Reflections and experiences on the teaching of colour in the architecture and urbanism course in the University of São Paulo

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In recent years, the curriculum of the Faculty of Architecture and Urbanism at the University of São Paulo (FAUUSP) has undergone a process of change in its pedagogical project. Past methods saw an excessive compartmentalisation of knowledge that proved incompatible with the new demands of the profession. The current tendency, however, is to concentrate on activities that focus on wide-ranging rather than specific themes. It is now recognised that the integration of other disciplines opens space for new approaches—including colour, even in a still uncertain manner—in the process of training the architect and urbanist. A deepened understanding of the themes is achieved by offering optional subjects to interested students. It is also important to highlight the proliferation of activities for postgraduate research aimed at training professionals, lecturers, and researchers capable of meeting the demands of the hundreds of courses distributed throughout the country. This text presents a summary of the reflections and experiences made in the undergraduate and post-graduate courses of the Faculty in recent years, aiming to add elements to the debate on the subject.

Introduction

"*To assert that color can be a techtonic we assume that it is a potent perceptual tool; color can both build form and transform. Its paradoxical nature, its ambiguity, can serve visual roles that are semantically opposed. Perhaps for this reason its use has been avoided until recently, in architectural praxis. In both instances, forming or transforming, structure is implicit.*" [1 p82]

Architecture course curricula have experienced major changes in recent times and the indications are that they must undergo even greater transformations due to the new methodologies applied to project development, new social demands, new technologies and environmental issues vital to the sustainability of the planet. However, although the study of the aesthetic and formal aspects of design is increasingly relegated to second place, there is a growing recognition of their importance in the training of professionals. The scarcity of architectural spaces requires a design that maximises use and values perceptual issues, not only in its occupation, but also in its relationship with the city.

Regarding the chromatic question, the course should address, at a minimum, the technical aspects of colour and its attributes through views related to physiological perception, relationship with light, knowledge of materials, and the mastery of scale and the three-dimensionality of the architectural space, not to mention notions of aesthetics and history. Some of these themes are covered throughout the course in different areas, however, colour is currently considered of minor importance.

For many decades, the FAUUSP curriculum provided five basic lines of teaching: building design, urban planning, landscape design, industrial design, and visual programming. The curriculum was further structured in three sections: History of Architecture, Project (with greater relevance), and Architecture Technology. Colour was addressed within the visual programming area, usually by artists, with a greater emphasis on graphic language and two-dimensional plans often based on themes studied by the Bauhaus school. Due to curricular changes over the years, particularly the reduction of the number of teachers and the creation in 2005 of the Design Course (graphic and product), the space allocated to this area in the curriculum was drastically reduced.
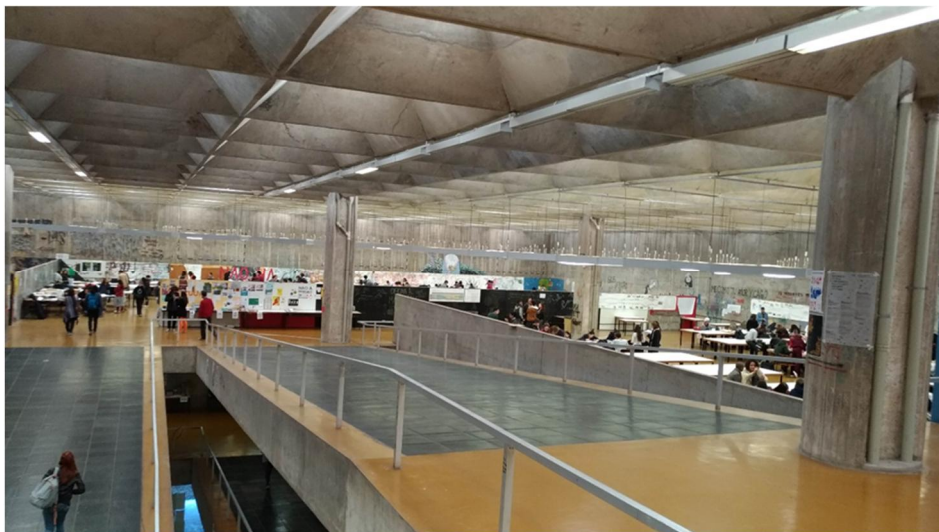
Figure 1: View of two of FAUUSP's five large ateliers (photo by the author).

New didactic and pedagogical approaches have arisen in an attempt to reduce the segmentation of the course disciplines. This is supported by digital technologies, which encourage research-oriented learning, and allow the student to achieve a broader contact with the aspects involved in the architectural project, including its execution and consequent appropriation.

