HEALTHY BUILDINGS: INNOVATION, DESIGN & TECHNOLOGY

ICAT 2016

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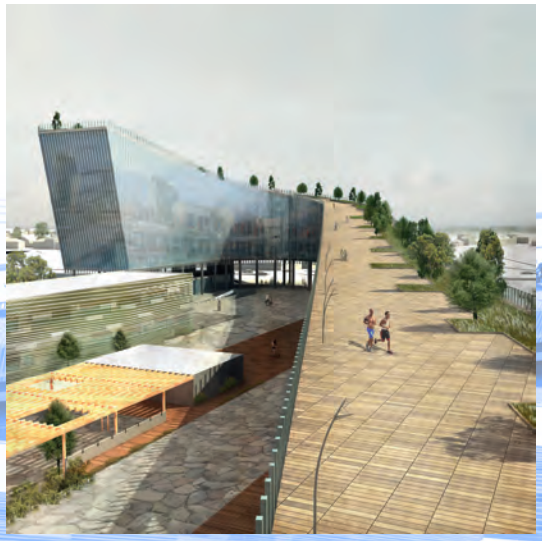
TAHAR KOUIDER



CONFERENCE PROCEEDINGS OF THE 6TH INTERNATIONAL CONGRESS OF ARCHITECTURAL TECHNOLOGY UNIVERSITY OF ALICANTE 12-14 MAY 2016

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Universidad de Alicante
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CONTENTS

TECHNOLOGY LANGUAGE AND FRANKENSTEIN STRATEGY

MANUEL PÉREZ ROMERO
IE School of Architecture.
Alcalá de Henares School of Architecture.
mpr@nodo17.com

Abstract. Teaching architecture is experiencing a moment of opportunity. New methods, like constructivist pedagogy, based on complexity and integration are yet to be explored. In this context of opportunity teaching architecture has a duty to integrate complexity in their curriculum. Teaching methods should also assume inherent indeterminacy and contingency of all complex process. If we accept this condition as part of any teaching method, the notion of truth or falsehood it becomes irrelevant. In this regard it could focus on teaching to contingency of language. Traditionally, technology is defined as the language of science. If we assume contingency as one of the characteristics of language, we could say that technology is also contingent. Therefore we could focus technology teaching to redefine its own vocabulary. So, redefining technological vocabulary could be an area of opportunity for education in architecture. The student could redefine their own tools, technology, to later innovate with them. First redefine the vocabulary, the technology, and then construct the new language, the technique. In the case of Building Technology subjects, it should also incorporate a more holistic approach for enhancing interdisciplinary transfer. Technical transfer, either from nature or other technologies to the field of architecture, is considered as a field of great educational possibilities. Evenmore, student get much broader technical approach that transgresses the boundaries of architectural discipline.
Keywords. *Integration, complexity, biomimicry, desfamiliarization, refamiliarization, technical transfer, Frankenstein and constructivist learning.*

1. Introduction.

There is no doubt that, in recent years, architecture has been subject to an exponential increase of its complexity. Due to position in blurred space between society and nature, architecture must provide answers to a growing number of factors. In this context, technology and technique are not the end but the means to meet this growing complexity. While technique could be defined as the skill to develop certain actions, technology is the set of tools that allow you to carry it out. Going back to blurred space between nature and society, architect has become a *man of action*, where its potential is more on technique than technology. Technique over technology is an inherently inclusive attitude, so it is difficult to separate it from the activity of the architect.

Due to architecture is an inherently complex discipline, it is necessary to reflect on the evolution of the curriculum of schools of architecture, and specifically in subjects regarding with technique and technology. Although the first thing one may ask, in this context of increasing complexity, is whether or not it is necessary a change in teaching methods.

2. Does complexity require new teaching and pedagogical methods?

The question would take us quickly to answer affirmatively. But before temptation, let's try to provide it with arguments. The first reflection has to do with the relationship between the number of hours spent in the curriculum regarding with building technology and the increasing complexity of architectural technology. In general, the technical subjects do not represent even 50% of teaching plans of schools of architecture. And surely they should not represent more.

Given this teaching load does not seem feasible to teach all knowledge related with materials and construction systems. Nor need. One of the main features of complexity is its own indeterminacy. The huge amount of architecture elements and systems, but not only technical, give its intrinsic complexity.

