Fix your display to the wall. The class will try to identify your machine or device.

### **Craftsmanship**

Richard Sennett distinguishes between several definitions of craftsmanship, including: 1) the practice of manual design and production based on tacit knowledge and tradition, as opposed to machine production; and 2) the designer/producer's perfectionist urge.<sup>26</sup>

As mentioned above, for the early, divergent project stages we value manual sketching and prototyping, rather than computer-screen representation, because they speed the design process by facilitating 'interactive cognition'. They allow, as Sennett says, a 'space of freedom' in which the designer/maker can experiment, make mistakes, and learn from them.

The later, convergent stages of a project, however, require the second meaning of craftsmanship: not 'quick and dirty' but slow and careful. God is in the detail: success depends as much on small, apparently peripheral decisions as it does on overall planning. The need for this aspect of craftsmanship applies strongly to the multiple dimensions of interaction design. Almost imperceptible adjustments of material and texture, acoustic timbre and interval, or movement speed and trajectory, distinguish an ordinary sequence of interactions from one which 'hits the sweet spot'.

Steve Jobs attributed his obsession for detail to a calligraphy class he took at college: 'It was beautiful, historical, artistically subtle in a way that science can't capture'.<sup>27</sup> All design education should spark a similar epiphany.

## Notes

- 1 Interaction design, a relatively recent activity, is the design of interactive products, software, systems and services. Such artefacts invariably incorporate a computing and, increasingly, a telecommunication element. Focus is on how the artefact behaves when it interacts with its user, and how the user experiences this interaction; interaction design is thus sometimes seen as a subset of so-called 'user experience design'.
- 2 Iuav (pronounced 'you-av') University of Venice, a public university, was founded in 1926 as an institute for the study of architecture. In 2001 a department of Design and Arts was added whose degrees included a Masters [*Laurea Magistrale*] in Visual and Multimedia Communication, directed successively by Giovanni Anceschi, Giorgio Camuffo and Gillian Crampton Smith. In 2006 Gillian and I began an optional Interaction Design 'route' within this Masters in the hope of eventually developing a specific *Laurea Magistrale* in Interaction Design. Annually decreasing resources destroyed this hope and, despite the professional success of its alumni, led to the route's death in 2013. Other factors included new government restrictions on employing part-time teachers in universities, and the elimination of the Design department and its dispersal between new departments. The remarkably centralised and rigid bureaucratic structure which straitjackets Italian public universities impedes their ability to experiment and respond agilely to a changing world.
- 3 This section is based on the judicious summary of design education history, although concentrated on architecture and civil engineering, in Ch. 6 of Andrew Saint, *Architect and Engineer: A Study in Sibling Rivalry* (New Haven and London: Yale University Press, 2007), 431–84.
- 4 *Ibid.*, 472.
- 5 Gillian's Professor of Fine Art at Cambridge, Michael Jaffé, conducted his teaching very much in the style of a Beaux-Arts *patron*, while two of my first-year Architecture teachers, Peter Eisenman and Colin Rowe, though no *académiciens*, had recently arrived from the USA, whose

architectural culture still breathed a strong memory of Beaux-Arts education and formal language. The Royal College of Art, where Gillian taught, retains much of its 'industrial arts' and Arts and Crafts origins. And the Cambridge Architecture School of the 1960s, where I studied, openly copied its teaching methods from the Bauhaus syllabus.

- 6 At Iuav the participation of many teachers in a single course was unusual. Funds for studio courses permitted only one senior teacher (*titolare*) and one assistant (*collaboratore*). To increase the variety of opinion and experience offered by our studio courses, therefore, Gillian and I taught together, sharing the *titolare* fee, and in each semester divided the *collaboratore* fee between four to five professional experts who each visited for a week or two, mostly from outside Italy, in some cases from the USA. To compensate for their modest fee, and to enjoy 'collegial' discussions about interaction design and its teaching, we accommodated and fed many of these visitors in our apartment.
- 7 I share the pleasure of my former co-teachers in Unit 17, one of the Bartlett's graduate design studios, in the double meaning of the word 'fabrication': "'To fabricate" means to make by skill and labour ... but also to devise a legend or a lie'. Niall McLaughlin, Yeoryia Manolopoulou and Michiko Sumi, *Unit 17: Materials and Ideas 2012–2013*, exhibition catalogue (London: Bartlett School, University College London, 2013), 2.
- 8 The final advice of Steve Jobs to the 2005 graduating students at Stanford. Steve Jobs, 'Discorso di Steve Jobs ai neolaureati di Stanford' (English with Italian subtitles), <http://www.youtube.com/watch?v=oObxNDYyZPs>, 12:54–14:15.
- 9 By 'design' I mean here the 'applied', as opposed to 'fine', arts: that is, invention directed towards usefulness. Design here thus includes architecture but not painting, sculpture, film and so on.
- 10 Herbert Simon, *The Sciences of the Artificial* (Cambridge MA: MIT Press, 1972), 55.
- 11 The disappointed hopes for automatic design methods in the 1960s are discussed in Gillian Crampton Smith and Philip Tabor, 'More Than One Way of Knowing', in *Theories and Practice in Interaction Design*, eds. Sebastian Bagnara and Gillian Crampton Smith (Ivrea, Italy: Interaction Design Institute Ivrea, and Mahwah NJ: Lawrence Erlbaum, 2006), 117–24: 117–18.
- 12 John Heskett, *Toothpicks and Logos: Design in Everyday Life* (Oxford: Oxford University Press, 2002), 7.
- 13 For critical design, developed as a method and ideological stance, see Anthony Dunne and Fiona Raby, *Design Noir: The Secret Life of Electronic Objects* (Basel: Birkhäuser, 2001).
- 14 For this brief and the resulting projects, see Gillian Crampton Smith and Philip Tabor, 'Venice Hypothetical', <http://www.interaction->