There is a valuation of the old atelier spaces[1], which were based on teamwork, interaction and exchange of ideas. These values inherited from the Beaux-Arts schools, are not restricted to small

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[1]Ateliers are large halls where all the students enrolled in the discipline (about 150) develop works, usually in groups, under the supervision of teachers. The FAUUSP building, designed in the 1950s by the architect João Batista Vilanova Artigas, was based on these open spaces and aimed at integrating students with teachers and the rest of the school. Theoretical classes are given in smaller, closed rooms with fewer students.

groups, but can involve different classes, schools and even other countries. Participation in this context, by academics, researchers and professionals from different backgrounds, provides the student with a comprehensive overview and induces research into the definitions of their training process.

The optional subjects will serve as a support to the ateliers and to deepen concepts, being able both to approach the central themes proposed to students and to opt for a parallel path, more focused and adequate to its objectives.

Discussion

Design studio. How relevant is this? Very highly, or so it seems from Donald Schön's analysis of what makes architectural education so special [2]. Like other observers from the human sciences, Donald Schön is fascinated by architects and their work, which he analysed, in considerable details [3]. Schön sees this as the very model for education in all the professions, including medicine, law and even business. For like architecture these professionals also have to deal with: 'complexity, uncertainty, uniqueness and value-conflict'. They all have to learn, understand and incorporate material from the applied sciences which themselves are constantly developing. Indeed, such professionals all have to integrate their methods of working with what Schön calls 'reflection in action' [4].

In deference to multidisciplinary pedagogy, lecturers with different training backgrounds and experiences, whether in architecture or teaching, will present varied theoretical and practical approaches to students. It must be remembered that the majority of lecturers are trained in architecture and not in pedagogy, which places them in the position of professionals or researchers, performing the function of teachers without, however, having the specific training to do so. This situation should lead to a didactic-pedagogical approach strongly supported by the concept of the Design Studio, (like that observed by Donald Schön or even Jacques Ranciere [5]) where teacher and student share in the production of knowledge. In the same classroom, students can be exposed to multiple visions and approaches to the same subject, allowing them to reflect and take a more well-informed position.

The simultaneous study of diverse aspects could favour the insertion of colour in design teaching, without a great appropriation of space in the course curriculum. It could take place on the levels of the technology of materials, historical and social aspects, aesthetic and artistic questions, the construction site, the study of executed works as well as environmental perception and psychology, among others. That is, colour permeates all stages of the project in a conscious way, but without occupying a prominent position. In addition, to meet the possible student demand, optional subjects could be offered, with the objective of deepening understanding in the topic.

As far as urban planning is concerned, the process could take place in the same way. Colour could be presented in the studies of understanding and perception of the urban space, in the search for a chromatic identity, in the processes of interventions, from initial sketches *in loco* to the final project, even if only in a secondary form aimed at making students aware of its importance:

Reports of an experience

"*I am convinced that we are now experiencing a very important period in which architectural colour, now expressed in material and illumination rather than paint, is creating a new chromatic dialectic between form, space, structure and light.*" [6 p86]

An optional module for four credits, AUT0585 – Colour Technology, was offered to the students of the architecture and urbanism course at FAUUSP. The title of the course emerged from research that

was developed at the time within the Research Group in Production and Representation of Architecture and Urbanism in the specialised area of Architecture Technology. The initial objective was to provide undergraduate students with tools to assist them in understanding and specifying colours in the development of architectural design.

One of the challenges was to fashion a discipline that conveyed the proposed conceptual content, in Design Studio standards, while also encouraging the student to research and seek solutions to the demands that arise during the development of the project.

The methodology adopted consisted of theoretical classes, practical classroom exercises, presentation of seminars, and the development of an architectural project focusing on chromatic issues. The project was delivered at the end of the course and publicly displayed to the entire school. It was intended to use a project that was being developed by students in another course to promote an interdisciplinary integration, which unfortunately only partially worked.

In 60 class hours, it was initially intended to address the following topics:

- A historical view of colour: theories and approaches
- Colour and its attributes
- Colour and technology: notations, production and reproduction
- Colour and perception
- Colour and aesthetics
- Colour and form — two-dimensional and three-dimensional
- Colour and light
- Colour and materials
- Colour in architecture and urbanism

From the outset, it was understood that the old didactic methods adopted were inadequate. While the theoretical classes aroused interest in the topics, it was the exercises, or the activities that involved the direct participation of the students, that achieved results which could be observed when applied to the final exercise.

