DRS2016
Design + Research + Society
Future-Focused Thinking

2016 Design Research Society
50th Anniversary Conference
27-30 June 2016, Brighton, UK

Sharing 10 years of experience with class AUP0479 – Design for Sustainability

Maria Cecília Santos[a], Tatiana Sakurai[b], Verena Lima[c*]

[a]Faculty of Architecture and Urbanism, University of São Paulo, Brazil
[b]Faculty of Architecture and Urbanism, University of São Paulo, Brazil
[b]Faculty of Architecture and Urbanism, University of São Paulo, Brazil
*closchia@usp.br; tsakurai@usp.br; verenalima@usp.br

Abstract: Unsustainability, be it environmental, social or economic, is a feature of our contemporary society. This complex challenge affects every aspect of the design field, such that moving towards sustainability requires profound changes to current practices and goals. This paper argues that design, in practice, must contend with real emerging issues, and especially in large urban centers. This paper discusses 10 years of experience with the elective university course AUP0479 - Design for Sustainability offered by The Faculty of Architecture and Urbanism - FAUUSP, Brazil, which deals with the work of the local COOPAMARE waste pickers cooperative. The class operates with design for need rather than design for greed as a foundation. As an observation on the span of the course's history, it raises questions and points to future opportunities for integrating sustainability in design teaching.

Keywords: education; design; sustainability; solid waste.

1. Introduction

> "We stand at a critical moment in Earth's history, a time when humanity must choose its future. ... We must join together to bring forth a sustainable global society founded on respect for nature, universal human rights, economic justice, and a culture of peace. Towards this end, it is imperative that we, the peoples of Earth, declare our responsibility to one another, to the greater community of life, and to future generations. ... Let ours be a time remembered for the awakening of a new reverence for life, the firm resolve to achieve sustainability, the quickening of the struggle for justice and peace, and the joyful celebration of life." (The Earth Charter, 2000)

15 years after the publication of this letter of intent and almost 30 years since the publication of the report *Our Common Future*, we are still far from overcoming the unsustainable conditions of our current society and our own future. 2015, the year the

United Nations and 185 world leaders had established as the deadline for achieving the *Millennium Development Goals* (MDG's)[1], aimed at eradicating poverty, a number of the eight major goals outlined in the MDG report [2] suggest significant progress including: a progressive decline in the number of people living in extreme poverty, improved access to clean water, increased primary school enrollment and diminishing child mortality rates. In September this year the United Nations Sustainable Development Summit established the *2030 Agenda for Sustainable Development*, including *17 Sustainable Development Goals* (SDG's)[3]. These are intended to end poverty, hunger and inequality, take action on climate change and the environment, improve access to health & education, build strong Institutions and partnerships, and more. These goals are aligned with the focus areas of the *United Nations Development Program*'s (UNDP) strategic plan: sustainable development, democratic governance & peace building, and climate and disaster resilience.

We are 7 billion people, with more than half of us living in urban areas, seeking quality of life and the benefits of an economic system based on mass production, consumption, waste and disposal. Everything we do, buy and use, on an individual or collective level, has a direct impact (Fry, 2009). What is called the *development model* has, "... a complex logic of economic, social and cultural relations, and the policies of global capitalism ...," causing disparities, social divisions, homelessness and the exploitation of workers among other equally significant consequences (Santos, 2014, p.46; Walker, 2014). According to the UNDP[4] (2015), 1.5 billion of us live in poverty with the added burdens of poor health, education and a low standard of living. However, there are 1.8 billion people between the ages of 10 and 24, more young people than ever before, which represent, "... unprecedented potential for economic and social progress …" (United Nations Population Fund [UNFPA], 2015[5]; Sahtouris, 2002). At the same time, these young people are mostly concentrated in developing countries, living in extreme poverty or in contact with it and thus on the threshold and potentially at risk. According to the UNFPA (2015), "... with proper investment in their education and opportunities, these young people's ideas, ideals and innovations could transform the future."

Achieving sustainability depends on systemic and holistic change, principally on improving current economic models, and as pointed out by Braungart and McDonough (2009), the intellectual disciplines that create and support them. In the context of this system, according

[1] They are: 1. Eradicate extreme poverty and hunger; 2. Achieve universal primary education; 3. Promote gender equality and empower women; 4. Reduce child mortality; 5. Improve maternal health; 6. Combat HIV / AIDS, malaria and other diseases; 7.Ensure environmental sustainability; 8. Develop a global partnership for development.
[2] *The Millennium Development Goals Report,* available at: http://tinyurl.com/p92xdd3.
[3] They are currently: 1. No poverty; 2. Zero hunger; 3. Good health and wellbeing; 4. Quality education; 5. Gender equality; 6. Clean water and sanitation; 7. Affordable and clean energy; 8. Decent work and economic growth; 9. Industry, innovation and infrastructure; 10. Reduced inequalities; 11. Sustainable cities and communities; 12. Responsible consumption and production; 13. Climate action; 14. Life below water; 15. Life on land; 16. Strong peace and justice Institutions; and finally, 17. Partnerships for the goals. Available at: http://tinyurl.com/pqo2nar.
[4] Available at: http://tinyurl.com/pb6xjp3.
[5] Available at: http://tinyurl.com/n9po8gg.

to Walker (2014), the combination of product design and advertising has become a powerful tool of persuasion aimed at driving consumption. The regular changes and updates to designs and styles, and their consequent aesthetic and technological obsolescence, have become driving forces in design, and are mainly in the service of increased sales and profits. Contemporary society is essentially a consumer society, reinforcing a superficial and limited view of design.