Let's go back to the previous question. If complexity has become an architectural feature, we could delve into new methods of learning as constructivist pedagogy (Piaget, 2001).[1] From this point of view teaching could be knowledge integrated action.

2.1. ACTIVE LEARNING: CONSTRUCTIVIST LEARNING METHODOLOGY.

Although constructivism is not a specific pedagogy, it is an oriented active learning where students construct knowledge from their own experiences. In this sense teacher should encourage students to challenge themselves and question their own strategies. Ideally, student must become *learner expert.*

In this sense, the role of the teacher is to be a mediator or coach, to help students make right questions. Constructivist pedagogy proposes to start from general concepts to parts, as opposed to the traditional system that began with parts to teach the whole.

Surprisingly, one of the origins of constructivist pedagogy goes back to a new discipline was once cybernetics. Initially founded by Norbert Wiener, cybernetics was set up to exercise control and communication over machines, and by extension to animals, since operational logic could be understood as similar. (Wiener, 1961) Later, Heinz von Foerster together with Gordon Pask developed second order cybernetic, which point of view changed, and focused on the proper subject observer. Thus giving rise to new methods of education and family therapy.

2.2 HOW COULD BE THE NEW TEACHING AND PEDAGOGICAL METHODS BASED ON COMPLEXITY?

Teaching architecture is experiencing a moment of opportunity. New methods based on complexity are yet to be explored. In fact, the so-called complexity theories are not one but multiple contributions, ranging from cybernetics (Wiener, 1961), Systems Theory (Von Bertalanffy, 1991) or

[1] It refers to the constructivist pedagogy initiated by Jean Piaget. Piaget's theory covered learning theories, teaching methods, and education reform.

Far-from-equilibrium Thermodynamic Dissipative Structure Theory (Ilya Prigogine, 1997) among many others. Recently, *Complex Thought* coined by Edgar Morin (Morin, 2011) is an attempt to unify these theories under what he calls self-eco-organization systems. Complex thought is an inclusive conception of knowledge, based on the Aristotelian maxim that the whole is more than the sum of its parts.

Constructivist pedagogy shares this integrative approach of knowledge. In this context of opportunity teaching architecture has a duty to integrate complexity in their curriculum.

3. The Technology Language (TELA) and the Frankenstein Strategy (FRAST).

The teaching methodology of Building Technology subjects taught by the author during the last five years at IE School of Architecture and Design is based on integration and complexity. Two subjects taught in successive quarters, Construction Systems and Construction Workshop, are linked by two evolutionary methods called by the author as Technology Language (TELA) y Frankenstein Strategy (FRAST). While the first is a process of concepts isolation, the second is a process of concepts integration. So the student will follow a nonlinear process where the TELA will feed the FRAST.

3.1. THE TECHNOLOGY LANGUAGE (TELA).

Teaching methods should also assume inherent indeterminacy and contingency of all complex process. If we accept this condition as part of any teaching method, the notion of truth or falsehood it becomes irrelevant. In this regard it could focus on teaching to contingency of language.

Traditionally, technology is defined as the language of science. If we assume contingency as one of the characteristics of language, we could say that technology is also contingent. Therefore we could focus technology teaching to redefine its own vocabulary.

So, redefining technological vocabulary could be an area of opportunity for education in architecture. The student could redefine their own tools, technology, to later innovate with them. First redefine the vocabulary, the technology, and then construct the new language, the technique.

TELA is a teaching methodology for the construction of a new technological language TELA is based on concepts unlike the traditional division between materials and construction systems. So, instead of implementing existing building systems is proposed to work with concepts associated with technology, and redefined by the student.

The student will begin a process from generic and open glossary, for its later redefinition. This glossary is formed by concepts associated with the implementation of a technology that it is to say, technique: *Watertight, Movement, Ornament, Transparency, In Process, Informal, Solid Ground, Out of Date, Low-Cost, Protection, Appearance and Atmospheric*[2].

3.1.1. Biomimicry and Tech-mimicry,

Through process of desfamiliarization students should investigate examples related to the above concepts, but from nature or from other technologies far from architecture field. Using techniques based on biomimicry, students are forced to leave comfortable areas of architectural discipline.

