Designing Complexity in Context: Light through Culture

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ABSTRACT
Light through Culture is an international design school which explores the theme of complexity in learning environments. The aim of the school is to weave the newest technologies and the rich existing culture into a new canvas for making and thinking. Learning is meant as a way to (re) incorporate culture and making into thinking. The school has been hosted by the Museum Complex Santa Maria della Scala, Siena, Italy. Being immersed in a rich historical-cultural context, the students had to design an experiential path along the Via Francigena, the ancient pilgrimage route developing in the middle age from Canterbury to Rome, passing through England, France, Switzerland and finally Italy. Traveling along the route, the pilgrims stopped at the Santa Maria della Scala, that was an hospital at that time, where they could be given shelter and care on their way. Pilgrims started a long trip toward the enlightenment, the hope, the alleviation. Are contemporary visitors new pilgrims? The design school tried to answer this question exploring history and culture by means of innovative light technologies. Learning developed while building a real path in the Museum underground crossed by the ancient Via Francigena, opening the results of the design activity to the experience of real visitors and reflecting on how people feel, perceive and make sense of their experience. Learning confronts with the whole complexity of a real environment: the results of the school were not only texts but also physical, virtual and mixed new realities consisting of new ways of presenting and adding new dimensionalities to the existing world.

General Terms  
Design, Human Factors.

Keywords  
Design, interaction design, designing in context, learning, complexity, phenomenology, light technology.

1. APPROACH AND MOTIVATION
The first half of the 20th century saw a whole new approach in philosophy and science of looking at the world. Phenomenology [1] stressed the unity between man and his environment, and saw action as the preferred link between the subjective and the objective. The distinction between the knower and the known is a distinction for the sake of analysis. Experience is intrinsically meaningful. The perception psychologist James Gibson [2] demonstrated this in an experimental way: through action, action possibilities (affordances) are opened in the world on the scale of our body (and perceptual modalities). Perception has thus become action, and vice versa. We cannot separate ourselves from the world, we are always contextualized. Experimental physicists already confronted the limits of explanatory power of classical Newtonian physics. Experimental phenomenology urges us to confront the complexity of life not through a classical Cartesian building blocks dissection, but as a whole in context. Charles Lenay, in his experimental work, has shown how perceptual crossing, a perpetual touching and escaping of “le regard” between people forms the basis of our sharing intentionality and a common perceptual space [3].

Designers are aware of this. They confront the complexity of the world through making, through doing. There is another element to complexity though. Electronics have left the work place and have invaded our daily lives. Electronics have no direct action possibilities, they do not afford anything to our mechanical bodies. We need interfaces to change mechanical into electric force. That is what interaction design is about. As electronics become more powerful and integrate with sensors and actuators, they add another dimension: behaviour. Things around us start to behave. How do we design these highly interactive complex, behaving, systems? These systems might adapt to us, know us, change us, etc. How will these systems communicate with us? We have been doing some theoretical work to explore these questions (Deckers et al, 2011 [4]; Marti & Overbeeke, 2010 [5]; Frens & Overbeeke, 2009 [6]). But we need more than theoretical work, we need action.

We still educate our youngsters, even most engineers, in terms of Platonic bodies moved by Aristotelian forces in empty space, in terms of cause and effect: the Newtonian conception of the natural world. We believe though that there is another way to teach youngsters to explore these new systems: by building them. By then reflecting on doing, they might get a deeper, felt-through understanding of how these systems can become part of our lived world.