As highlighted by Fry (2009), it is necessary that industrial culture be reconfigured, which will only happen through design and through its redesign. This transformation of design implies a re-education process of the practice itself in which the designers begin to operate in new spheres of influence, well beyond those currently available to them and where they shape and create products based on true need. Similarly for Walker (2014), a move in this direction requires considerable changes in practice and re-examination of the very purpose of design itself. This would require new priorities where technological and psychological obsolescence, the objectives of which are to create dissatisfaction and encourage consumption, cease to drive design. The new priorities would need to go beyond punctual, mollifying transformations, and profoundly rethink the nature of our material culture.

It is essential that design be able to act, reflect and consider new contexts and scenarios independent of those prevailing and exclusively dedicated to consumption— especially those solely accessible to the few wealthy consumers and aspired to by masses. Furthermore, these new contexts and scenarios would fully manage materials and by-products, both pre- and post-consumer. This is especially relevant to Brazil where the acute contrast of wealth and poverty coexist as a persistent quotidian reality without any real dialog. We must consider design in the context of life at the margins, apart from wealth, reconstruct design practice and harness its power as an agent for social change. It is essential to understand design possibilities as agents of intervention, addressing the emerging challenges in large urban centers. As pointed out by Papanek (1974, p. 219) in his seminal book *Design for the Real World: Human Ecology and Social Change*, it is fundamental, "... to design for people's *needs* rather than their *wants...*".

This discussion about reconfiguring design education and practice is very much of the moment and has been addressed in several papers, many of them published and presented in conferences dedicated to the subject[6]. Considering that education is at the core of experimental and professional design practice, Santos (2013) makes clear that this is an effective way to disseminate ideas regarding a variety of contexts and it is possible to address emerging issues such as the management of materials in production and waste cycles, as well as urban poverty. However, Margolin (2014) rightly points out that these issues are scarcely addressed in the academic environment.

[6] Some recent conferences that addressed the repositioning of practice and teaching in design include LearnxDesign: the 3rd International Conference for Design Education Researchers (2015), Unmaking Waste Conference: Transforming Production and Consumption in Time and Place (2015), and Design with the other 90%: Cumulus Johannesburg Conference (2014).

Therefore, design education is a crucial discussion topic[7]. As argued by Santos (2013) on the basis of Margolin (2014), current design pedagogy in a vast majority of schools is oriented toward the market, consumer needs, their privileged conditions and fosters awareness of consumer culture rather than real problems. Recalling a passage by Papanek (1974), Santos (2013) emphasizes that, in the context of design education, problems arise due to the lack of connection with the real world—apart from a population that is privileged in terms of wealth, culture and technology. It is therefore crucial to connect with this real world and its needs, which are often local. In this sense, Fry (2009) emphasizes that students be confronted with the local environmental, social and economic context in order to redirect and develop their skills, and that classes should include content that promotes critical reflection.

Specifically regarding the Brazilian context, Santos (2014) points out the importance of design students confronting otherness in their own context, such as the large population of homeless and roaming recycling waste pickers—those people often disregarded in design education due to their marginal status. In line with Fry (2009), Santos (2014) adds that design practice could effectively contribute in these scenarios. In response to this situation, an elective course was offered to undergraduate students of the Architecture and Urbanism Faculty at University of São Paulo - FAUUSP in 2003, which addressed design for social responsibility and sustainability. Active and critical participation with waste pickers from the Autonomous Collectors of Paper, Cardboard, Shavings and Reusable Materials Cooperative[8] (COOPAMARE) was central to this class'work from the outset.

The experiences and activities of these classes have already been presented in several studies[9] over the past few years. The goal in this paper is to address its 10-year history, reflect on the changing context, profiles and themes of work undertaken by participants and to generate qualitative indicators that facilitate future study.

2. Methodology

The literature review and contextualization about the matter of sustainability introduce the paper and situate the course AUP0479 - Design for Sustainability in relation to the issue.

Then, the paper analyses the course from the following data since its beginning up until now:

[7] The Earth Charter (2000) establishes as one of its guidelines: "Integrate into formal education and life-long learning the knowledge, values, and skills needed for a sustainable way of life. a. Provide all, especially children and youth, with educational opportunities that empower them to contribute actively to sustainable development. b. Promote the contribution of the arts and humanities as well as the sciences in sustainability education. c. Enhance the role of the mass media in raising awareness of ecological and social challenges. d. Recognize the importance of moral and spiritual education for sustainable living."

[8] COOPAMARE, the first waste pickers' cooperative in Brazil, was founded in 1989.

[9] Some of the works are: "Re-shaping Design - The teaching experience at COOPAMARE: listen to the collector's voice" (2004), "Design for social responsibility: perspectives on students' work" (2005), "Design education against exclusion: from COOMAPARE to CAMAPET" (2006), "Educational experience in design for sustainability: enhancing a critical perspective among undergraduate students" (2013), and "Teaching design in unsustainable conditions" (2015).

- Systematic discuss and notes about the classes, realized by professors Maria Cecília Loschiavo dos Santos and Tatiana Sakurai, and by monitor Verena Ferreira Tidei de Lima;
- Review of specific literature;
- Comparative analysis of class programs and activities (2003- 2015);
- Numerical data regarding the course (number of students, projects developed and frequency dropout rate of students);
- Digital data: video recordings and photos along the years;
- Testimonies of some participants: students, members of the COOPAMARE, invited speakers, professors and monitors, collect by interviews and questionaries;
- Projects and proposes developed by the students;
- Participation in scientific events presenting the class experience and collecting impressions.