venice.com/projects/iuav09-10Lab1. The public Interaction-Venice site, [www.interaction-venice.com](http://www.interaction-venice.com), shows almost all the projects designed by students over the route's eight years. As a design developed, each student or student team recorded progress on a communal private, password-protected blog; at the end of each project they then had to transfer their final design, fully documented, to the public site—or they would not be assessed for a grade. This ensured a useful project archive for future students and the general public.

- 15 The evolution of interaction design from HCI is briefly discussed in Sebastiano Bagnara and Gillian Crampton Smith, 'Introduction', in *Theories and Practice in Interaction Design*, op.cit., xxi–xxxiii: xxiii. For a fuller history of interaction design's birth see Bill Moggridge, *Designing Interactions* (Cambridge MA: MIT Press, 2006).
- 16 For this brief and the resulting projects, see Gillian Crampton Smith and Philip Tabor, 'Theatrum Urbis', <http://www.interaction-venice.com/projects/iuav10-11Studio1>.
- 17 The atelier system is described in Richard Chafee, 'The Teaching of Architecture at the École des Beaux-Arts', in *The Architecture of the École des Beaux-Arts*, ed. Arthur Drexler (London: Secker & Warburg, 1977), 61–109.
- 18 Despite the 20-maximum pizzeria rule for London, more accommodating pizzerias in Venice could seat over 35 students and teachers around a single (long) table.
- 19 Our impression is that, unlike students at our British schools, who were typically from a wide range of nationalities, our Iuav students, predominantly Italian, much preferred collaboration to overt competitiveness. This is no bad thing, but may have been the accidental result of interpersonal 'chemistry'.
- 20 Competitions at the Ecole des Beaux-Arts were rigidly time-limited. Students were locked in the atelier for, say, twelve hours. Chafee, op. cit., 92: 'Outside the ateliers, students would load their designs onto little handcarts [*charettes*] that they would drag through the streets to ... the Ecole [to arrive before the deadline. Thus] being *en charette* came to mean not only the rush to the Ecole, but also before that, the long hours of last-minute work in the atelier'. When I was a student at Cambridge, design exams were time-limited (typically of two three-hour sessions) and we called all-night design sessions 'charettes'.
- 21 The Arduino microcontroller was invented in 2005 at our previous school in Italy, Interaction Design Institute Ivrea, to make it easier for design students to prototype their ideas.
- 22 Donald Schön, *The Reflective Practitioner: How Professionals Think in Action* (New York: Basic Books, 1982), 132. The relationship of this psychological process to Martin Heidegger's *Befindlichkeit* [situatedness]

is briefly discussed in Gillian Crampton Smith and Philip Tabor, 'More than One Way of Knowing', op. cit., 118–19.

- 23 Henrik Gedenryd, 'How Designers Work: Making Sense of Authentic Cognitive Activity' (PhD diss., Lund University, 1998), <http://archive.org/details/HowDesignersWork-MakingSenseOfAuthenticCognitiveActivity>. Interactive cognition and the role of sketching, prototypes and imaginary scenarios is described in Ch. 6, 147–96.
- 24 That said, the so-called 'maker subculture', facilitated by the Internet, is a growing and innovative collaboration between Arts and Crafts, DIY, programming and electronics enthusiasts. See P2P Foundation, 'Maker Movement', [http://p2pfoundation.net/Maker\\_Movement](http://p2pfoundation.net/Maker_Movement).
- 25 This introductory seminar course was attended by many students, not only those on the Interaction Design route. It intentionally required no computers or electronic hardware except a mobile phone for recording video prototypes.
- 26 Richard Sennett, *The Craftsman* (New Haven and London: Yale University Press, 2008), trans. as *L'uomo artigiano* (Milan: Feltrinelli, 2008). Sennett sees a virtuous parallel between the ethos of the archaic craft workshop and some social arrangements now emerging in new technologies, such as the open source collaborations of the Linux Corporation (English ed., 24–27).
- 27 Jobs, op. cit., 3:19–3:55.