We set up a winter school in Siena. The Museum Complex of the Santa Maria della Scala offered us the opportunity to deploy authentic design activities in a real environment. Students with different backgrounds (design, communication, engineering) from Siena and Eindhoven University were to design, by means of light
and sound installations, a purifying pilgrimage route through spaces that were hitherto not open to the public. Before we describe the specific activities, we have to dwell a few moments with the “how” of our method of dealing with complexity through design. We asked the students to design an experiential route. Experience is about meaning. Therefore students had to design in a meaningful context. This context includes the history of the place as a haven for pilgrims: its social-cultural aspects. We addressed the students craftsmanship and their different cultural and educational backgrounds to open up a poetic rapport with this context. We do believe that we should restore this poetic rapport with reality, in the phenomenological tradition. Story telling thus became a way of creating a holistic experience that is not just based on historical facts but also exploits the deeper cultural feelings and affects. The students built a narrative path open to rich experience and meaning. Their learning activity was thus based on activity, i.e., doing, and intentionality promoting reflection and the development of their personal point-of-view: they had to take full responsibility for the experiential possibilities they put in the world. In this way we wanted to push them to fully exhaust the learning-through-doing paradigm (Hummels & Vinke [7]).

2. THE SCHOOL

Light through Culture is an international design school which explores the theme of complexity in learning environments. The first edition of the school has been hosted by the ancient Hospital of Santa Maria della Scala, nowadays an important museum in Siena, built during the 11th century to host pilgrims, poor people and orphans. The museum space is by itself a unique environment where time and space melt together in a labyrinth of memories. The school was hosted at the first level of the building with access from the Chiasso di Sant’Ansano, the “inner street” of the museum that covers part of the basement of the ancient “hospital” and is linked to the pilgrimage route of the Via Francigena in one of its last stages before the final destination (Rome). In fact the Via Francigena was the major medieval pilgrimage route from the North (England, France, Switzerland) to Rome and even today pilgrims travel this route.

The Via Francigena has a unique history: it was not a single main road provided with changes of horses for official travelers. It did not connect cities, but relied more on abbey and hospitals. It comprised several routes that changed over the centuries as trade and pilgrimage developed and waned. The route was first documented as the "Lombard Way" since the Lombards financed the maintenance and defense of the section of road through their territories as a trading route to the north from Rome, avoiding enemy-held cities such as Florence. The Santa Maria della Scala Hospital was founded across the Via Francigena to house the pilgrims coming from France and northern Europe to Rome. It was one of the first hospitals in Europe, with its own organization set up to care for pilgrims, assist the poor and provide for abandoned children. The unique history of the hospital reflects itself in the peculiarity of its structure, making the Santa Maria della Scala itself an “city into the city”. It is a city because it developed like a city, by continuous additions and organic optimizations of different parts and because, like a city, it contains real urban bodies: a street, a church, passages, bakeries and fountains.

The design school was hosted at the first level of the building among the fascinating tunnels located next to the Archeological Museum area inaugurated in 2001. During the excavations, old warehouses, cellars, granaries, cisterns, workshops and layman’s shops were unearthed. But the whole area is still not accessible by the museum visitors. Therefore the school had a tremendous opportunity to disclose a dark and unknown area of the ancient hospital revealing its history and culture.

The school was organized as a project-based activity with a challenging design brief: “Today, from all over the world, travelers visit Siena and her Hospital, to learn about the history and experience of what has formed the roots of European culture. The Hospital, as an incredible building that truly embodies the idea of a long, long evolution, is now a museum after having been a Hospital for centuries. Are the tourists the new Pilgrims? What are they looking for? What insights, discoveries could they gain? What is the meaningful experience they are looking for? Enlightenment? Hope? Alleviation? Redemption? Silence?”

Through an intense design investigation, the students draw upon the wealth of cultural heritage and set out to translate this into a continuous experience for visitors, to feel what lessons, stories and meaning can be derived.

The light was both a metaphor and a means to develop the brief. The exploration of innovative light technologies has been the thread binding tradition, history and culture with the objective to offer a meaningful experience to the visitor.

2.1 The method

The school did not foresee traditional lectures. The method used was defined “learning in context”, since all activities like inspiration, content review, technology exploration, concept design, prototyping, installation and exhibit set up were developed in the underground spaces of the museum. Learning in context offers the opportunity to deploy authentic design activities in a real environment conceived as a living lab where the students take the responsibility of their choices, decisions, ways of interpreting the design brief and the full functioning and maintenance of the exhibit. Learning in context aims at exploring the whole complexity of the learning environment, where the students are called to master and combine inventive, creative, managerial, and scientific and technical competences.