Much of the data was collected and systematized through the on-going project "10 years of experience in elective course AUP0479 - Design for Sustainability: Education and Learning". The project is further clarified in this paper.

The data analysis was conducted in the light of the sustainability discourse, comprehending its evolution over the years. The parameters used were the inputs provided by the course and the results achieved by the students, in order to verify the relations between them, as it is shown in the figure below:

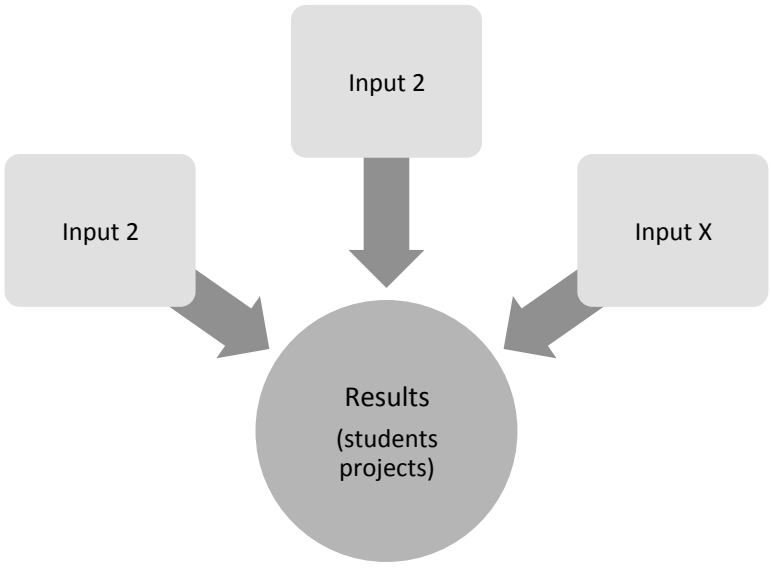

Figure 1 Parameters of data analysis

The database is quite select. However, as pointed by Sears (1986), such a fact does not threaten the validity of the results. In his paper, Sears (1986) discuss about the influences of

a narrow database on research. Although the discussion conducted by Sears along his paper concerns another field of research, his statement regarding the validity of the results is accurate, specially if we consider that here, in this paper, the presented conclusions represent a view of a specific experience to which the database used is directly connected.

Naturally, in the case of using the main findings in other experiments and in different contexts, there should be the awareness that the results may or may not be the same.

3. Origins and objectives of Class AUP0479 – Design for Sustainability

This class was created in 2003 by Full Professor Maria Cecília Loschiavo dos Santos at the FAUUSP, and was offered to undergraduate students of Architecture and Urbanism. Since 2014, the course has been given in conjunction with Professor Tatiana Sakurai. It is elective, with a workload of sixty semester-hours distributed among fifteen weekly classes, and is offered annually in the second semester from August to December. The students can choose from a catalogue of options the classes with specific knowledge that will complement the basic curriculum, and the class AUP0479 - Design for Sustainability is one of many options. It is a theoretical and practical design course that combines various educational activities: lectures by visiting experts, site visits to COOPAMARE, theory lectures, design exercises, and presentations.

The class objectives are:

- Introduce students to the requirements of environmentally sustainable design; investigate the possibilities and limits of integrating sustainability with product design;
- Stimulate new ways of considering design that prevents product disposal and promotes re-utilization in the urban environment, including electronic component waste;
- Develop understanding of the concepts of sustainable design and its social interface;
- Develop understanding of solid waste production in urban areas with an emphasis on the environmental education of consumers and the role of recycling pickers cooperatives as key actors in the reduction and management of waste;
- Develop understanding of waste reduction of in the design process.

With these objectives the course focuses specifically on the very relevant sustainable recycling being done by waste pickers, mainly within COOPAMARE, under the direction of professor Santos who pioneered this educational program. The cooperative, easily accessible but invisible both socially and spatially, is located on the Galeno de Almeida Street, within a semi-open shed underneath the Paul VI highway overpass in the Pinheiros neighbourhood on the western side of São Paulo (http://tinyurl.com/o6c9mzu). The region has hilly terrain,

with a population density of 9.14 inhabitants per square kilometer[10] with high-income, amid mixed use residential, service, office, retail and library buildings.