Biomimicry is a revolutionary new science that analyzes nature's best ideas. Through strategies based on biomimicry it is possible to study technologies occurring in nature for subsequent application to architecture. Biomimicry studies nature to find inspiration in it. Biomimicry comes to solving those human problems that nature has already solved. Also, it is possible to learn from nature how organism has adapted to unexpected situations throughout its resilience capacity.

Another inspiration source for students is technique and technology far away from architectural discipline. Technology level development in architecture is usually far behind other disciplines such as aeronautics, amusement parks, oil rigs or medical prostheses among many others; as

[2] TELA glossary is given by professor.

biomimicry is considered an area of great potential to study advanced technology. In this sense, student may discover examples associated with TELA glossary from nature or other technologies outside architectural discipline.

On each concept student must submit an explanatory sheet over example selected. Each sheet will contain a minimum graphic documentation drawn in black and white with at least a plant, section and detail. It can be illustrated with one photograph only as a reference and a brief explanatory text of no more than 120 words.

3.1.2. Desfamiliarization and refamiliarization.3

Once studied and analyzed the selected technique outside architecture discipline, shall be applied now to architecture by designing an artifact. It must be a minimum consistency between selected example and its application to the field of architecture. The student will submit a sheet with the same graphic documentation required for the example studied, but in this case on the newly designed device.

Pedagogically the student has made a return journey, based on a process of desfamiliarization and refamiliarization. In this sense student acquire a more global view of technique, not only from architectural discipline. Architectural technique expands by incorporating contributions from nature and other techniques. Finally, students understand technique from an interdisciplinary approach.

[3] The words desfamiliarization / refamiliarization are used in a similar sense than the deleuzian concept desterritoralization / machinic assemblages / reterritorialization.

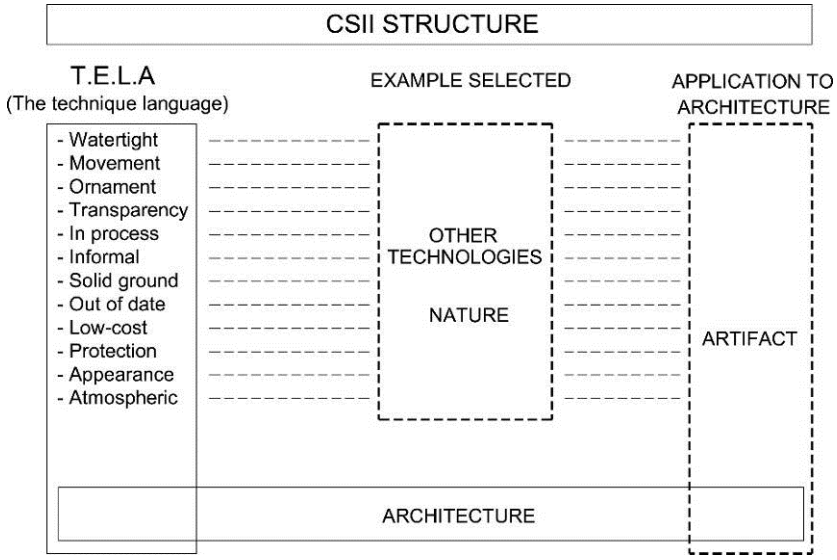

Figure 1- TELA STRUCTURE- The process of desfamiliarization / refamiliarization. Diagram by the author.

See in Annex I, TELA example.

3.2. THE FRANKENSTEIN STRATEGY (FRAST)

Once students have redefined and created its own glossary through the above process of desfamiliarization and refamiliarization, will begin a new evolutionary process based on integration.

So while TELA methodology was based on isolated layers system, the FRAST is focused on additive system. The layers correspond to glossary concepts redefined by students during TELA process.