The method consists in the integration of different approaches/sciences (history, architecture, engineering, design) by de-construction of concepts/phenomena and re-construction from multiple and variegated viewpoints.

This method focuses on opening people’s sensitivities in the first place. We believe that action (i.e., perceiving and doing) has a primacy over abstract thinking, in the sense that it should precede it. For this reason the school started with a sensorial exploration/observation of the space with the aim to get inspired about the different qualities of the space (smell, gloom, semidarkness, humidity, coldness, material quality of the walls). Facts related to the history, culture and architecture were shared by walking through the space with experts and people who participated in the last excavation of the area. Students split in groups, and each group identified a space of interest. Later they made use of different techniques like role playing, acting out, story telling, simulations to generate ideas and experiment with them.

The second step of the learning process is making. Through physicality and thinking with our hands, we can actually
transform the world and create the radically different. The radically different exploits to the fullest culture and technology. Making was grounded in technology exploration and building using different materials. Each group built an interactive installation as a part of the imaginary pilgrimage of contemporary visitors of the space.

Reflection is the next step. This step was the opening of the exhibition to the public. The students host the visitors, introduced them to the exhibition and collected their comments at the end. Reflection was conducted in a "performance" way sharing the experience in context.

2.2 The technology
We wanted the interactivity of the space to be automatic. Therefore, we used sensors and actuators connected through programmable boards. Sensors included distance sensors, movements sensors and ultrasound sensors. Actuators included power LEDs, LED power bars, powered RGB lights and LAN boxes. Students mainly used Arduino boards to connect sensors and actuators. In this way they could easily tweak the input to the output.

2.3 The installations: a walkthrough
The museum context offered a striking scenery for the design activity. By means of light and sound installations, a purifying pilgrimage route was developed along five main installations.

The pilgrimage route
Visitors start the pilgrimage route from the entrance hall, a waiting room where they get introduced to the experience. Projections on the wall metaphorically evocate the difficulties of the path, as a path through life, pain, alleviation and redemption (Fig 1, right). LEDs embedded in the floor light up to invite the visitors to start the visit showing the way (Fig. 1, left).

The entrance hall
Visitors enter the space at the light of dawn. A voice-over introduce them to the experience of the pilgrimage. Meanwhile the rhythm of day and night is simulated through light to mean a long imaginary trip (Fig 2).

The staircase
Life is full of mistakes. This is what first part of the story is about. Visitors move along a narrow corridor getting to a crossroad: the road that seems easy might lead nowhere. A weak shimmer of light invites them to proceed. At the end of the right corridor, there is a flickering light. The visitors move towards it, noticing that the light dims when approaching the end (Fig 3, left). The corridor leads to a dead end. When looking into the shaft at the end, the visitor can read lines of text that are referring to the necessary failures one needs to make to progress in life (Fig 3, right).

The room of uncertain death
Life has a certain end. But there is hope. The second part of our story enlightens us. The room of certain death makes us reflect on our transitory nature.
Until the 1985 this room was the morgue of the old hospital housing the dead for 24 hours before dispensing the blessing. In fact, by law, the burial could not take place before 24 hours. Unfortunately there were no scientific instruments to establish the death with certainty. For this reason, the environment received the nickname of "uncertain death room" since a bell was attached to the ankle of the corpses, to detect any movement or sign of life. A dimmed light lures the visitors towards this room. When entering, they hear whispers and ambient sounds. When moving to the wall and the corners, little lights appear and flicker, while producing the sound of small bells and whispers (Fig 5, left). The sound of a bell acquires a new meaning: it calls us to free our deepest aspirations in togetherness. Light is liberated and liberating: the room is illuminated and a bright light comes in through the window (Fig 5, right). At the climax, a loud church bell rings. The visitors leave the room and continue the path.