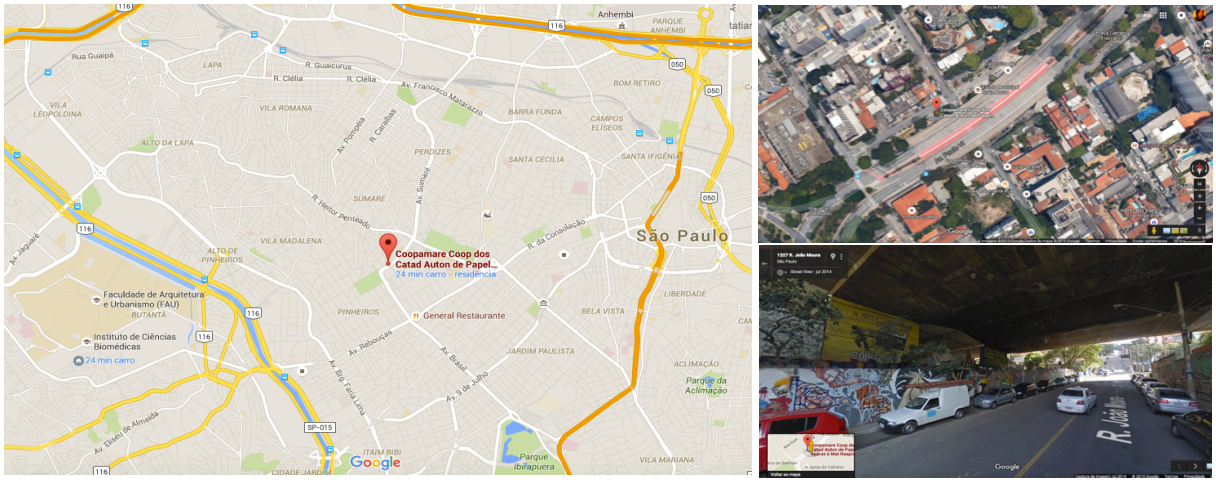

Figure 2 Location of COOPAMARE via Google Maps. Details: Satellite Photo via Google Maps of COOPAMARE and its surroundings. The cooperative is located under the overpass and flagged in red.

3.1 The class: dynamics and teaching methodology

The class has evolved since its beginning, having gone through several changes. It is currently divided into two main stages: the first theoretical and the second practical, each composing nearly 50% of the whole class.

In the first stage, students are introduced to a variety of sustainability concepts and interventions of differing scope and scale that become the subject of study and foundation for identifying key relationships and points of conflict within social and environmental spheres. In this context, the problem of waste is discussed, and as formerly reported by Santos (2013), the course considers such related topics such as social equality, class domination, gender and privilege. It consistently conducts critical assessments of the performance and behavior of design in relation to these factors. The National Policy on Solid Waste (PNRS, Law 12.305), adopted in March, 2010, by the Brazilian legislature, is also widely discussed in the classroom.

At first, these contents are discussed in theory lectures and by visiting experts from disparate fields beyond the field of design and architecture, including: management, environmental management, law and engineering, among others. Along with these experts, researchers, teachers and representatives of civil organizations is the recycling collector and community leader Eduardo Ferreira de Paula,who brings his invaluable insights to the discussions on the PNRS, COOPAMARE and the work of recycling pickers. So often ignored in academic settings and traditional design school curricula, it is a unique privilege that the

[10] Information provided by the city hall website (Prefeitura de São Paulo, *Dados demográficos dos distritos pertencentes às subprefeituras*): http://tinyurl.com/3far3mu.

class, the students and the FAUUSP as a whole, have access to such authentic and profound knowledge on this theme amassed from the collectors. At this point in the class, reference texts are read, discussed, and presented by the students.

Late in the first stage students are brought to COOPAMARE. Visiting the cooperative, students have the opportunity to observe the dynamics and monitor in detail the work of the recycling pickers. It is also an opportunity to talk to the collectors in their working environment enabling knowledge sharing in a way that minimizes the barrier of acute social hierarchy.

The visit to COOPAMARE completes the first stage of this class, and it is here that students identify sub-themes of interest, which will guide their projects in the second stage. ok

Having identified the sub-themes of interest from activities conducted in the first stage and subsequent brainstorming, students form into in small groups of up to four members to start the second stage of the class.

The second stage is essentially practical, and includes the development of student projects. The three steps follow described below:

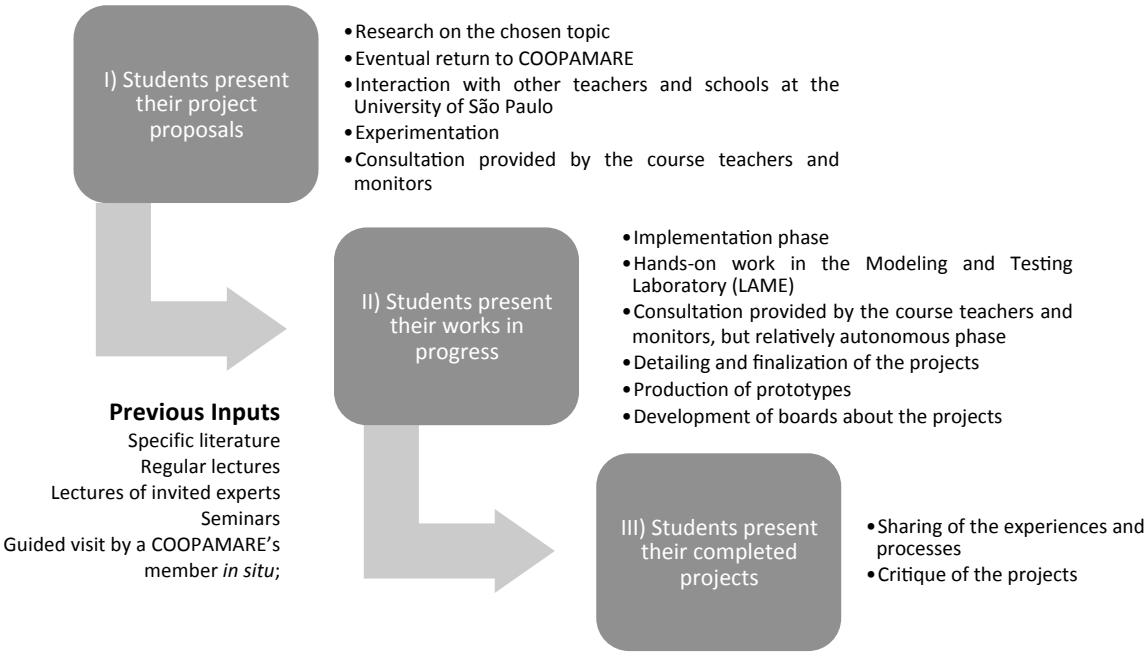

Figure 3 The three steps of the second stage

Student performance, continuously assessed both individually and collectively, is considered as a whole within in the context of all their activities throughout the semester. Regarding the projects themselves, the design process is as important as the result. In 2015, we began employing a knowledge consolidation questionnaire immediately after the first stage in an attempt to identify the content assimilated by students up to that point. Unlike a test, the questionnaire asks students to comment on the content covered in a frank and open

manner and to elaborate on its impact on their education. We look forward to finishing this year by opening an exhibition of works to the larger FAUUSP community and with the now essential and traditional presence of coop members on the jury panel to critique student work.