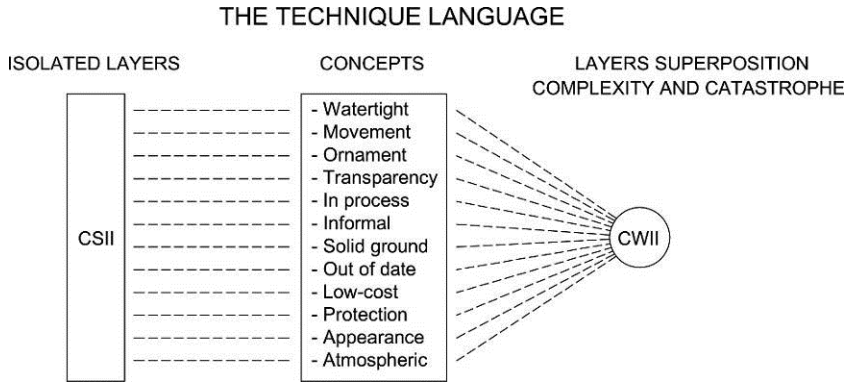

Figure 2- From TELA to FRAST. From isolated system to additive system. Diagram by the author.

Students will start a non-linear process that will end with the construction of unexpected artifact. Over one of artifacts made during TELA methodology, students will be adding and integrating more layers or artifacts. First integrate two concepts then three and so on to create a whole language. Thus, the vocabulary created during TELA finally becomes a language through the above additive principle.

FRAST is a strategy that forces students to integrate objects virtually impossible to unite, because of its so diverse origins, characteristics and scales. The FRAST is an exercise that is performed individually and collectively, by physical construction of Collective Frankenstein model.

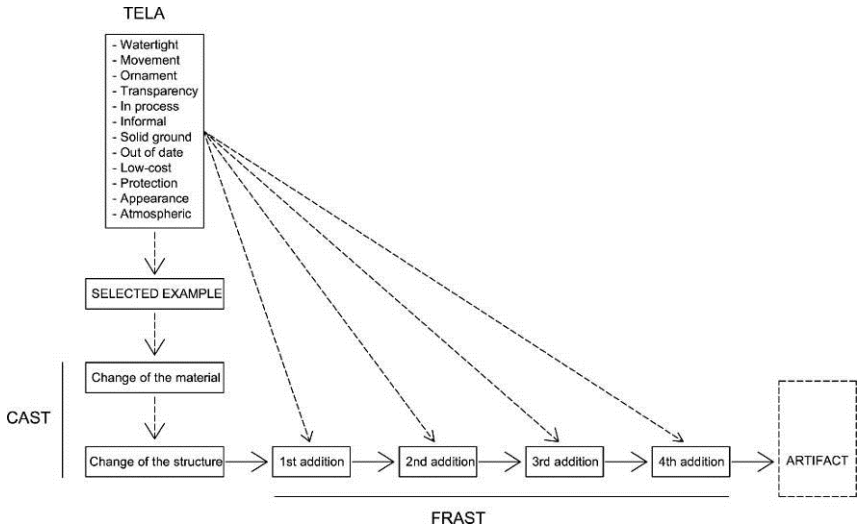

Figure 3- FRAST methodology. Additive principle. Diagram by the author.

See in Annex II, a collective and individual FRAST example.

4. Conclusion.

As noted at the beginning of paper, teaching methods in architecture are going through moments of opportunity. Changes in architecture should lead us to changes in teaching and pedagogical methods of schools of architecture.

The complex intrinsic condition of architectural discipline should enhance new teaching methodologies. In the case of Building Technology subjects, it should also incorporate a more holistic approach for enhancing interdisciplinary transfer. Technical transfer, either from nature or other technologies to the field of architecture, is considered as a field of great educational possibilities. Even more, students get much broader technical approach that transgresses the boundaries of architectural discipline.

On the other hand, use of evolutionary pedagogies help students to construct their own knowledge. The results of TELA and FRAST methodologies, over the last five years, seem appropriate to integrate knowledge and apprehend parts from whole.

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ANNEX I- TELA METHODOLOGY.