Figure 5: The room of uncertain death

The ossuary
Life is cruel. The third part of the story is cruel. During the excavations of the tunnels, walls made of black earth with sharpen points were discovered. It is the so called “carnaio” (ossuary) constituted by a wall of limed bones, splinters of skulls and rags of fabric dating back to the terrible plague that struck Siena during the 14th century, forcing to halt (and never restart) the just started widening works of the Cathedral. 1348 was the terrible year of the "Black Death" for Europe. From China, the disease had arrived in the Crimea, from where it had penetrated to Constantinople where the ships spread it across the Mediterranean. In March of 1348 the pest spread throughout Tuscany and Siena, from May to October, killing about two thirds of the population. The dead were so many that it was not possible to bury all of them and then the bodies were thrown into a huge mass grave, a deep hole that reaches the depth of groundwater below the first level of Santa Maria della Scala. The chasm of the carnaio was accessible from an opening in the oratory of Santa Caterina dellaNotte, which was used to throw the corpses in. Given the high number of deaths, the bodies that quickly swarmed the ossuary were so many that it was necessary to find solutions to contain the smells. For this reason, all entrances to the carnaio were walled up and a channel was built to bring the smell out the second city wall. A label located at the entrance of the carnaio reveals the numerous attempts to contain the problem “Through this door you can reach the burial place of the city and of Saint Christine. Inside there is another door which is half an arm thick. That has been walled up to prevent the penetration of smells. This is stated in the book of records of the hospital, Dated 1415 – 1603 at page 148. This area has been restored in the year 1716” (Fig 6).

The visitor passing through the door look at the label: the letters composing the text in vulgar Italian get parted and reassemble the text in English to welcome visitors from abroad.

Figure 6: The label

When entering the Carnaio, the visitors walk through a narrow entrance of cloth. The first space is lit by light bulbs projecting a multitude of shades on the walls, supported by humbling sounds, thus enhancing the presence of the dead (Fig 7, left).

Figure 7: The ossuary

Whispering voices accompany the visitor while moving through the space. Any sound or noise produced by the visitors stops the whispers while silence gets them louder (Fig 7, right).

The space tells us that thousands of people are struck by disease and death. What shall we do with them? How can we go on? Why should we? Leaving the space a light bulb falls down quickly in the next room. The visitors can use it as a torch to scan the space and read the words that appear from the shadows: “Fiat lux”, “God said the light and there was light” (Fig. 8, 9). The word comforts us. The knowledge liberates us. We overcome our troubles and find solace in each other.

Figure 8: Using light to scan the space
After leaving this space, a shower of light lead the visitors to the next space.

The washing facility of the house of the wet nurses and the orphans

Life is purifying. The final part of the story takes us the source. During the excavations and emptying activities of the tunnels, at the end of a claustrophobic corridor, a wide room with a big medieval basin was unearthed. The washing facility inside the House of the Wet Nurses and the Orphans was part of the complex system of underground sandstone waterworks (called “bottini”), sometimes walled up and often practicable, that, after having collected all the seepage of the rain water and of streams from the surrounding hills, feed with these waters public fountains and numerous private wells.

Water dripping from sandstone cliffs was collected into the basins and used by the wet nurses to wash clothes and take care of the orphans. Inside the scavenged corridor the visitors hear a stream of water and drips of water falling down. The space is lit with blue light of rippling water (Fig 10).

At the end of the corridor, the visitors enter a large room with a weak blue light coming out from the basin which is filled of smoke simulating water.

The environment consists of two tanks, a larger one in which the clothes were washed and a smaller one to finish the last rinse. The water used came from the collection of rainwater, because at the time the place was open, but was also collected from drippings from the walls of sandstone. The washroom was accessed by a staircase leading to the building where the orphans and abandoned children lived with the nurses who took care of them.