Figure 4 Several activities of the class

3.2 The students

Since its inception, this course had aroused the interest of a considerable number of students. Because it is elective, students choose it based on their interests and identification with the subject. Each year, between fifteen and twenty students typically enroll in the course. However, in 2015, forty-three students enrolled.

In the very first class students are asked what motivated them to enroll. A common response is that this is the only class at Faculty of Architecture and Urbanism that addresses the issue of sustainability specifically and directly. Many express personal and professional interest in the subject and consider it to be urgent and extremely important today. Some students, having just arrived from an exchange program (mostly in European countries), mention that they have studied the subject in their foreign school. In general, two points recur among the students: the importance of this course because of its focus and personal and/or professional identification with the issues it examines.

It is important to note the course´s growing number foreign exchange students. The FAUUSP receives many such students from a wide variety of countries, including Colombia, Venezuela, Mexico, Spain and France. In 2015, nine of the forty-three students enrolled were from foreign universities. The presence of these students provides a rich and diverse range of experiences in the area of resource and waste management. This marks quite a departure for Brazilians, promoting two-way learning.

Students' impressions of COOPAMARE are also noteworthy. After visiting, they make a remarkable range of observations. While many students feel the cooperative and its space are surprisingly large, others consider it to be small in relation to the size of a megacity like São Paulo. Many students report a noticeable organization and systematization of activities, while others focus on the informality of transactions conducted on site. They are, however, unanimous in their remarks on the massive amount of waste accumulated in the cooperative versus the small number of people working there. Students frequently note the waste sorting processes, with an emphasis on the separation of different plastics and the collector´s know-how in regard to procedures. Thus, the visit to COOPAMARE provides students with a critical and real understanding of the daily excesses of production, consumption and disposal in a megacity like São Paulo. It also allows them to discover the extremely vulnerable human dimension of this population and their unique knowledge.

3.3 The projects

There are a variety of proposals related directly or indirectly to COOPAMARE: new products made from discarded materials found in the cooperative; construction materials and finishes to be derived from waste; management and work safety procedures; projects that raise awareness among the surrounding population; communication platforms connecting members, the larger society, government and other cooperatives; educational games for children; inexpensive everyday architectural solutions for the cooperative; cell phone applications regarding the work of the collectors; tools that optimize the activity of collection and separation; and many more.

Projects not directly related to COOPAMARE are common, but the problem of waste production and management as a whole remains central. The variety of design projects underscores how inspiring the topic of resources disposal is to our students. Moreover, issues such as urban poverty and homelessness also attract a great deal of attention from students who choose to develop projects dealing with these issues.

It is possible to see significant changes in projects undertaken by the students over the 10 year history of this course. Many of these are related to the advent and spread of certain technologies and platforms—such as the Internet and smartphones—and also the evolution of critical discussions and reflections on the production and management of waste as a whole.

Initially, the projects developed by the students were often related to the use of recyclable materials found at COOPAMARE. Many of these resulted in products (Figure 5), and the recyclable materials chosen were often used in the raw state in which they were found.

Figure 5 Cardboard Bench made from folds and cuts in the material. Student: Camila Souza. Year: 2004.

Over the years, rehabilitation projects which intervened physically in COOPAMARE began to emerge, as well as projects related to awareness of the cooperative (Figures 6 and 7) and waste management.

Figure 6 Nameplates on the cart used by collectors. The sign reads: "Be careful, collectors at work". Students: Joyce Delatorre and Marisa Bueno and Souza. Year: 2006.

Figure 7 Poster publicizing COOPAMARE and its services. Information includes: "who we are", "where we are", "materials we collect", "how to help", "location", "partners", and "support". Students: Ana Gabriela Akaishi and Suzana Bozza. Year: 2009.

In the last three years, new communication and information technologies have permeated several projects, including smartphone applications (Figure 8) and websites related to the collection and disposal of waste (Figure 9). Services have also cropped up among recent projects (Figure 10).

Figure 8 Mobile phone application: educational game based in the activities of waste pickers. Student: Juliana Eiko Hiroki. Year: 2014.