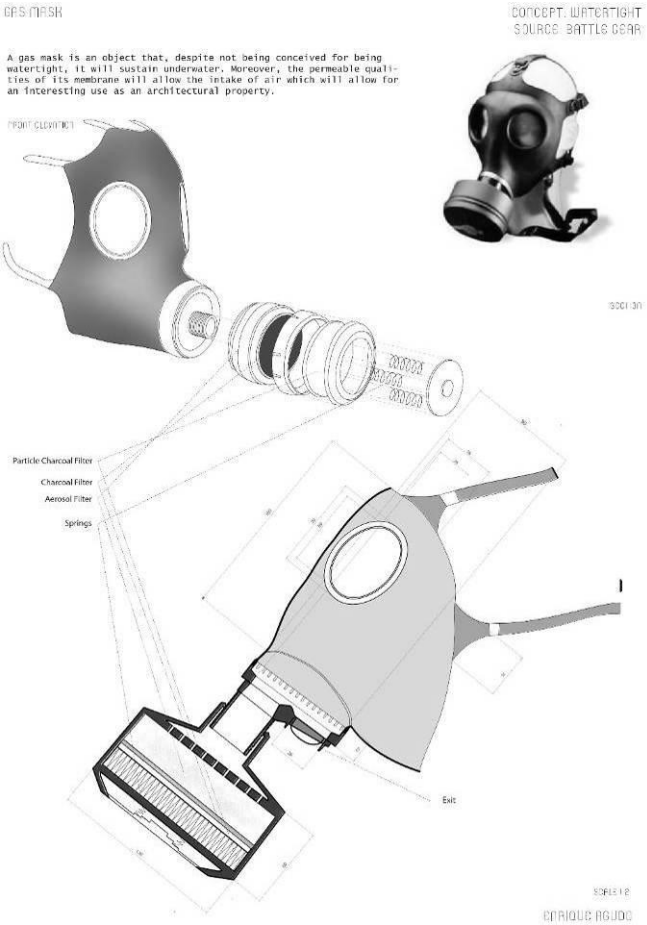

Figure 4 . *Student's work from TELA methodology.Work from Enrique Agudo. After studying technology example outside architecture (in this case a gas mask) the student will apply it to architecture through the construction of an artefact (a window protection device for chemical wars)*

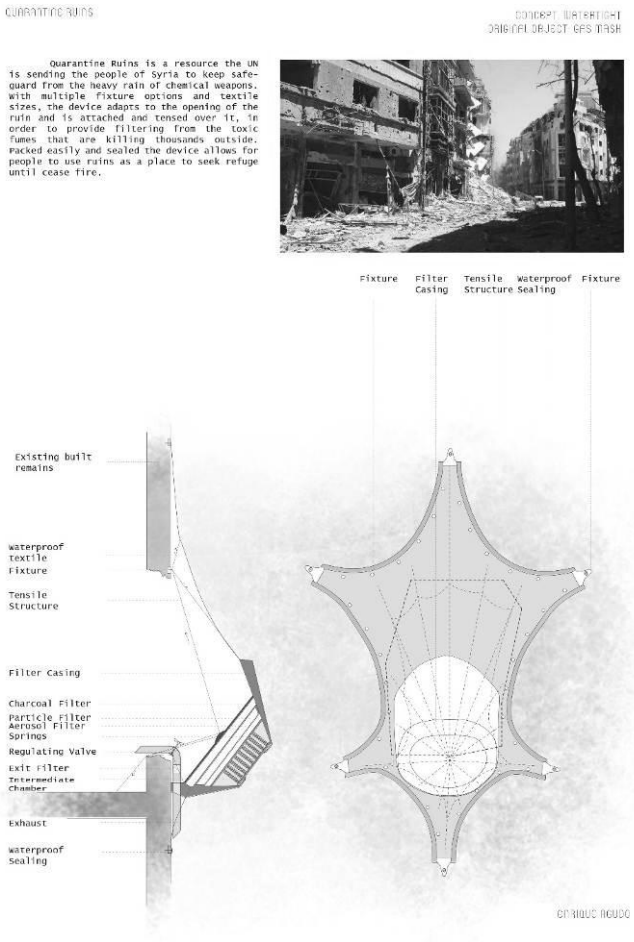

Figure 5. Student's work from TELA methodology. Work from Enrique Agudo. After studying a technology example outside architecture (in this case a gas mask) the student will apply it to architecture through the construction of an artefact (a window protection device for chemical wars)

ANNEX II- FRAST METHODOLOGY EXAMPLE.