It was important that the final work was involved in the development of the classes, if possible, from the beginning. This position implied a risky reversal in the approach to the planned themes. That is, to talk about colour in architecture and afterwards address the more theoretical issues. Or rather, insert it into the project as a basis for approaching all the other themes. Contrasts, attributes and theories could be seen more from the viewpoint of the three-dimensional approach of architecture and less by the dimensions of the visual arts.

Students must consider that architectural representation will always be limited, as its perception will only be complete when experienced in its real scale and in real time.

"Let empty space be the protagonist. In architecture, if we think about it, this is natural because architecture is not only an art form, not just an image of historical or lived life, but for both ourselves and for others it is, above all, the environment, the scene where we live our lives." [7]

What is sought is a form of representation that can refer the observer to the level closest to the actual understanding of the proposal.

It is necessary that the representation and execution of the architectural project are loyal to the imagined and therefore, in the case of colours, requires the necessary knowledge of the chromatic attributes and their notation systems, which is also fundamental for the proper use of the digital

systems. Colours are no longer specified on the construction site; modern times often distance the specifier from the executor.

The means of representation, from the creation and elaboration of ideas to execution, are aimed not only at communication but at the very understanding of the work in development, and therefore, could include colour, even in a simple way. This would also allow a better understanding of the use and limitations of digital systems, particularly as regards the application of colours in architecture. Regarding scale, there is no way to visualise and experience a building design from the dimensions of a computer screen, and this greatly impairs the perception of space and its chromatic relationships.

It is also necessary to consider that the displayed colour does not faithfully represent the specified. It is not unusual for a beautiful image or rendering to be confused for a beautiful project and, worse still, even by its own author.

The appropriation of digital technologies becomes a challenge, because replacing a teaching supported for centuries in the subtractive colours — even if precarious, for additive— is an arduous task. It is also important to consider that in architecture there is a predominance of substrates, although, light, glass and digital means are becoming more and more important in the formation and perception of space.

In countries like Brazil, where budget constraints, especially in public schools, are increasing, the adoption of new technologies faces enormous difficulties. It is also necessary to consider the limitations of teachers and professionals in these technological fields, which restrict adoption and requires constant retraining and professional enhancements. In this context schools cannot keep pace with transformations in the way the architect works, and they seek to remedy this deficiency through a more theoretical training.

It is this possibility that has been gradually developed and is perhaps the most important result of this process. A new proposal for the teaching of architecture could involve colour in all stages of the development of the architectural project, but in a different time scale and with a greater focus on chromaticity.

The Figures 2 and 3 show some results obtained from exercises performed by students, not yet as project proposals, but as studies of volume, light and shadow, and relationships with surroundings. The works presented in seminars in the last classes, could have provided a rich discussion, however they ended up being limited due to a lack of time. It is intended to extend this discussion time for the future development of the course.

Figure 2: Drawings made by students: Fernanda Panontin Tsuda e Nathalia Mara Lorenzetti – initial studies for a project in development.

Figure 3: drawings made by students: Victor da Mata e Silva e Renan Rosatti de Siqueira – initial studies for a project in development.

The initial results of this process, which should continue in the coming semesters, concluded that:

- Interactive classes with the active participation of the students, promote a greater assimilation of knowledge, either through seminars, or discussion of texts, or in the discussion of the works in development;
- The preparation of an individual portfolio, developed during the running of the course, in which the student summarises their understanding of the theoretical classes, texts read, seminars and discussions, and containing their completed exercises and a copy of their final work, serves not only for evaluation of the student and of the discipline itself, but as material for future students to consult and, especially, to provide value for participation in the discipline;
- The architectural project as the central axis makes the process more objective, productive and interesting for the student.

Points to be improved or to be equated:

- The scarce Portuguese bibliography on the subject greatly hinders the access of some students to texts, representing a strong obstacle in the development of studies and research. Undergraduate students cannot be required to master a foreign language, and with the high costs of imported books, this leads to the search for online content, which is not always reliable. In this sense, some texts are being prepared that will be delivered to the students, based on the course bibliography. It is also intended to introduce the internet as a didactic tool, in order to encourage research in reliable sources, if not in English, then in other languages more accessible to those of a Portuguese speaker, such as Spanish and Italian. We must also consider that the few books translated into Portuguese, in many cases, present serious problems due to the improper translation of concepts and terms.
- The material resources for the development of exercises, in terms of costs, are replaced, as far as possible, by digital resources; software available to students for use in other disciplines has proved useful in developing exercises and in understanding some concepts. An example is the use of Power Point to visualise chromatic contrasts in the colour studies proposed by Josef Albers. In the development of the proposed project, it is possible to show how to use colour in

software such as AutoCad, not as a differentiator of lines, surfaces and layers, but as a constituent element of the project, even with all the limitations and standards adopted by architectural offices. Software that allows the simulation of solar movement also permits the study of variations of shadow and helps in the definition of colours in the project. These interactions aim to accustom the student to the inclusion of chromatic studies in their activities related to the development of an architectural project, without implying the adoption of new complex procedures.