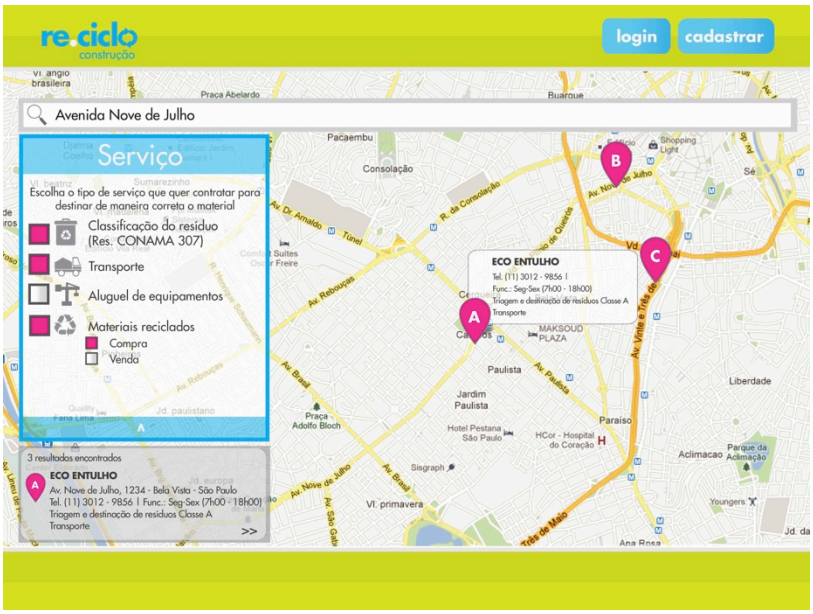

Figure 9 Virtual tool for the disposal of construction waste. Students: Andreia Tagomori and Denise Kaminaga. Year: 2012.

Figure 10 A system for accumulating points based on selective collection, and aimed at reducing waste generation. The less waste produced by an individual each week, the greater the number of accumulated points they receive that can be redeemed for benefits—much like an airline miles program. Student: Juan Garcia. Year: 2014.

Most projects focus on experimentation and direct manipulation of solid waste as a crucial component to the design process. The produced items are intended for domestic or public use, individually or collectively, or as systems, and as building construction components, and these have been well explored. Several projects can be seen at *http://aup479.jimdo.com*, the website itself was developed as the final project of student Rodrigo Yudi Honda in 2010. Others have been shown in works[11] previously published on the course.

It is worth mentioning that a project developed by a student in 2012 resulted in a patent application filed with the National Institute of Industrial Property (INPI) in 2014[12]. This was inspired by a class lecture by Lucia Helena Xavier, a researcher at the Joaquim Nabuco Foundation who at the time had been working on her postdoctoral studies on the reverse logistics of electronics waste at the University of São Paulo.

In this sense, it is remarkable to point that the inputs provided by the course have strongly influenced the results achieved by the students. The projects often reflect the emphasis adopted during the first stage of the course. It can be observed below:

[11] Some of the works are: "Re-shaping Design - The teaching experience at Coopamare: listen to the collectors' voice" (2004), "Design for social responsibility: perspectives on students' work" (2005), "Design education against exclusion: from Coopamare to Camapet" (2006), "Educational experience in design for sustainability: enhancing a critical perspective among undergraduate students" (2013), and "Teaching Design in Unsustainable Conditions" (2015).

[12] The University of São Paulo aided the process. Application to the INPI has been made and is awaiting review. The design is of a tool for optimizing the separating of certain materials from electronic waste.

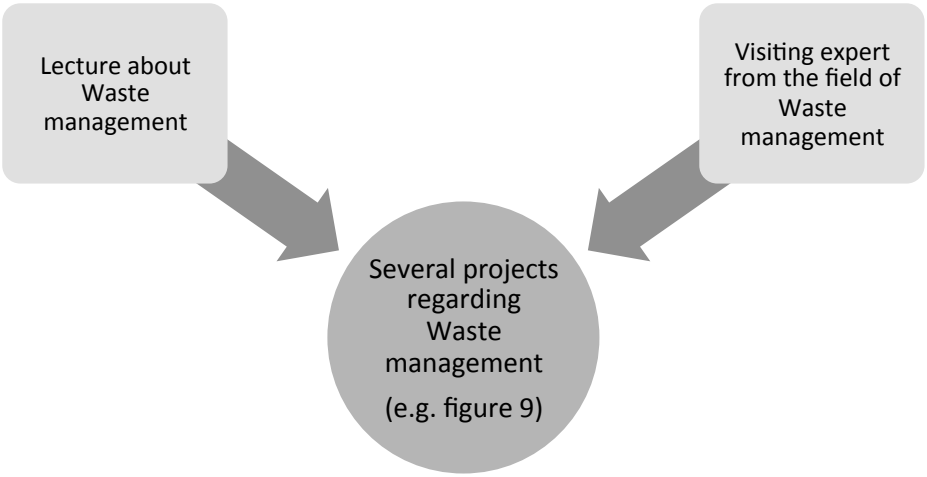

Figure 11 Emphasis on the inputs provided and the results achieved

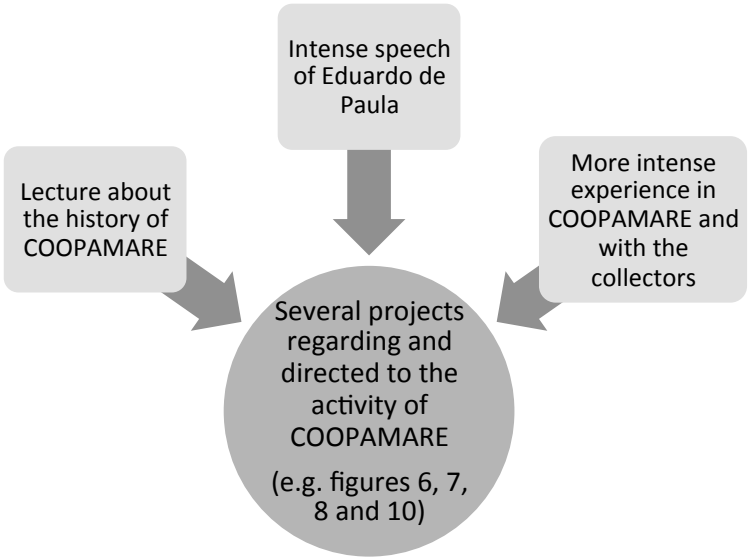

Figure 12 Emphasis on the inputs provided and the results achieved

4. The project "10 years of experience in elective course AUP0479 - Design for Sustainability: education and learning"

With the Dean of University Culture and Extension from the University of São Paulo, the project "10 years of experience in elective course AUP0479 - Design for Sustainability: education and learning" was approved in 2015. The one-year project, begun in August 2015, is coordinated by professors Santos and Sakurai, with the participation of two scholarship undergraduate students, Deborah Piacente de Oliveira and Yedda Magalhães Figueredo, and in collaboration with the doctoral student Verena Ferreira Tidei de Lima.