When the visitor move further inside the room, the shade of a wet nurse walking down the stairs appears (Fig 11).

This last part of the story leads to the purification. The visitors put their hands into the basin and the water (smoke) turns from blue to red and thereupon white: their sins have been washed. After their sins have been washed, the sky fills with light, and they hear children, birds, water, they hear life. Water purifies them (Fig 12).

When the silence returns, the visitors can leave the room towards the exit of the exhibit.

3. THE VISITORS’ VIEWPOINT

Light through Culture was opened to the public for a few days. The first opening was reserved to schools, with students from primary and secondary schools from Siena and the surroundings, whilst the grand opening was free for all the visitors of the Santa Maria della Scala.

The event was a big success. We had about 500 visitors in a few hours. They visited the exhibit in small groups and left their comments at the exit. People reported strong impressions from the exhibit. They experienced difficulties and doubts, gloom and relief. The experience was a carrier of learning. Light revealed the history and culture of the city in a vivid, involving and unexpected way.

We did not a formal evaluation of the visitors’ reactions. At the end of the path we visitors could write down their comments in a book. Someone reported that without the light technology she would have never been encouraged to walk through scaring and dark spaces like the tunnels of the Santa Maria della Scala. Other people were amazed by the opportunity to learn and reflect upon what they experienced through their senses.

Here there are some literal quotes from the visitors’ book:
“A great example of an encounter between culture and technology”.

“Thank you to let us reflect on hidden an explored aspects of ourselves”.

“I really loved it. In every room you can understand what happened in the past... a wonderful experience”.

The new ways of presenting and unearthing history and culture was highly appreciated. The particular use of light was considered as a new modality of displaying beyond projection, in a highly dynamic and interactive way. This way of displaying acted as an invitation for social contacts and for learning. While a visitor interacted with the space, another visitor gets drawn into the action, starts a conversation and possibly a collaboration, in a process of learning by mutual action.

4. CONCLUSIONS

For many years, the main resource available to educators to plan and manage teaching activities derived from the pioneering work done at the beginning of the nineteenth century by the German philosopher Johann Friedrich Herbart. According to Herbart learning is the acquisition of knowledge and existing data, structured in sequential units of contents. In this approach the lesson plan is the main source for the training process. It must be organised by a clear and replicable structure according to criteria defined a priori [8]. This approach considers learning as detached from the social processes and experiences in which the student daily grows and is formed. The knowledge acquisition is based on universal principles that individuals should acquire according to their aptitudes and abilities. The main objective of Herbart, therefore, was to define methodologies to systematize and present the training material in order to facilitate and finalize the knowledge to the “average student”.

From its original formulation, the lesson-plan has undergone several transformations without loosing its original formulation. Despite the fact that the idea of the lesson-plan has been widely criticized for being too prescriptive and for limiting the space for creative and authentic activities, it is still widely used.

The vision of learning experimented in Light through Culture has led us to define a training model in which the individual differences are valued as a source for learning, and knowledge production is not the exclusive prerogative of the teacher but rather is an iterative activity of making and reflecting where the students take full responsibility of their learning process.

The key points of our approach can be summarized as follows:

- A perspective view of learning which values the unpredictability of the outcome of the process with respect to the final artifacts, and leaves the creative process open to the initiative and the interests of the students.

- A quality model that makes it possible to build new knowledge by deconstructing and reconstructing contents in a new form and in new ways of experiencing them. The model allows to share the stage with peers, finding together the solutions to the encountered problems and taking the responsibility of the learning process and its products.

- An educational activity that confronts with the whole complexity of a real environment: the results are physical, virtual and mixed new realities consisting of new ways of presenting and adding new dimensionalities to the existing world.

Also for the visitors this was a new way of learning. The interactivity of the historic spaces not only highlights their historicity, but also elicits explorative behaviour from the visitors. In this way they learn about the events that took place hundreds of years ago by being “part” of it, through experience.

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6. REFERENCES