- The excessive number of students, 40, for only one teacher, in a discipline that requires individual attention in the development of the exercises, hindered a more active student participation and impaired the progress of work. Part of this problem has been solved with the participation of postgraduate students, related to the subject area and even of monitors — undergraduate students who have already participated in the course and wish to collaborate;

- Sometimes the participation of students from other courses, such as design, textile and visual arts, has contributed to a diverse class, at different levels of knowledge of the theme and with different demands. This situation leads to the creation of other thematic axes besides the architectural project, diverting from the principal proposed focus; the solution has been to block access to these students by means of prerequisites and by wide dissemination of the course objectives;

- Further integration of the discipline with other areas involving the architectural design — environmental comfort, post-occupancy evaluation, visual programming, architectural history, etc. — is a goal yet to be achieved.

Study of works of consecrated architects, accessible to students, are proposed. Whenever possible, this is done in two stages, once at the beginning, when the student does not yet have a more in-depth knowledge of the subject and again nearer to the end of the course. For both, drawings and annotations *in loco*, photographs and software applications such as Photoshop are used.

One of the most important activities is the study of the architectural design approach, from the definition of materials to the specification of their respective available chromatic palettes. Materials characterise how the colours are presented — bright, opaque, textured, smooth, strongly reflective of light, etc. — and generate new chromatic possibilities, often not foreseen. A part of the course is devoted to this analysis of material under different lighting conditions, but mainly it concentrates on behaviour over time, and with wear and maintenance.

It is important to reinforce the idea, in the course, that the process of perception of a building can change according to the colours and materials chosen. In this sense, it is key to emphasise the importance of understanding the scale, volume, relationship with the environment and even symbolic and cultural aspects of a building.

Conclusions

There are many demands currently being made on the training of new architecture and urban planning professionals. If in the middle of the last century colour occupied an important space in courses, influenced mainly by the proposals of the Bauhaus school (1919-1933), the same cannot be said to occur today. In the case of FAUUSP, several aspects led to this situation, starting with the separation of the design course, particularly the graphic area, which was previously integrated with architecture and urbanism. Social issues involving the growth of cities and the improvement of the quality of life of

its inhabitants, have come to occupy a strong space in architecture course. In this sense, the study of colour and its applications in architecture and urbanism are addressed less and less and the topic needs to find niche areas where it can integrate with the other themes of the course.

The proposal of a greater integration of the various disciplines of the FAUUSP architecture and urbanism course has been gradually incorporated while also attempting to preserve a space for the specifics fundamental to the training of the architect and urbanist. In this sense, there is an opportunity to include the study of colour as an integral element of the architectural project, even if only tentatively, opening space so that in the near future it can meet the greater demand from students (as has already been observed). This time frame will also allow the lecturers involved in the process to prepare themselves to meet this demand, as well as the faculty's postgraduate course, which has already trained masters and doctors in this area, many of them with competence to participate as lecturers and teaching assistants, not only to provide support but also to administer disciplines with a specific focus on colour and its relation to architecture and urbanism.

In this context, the development of a discipline focused on the study of colour, optional, attends to a growing demand on the part of the students and introduces the subject with a focus on architecture and urbanism, already counting on the support of students of postgraduate studies, which may continue this process, including in supporting the activities of the other disciplines.

The biggest challenge is to create didactic-pedagogical project for the teaching of colour that meets the demands of a new way of thinking about and developing architecture and urbanism projects, which is a form in constant change, and that at the same time arouses interest in a new generation of students very different from the one in which most of the current lecturers were trained.

The experience of this subject, presented as an option in the under-graduation course at FAUUSP, associated with the Post-Graduate Programme, represents the beginning of a process. It aims to integrate it with other areas of the course, to disseminate among students the importance of having a basic grounding on the subject for professional practice and, primarily, to form a future group of researchers and teachers who can improve and diffuse this proposal.

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