The project aims, in general, to gather and systematize the content, methodology and results achieved by the class so far, and make them available to the public through the restructuring and improvement of an existing website and through the publication of a book (digital and/or printed). These activities are intended to expand and support discussion and reflection on the classes' theme, and will include an international perspective.

A variety of information on the class has been accumulated, some unknown until now and some even forgotten, including: changes in nomenclature, enrolled students, several developed projects and related publications, among others contents. In the next step, former students will be contacted (many of them now graduates) in order to collect as much information and available materials as possible about the projects.

5. Final considerations

Unsustainability, a prominent aspect of our contemporary society, is primarily related to an economic system and its patterns of excessive production and consumption, the consequences of which are environmentally and socially harmful. Among these is the problem of waste production and management, especially in large cities like São Paulo.

Changing this condition is a very complex issue that permeates the design field, the current activity of which is predominantly directed at consumption—especially consumption practiced by privileged parts of society. Thus, a considerable change in the practice and purpose of design is required, one in which obsolescence is not the main driver and consumption not the first priority. One must consider design in different contexts, outside the exclusive context of consumption, and instead integrated with the issue of waste. Especially in Brazil, it is essential to understand design as a discipline of knowledge that is able, through teaching and research, to train agents of change confronting challenges that include the production and management of waste, as well as urban poverty, among other issues.

If we consider education as an important means of disseminating new ideas in a variety of contexts, it is essential to discuss the inclusion of emerging issues in design education such as those mentioned above. The current design education paradigm is oriented toward consumption, which makes re-orienting it toward real problems and needs that much more urgent and crucial.

The elective course AUP0479 - Design for Sustainability, first proposed by Professor Maria Cecília Loschiavo dos Santos in 2003, is based in the perspective of Design for Need, instead of Design for Greed. Its sphere of activity is the theme of waste, and specifically the recycling work of COOPAMARE members and of waste pickers in general.

Analysis of the evolving path and changes occurring in the discipline in question, together with the dynamics of this class and results achieved to date, raise further questions and points which are addressed below.

The flattening of hierarchies and the multiplicity presented in this class, especially in its early stages, are certainly among its greatest assets. The possibility of interaction between students and experts from various fields and backgrounds—academic or otherwise—have brought a diversity of views to the question of design, expanding the possible paths to approaching it, and contributing in a very significant and productive way to the accumulation of knowledge regarding issues of waste production and management, collectors of recyclable materials, and the area of design for sustainability as a whole.

Regarding the participation of specialists from various fields, it is particularly important to note that a visiting professor and researcher of reverse logistics was instrumental to one student´s patent application in 2012.

Interest in the subject must also be highlighted. Growing demand by students points to a rising interest in this important field. Because of this, it would appear important to argue for the possible incorporation of classes of this nature in school curricula in a binding and definitive way. It is also therefore valid to question the lack of other classes oriented toward sustainability at FAUUSP. In interviews with select alumni of the course is observed the concrete "lifelong learning" concept advocated by Su et al. (2011, pp. 158) for which the “institutions of higher education must reconsider and reframe their curricula and pedagogy to develop students who become lifelong learners capable of creating a desirable and sustainable future”.

The opinions and insights of students are key to the construction and evolution of this class and reinforce its horizontal organization. Students’ design process is a crucial component and is as important as the final outcome of their projects. Experimentation is one of the classes’ most valuable features, especially in the second stage whatever the projects. Transferring the class to a room beside the LAME brought many benefits because the students could devote themselves more readily to active experimentation and implementing their projects. Learning is often based on empiricism that is built up during the design process and allows for personal and professional development that is both critical and autonomous.

The evolution of student projects allows us to infer that, year after year, they have understood with ever more clarity the complexity of sustainability issues as a whole. Tackling new issues such as homelessness and civil construction shows that the course is fulfilling its purpose to address real needs and problems of our currently unsustainable context. Incorporating technologies from their daily life into their projects as the tools and platforms they choose in tackling these contemporary challenges, reflects the level of student commitment and further underscores the topical and urgent nature of the class.

The completion of the culture and extension project "10 years of experience in elective course AUP0479 - Design for Sustainability: education and learning" will enable significant study into its means, methods and future possibilities. The dissemination of project results

(via website, and a digital and/or printed book) will ensure national and international reach to this discussion.

The increasing scope and complexity of the discipline to keep in step with the challenges of sustainability only serves to highlight the immediate value and continual relevance of this course. The educational experience of the class, by engaging students with new perspectives and possibilities for learning and taking action via design, has allowed them to explore emerging issues in the real world and to develop innovative responses in the form of class projects. The multiplicity of results presented by students shows the potential of design in contexts beyond mere consumption and urges consideration of replicating such an educational experience at other learning institutions.