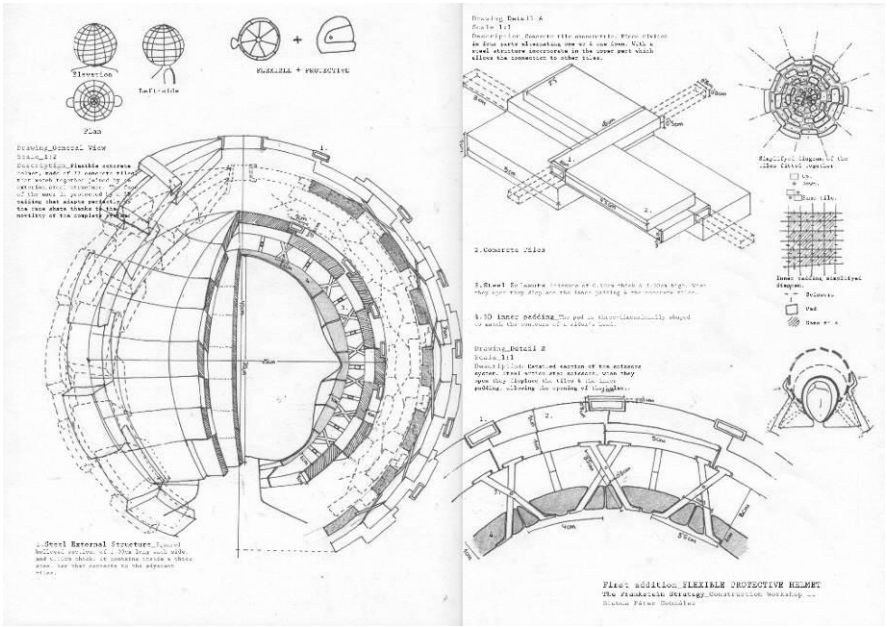

Figure 6. Student's work from TELA methodology. Work from Blanca Pérez

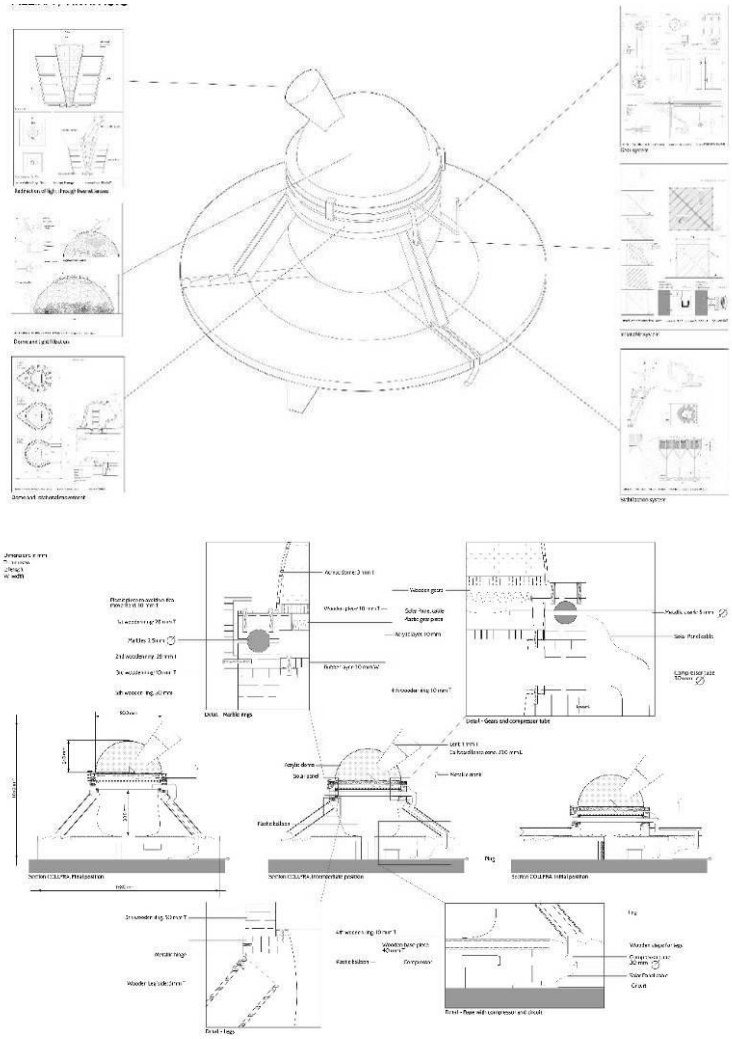

Figure 7. FRAST methodology. Collective Frankenstein. Student group: Mar Morris, Elena García, Ismael Fernández, Montserrat Gutiérrez and Andrés Antolín. A technological artifact made from completely different parts.