Acknowledgements:
Coordination for the Improvement of Higher Education Personnel - CAPES.
Dean of University Culture and Extension from the University of São Paulo.
To designer Matthias Brenddler for final review.
To all COOPAMARE members, students, teachers, researchers and monitors who were with us on this journey.

6. References

Braungart, M. & McDonough, W. (2009) *Cradle to Cradle: Remaking the Way we Make Things*, Vintage.

Breytenbach, A. & Pope, K. (2014) Design with the other 90%, *in Cumulus Johannesburg Conference Proceedings*. Johannesburg, South Africa, Greenside Design Center & University of Johannesburg.

Factum, A. B. S. & Santos, M. C. L. (2006) Design education against exclusion: from Coopamare to Camapet. in *Conference Proceedings IV Global Conference on sustainable product Development and Life Cycle Engineering*, São Carlos : Suprema, v. 1.

Fry, T. (2009) *Reconstruções: ecologia, design, filosofia*, Editora da Universidade de São Paulo.

Margolin, V. (2014) *Políticas do artificial: ensaios e estudos sobre design*, Record.

Papanek, V. (1974) Design for the real world. Human ecology and social change, Paladin Books.

Prefeitura de São Paulo. (2010) *Dados demográficos dos distritos pertencentes às subprefeituras*, http://tinyurl.com/3far3mu, (Accessed 7 November, 2015)

Sahtouris, E. (2002) *Skills for the age of sustainability: an unprecedented time of opportunity*, http://tinyurl.com/2vc3ryc (Accessed 23 November, 2010).

Santos, M. C. L. (2004) Re-shaping Design - A teaching experience at Coopamare: listen to the collectors voice, in *The Zone: an area of transition. Cumulus Conference Utrecht 2004*, Utrecht. Utrecht/Cumulus 2004. Finland: UIAH, v. 1. p. 1-1.

Santos, Maria Cecilia Loschiavo (2013) Educational experience in design for sustainability: enhancing a critical perspective among undergraduate students, in Walker, S.; Girard, J. (eds). *The handbook of design for sustainability* (pp. 273-282), Bloomsbury Academic.

Santos, Maria Cecilia Loschiavo (2014) Lições das cidades de plástico e papelão: resíduos, design e o panorama visto da margem, in Santos, M. C. L. (ed.), *Design, Resíduo & Dignidade* (pp. 41-55), Editora Olhares,.

Santos, M. C. L., Jonas, W., Chow, R. & Verhaag, N. (2005) Design for social responsibility: perspectives on students'work. In *Proceedings of the 6th international conference of the European Academy of Design,* EAD 06 (pp. 10-20), University of the Arts Bremen, v. 1.

Santos, M. C. L., Sakurai, T. & Lima, V. F. T. (2015) Teaching design in unsustainable conditions, In Unmaking Waste 2015 conference proceedings. Adelaide, SA: Zero Waste SA Research Centre for Sustainable Design and Behaviour.

Sears, D. O. (1986) College Sophomores in the Laboratory: Influences of a Narrow Data Base on Social Psychology's View of Human Nature. *Journal oh Personality and Social Psychology*. Vol. 51, No. 3, 515-530.

Su, Y., Feng, L., Yang, C., Chen, T. (2011) How teachers support university student's lifelong learning development for sustainable futures: The student's perspective, in Fuller, T. (ed.) *Futures: The journal of policy, planning and futures studies,* Elsevier, n. 44, pp. 158-165.

The Earth Charter Initiative. (2000) *The Earth Charter*, http://tinyurl.com/nzkynem, (Accessed 4 November, 2015).

Thornton, K. (ed.). (2015) *Unmaking Waste 2015 conference proceedings*, Adelaide, 2015, Zero Waste SA Research Centre for Sustainable Design and Behaviour.

United Nations. (2015) *The Millennium Development Goals Report,* http://tinyurl.com/p92xdd3, (Accessed 6 November, 2015).

United Nations Development Program. (2015) *Sustainable Development Goals,* http://tinyurl.com/pqo2nar, (Accessed 6 November, 2015).

United Nations Development Program. (2014) *Human Development Report 2014,* http://tinyurl.com/pb6xjp3, (Accessed 5 November, 2015).

United Nations Population Fund. (2015) *10 things you didn't know about the world's population*, http://tinyurl.com/n9po8gg, (Accessed 4 November, 2015).

Walker, S. (2014) Terras dos Resíduos: sustentabilidade e Design com Dignidade, in Santos, M. C. L. (ed.), *Design, Resíduo & Dignidade*Editora Olhares, (pp. 15-27).

Zande, R. B., Bohemia, E. & Digranes, I. (eds.). (2015) LearnxDesign: proceedings of the 3rd internacional conference for Design Education Researchers, Chicago, Aalto University.

About the Authors:

Author 1 She is a philosopher and full professor of Design at the Faculty of Architecture and Urbanism, University of São Paulo. She got her MA and her Ph.D., in Philosophy, Aesthetics. Her current research is about modern furniture design, homelessness and recyclable material collectors.

Author 2 She is a professor and got her Ph.D. at the Faculty of Architecture and Urbanism, University of São Paulo. She graduated and got her MA at Architecture and Urbanism Institute - USP. Her current research is about Experience Design and interfaces for domestic spaces.

Author 3 She is a Ph.D. student at the Faculty of Architecture and Urbanism, University of São Paulo and got her MA at the School of Arts, Sciences and Humanities, EACH-USP, in Textile and Fashion. She graduated in fashion design. Her current research is about the sustainability approach in higher education in fashion design.