

# EduCAAD: An X-ray of CAAD education in Brazil

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## ABSTRACT

The present work offers the project of an online resource for investigating the actual Brazilian academic panorama concerning CAAD education. The access to this information is given through the development of a website, which introduces the visitors to the actual Brazilian CAAD education situation, offers a questionnaire, accessible by everyone and builds up a visual information mapping the current state of CAAD education in the different regions of Brazil. The questionnaire is 14 questions long, and its link has been sent via email to the addresses of the Brazilian faculties of architecture, being re-directed equally both to its students' committees and courses' coordinators. The objective is that, at its conclusion, the access to this information will lead to a better understanding of the CAAD education in Brazil. It can motivate discussions about curricula and CAAD's pedagogy. Through the analysis of its visualizations, maps, tables and statistics, it points special features in Brazilian education system, as well as give directions for further researches and pedagogic proposals.

**KEYWORDS:** panorama; CAAD education; questionnaire; data visualization.

The goal of the work presented in this paper is to investigate the current Brazilian academic panorama concerning CAAD education in order to find out how it could be improved. The paper first discusses some potential reasons for the current situation and then outlines the methods and goals applied in an online survey by which it can be assessed and evaluated. The survey will use methods that are believed to be a potential key to improving the status quo: openness and sharing of expertise online. Thus not only the survey will be conducted online, but also its results will be accessible through a website with automatically updated data. Thereby it will build up a visual information mapping of the current state of CAAD education in the different regions of Brazil.

The applicability of digital technologies in the field of Design has increased considerably and has been extensively studied. Since pioneering computer graphics' studies during 60's, passing through the beginning of using AI as method of enhancing design solutions and analysis, and the rediscovery of the role of Natural Sciences in the architectural design process, various digital design methods have been developed and found their way into practice. Applying advanced CAAD

methods has many potential benefits: The possibility of performing analysis during the first design phase, of designing objects of greater complexity, the greater dynamics of the design process, to name just a few.

Despite these advantages these technologies and methods aren't fully explored by the architectural education in Brazil. Among the possible reasons for this may be a widespread skepticism and mistrust of technology and scientific methods that is rooted in the history of architecture education in Brazil, which was strongly influenced by the *École des Beaux Arts*, Celani 2003, apud Souza 2001. Until today the way the design process is being taught is mainly empiric and inductive, based on a trial-and-error method. While the *Beaux Arts* model was also an important reference for the development of architecture education in USA and Europe, there the practice in big offices and the Post-War reconstruction occasioned discussions about the role of design methods in architecture, Celani 2003, 6. In Brazil these discussions didn't take hold and the approach to design is typically more formalist. In an academic culture that doesn't value the role that design methods play in architecture, it's presumptive that also digital design methods aren't the trend.

This background may explain the reason behind the tradition of architecture education in Brazil, but doesn't offer solutions to the current problem. To clarify the directions of how to improve it, it's proposed here to ask students and professors about their opinions regarding (digital) design methods in their courses.

## Research's Design

During the thinking process of how to formulate the questionnaire, how long it would take, what questions it would contain, how it would arrive to the hands of the respondents, some considerations submerged. First of all, the questionnaire would be too long, if all the data about the education system were going to be answered only through it, and it could also lead to the boredom from the interviewees. By this thought, it was decided to split the research in two parts. The first part would collect and analyse the data already available online. The data was collected from the website of the Brazilian Ministry of Education (MEC). The analysis of this data was made linking the data from Excel with Grasshopper plug-in for the 3d software Rhinoceros. This data analyses together with bibliographic research provided the needed support for the elaboration of the EduCAAD questionnaire. The questionnaire is available in the address. The intention is that at the end of the year it achieves the expected rate of answers for it to gain statistically trustability.

## Documental research and data analysis.

Much relevant information was set by the analyses of the data contained in the MEC's online platform.

Currently there are 289 higher education architectural programmes in Brazil, of which 13 constitute new programmes, which will substitute old curricula.

For this research it was accounted the Schools of Architecture currently in activity. At the construction of the 3d visualization, these 13 extra courses were excluded to avoid generating duplicate data. Otherwise it would create two identical points when converting the programmes' to coordinates to 3d points in Grasshopper. Considering also the fact that these programmes (the old one and the new ones) share the majority of their attributes, i.e. the course's coordinator, the university contact data, the geographical location, the MEC indexes academic evaluation, etc. It was assumed that its combination wouldn't interfere the veracity of the data analyses.

These courses are spread around all Brazilian geographic regions: West-Center, North, Northeast, South and Southeast. Although the highest concentration of schools occurs in South and Southeast, where the state of São Paulo contains the highest number, 54 institutes of higher education providing 74 independent

architectural programmes in the state. Just the city of São Paulo gathers alone a sum of 20 programmes. In this accounting the Southeast region totalizes 118 programmes, followed by the South with 68, the Northeast with 34, the West-Center with 27 and the North with 21 courses.

The statement of very diverse conditions between North and South of Brazil isn't new. A lot was already discussed about this reality. The South and Southeast regions are, however, the most populated parts of the country, what makes natural the existence of more universities, a tendency that continues present when talking about schools of architecture.

The analysis of this data was made by the design of Excel table and its connection to 3d Software (Rhinoceros). The 3d graphics were designed in Rhino with the Grasshopper plug-in. It was used the university coordinates and the Brazil's border coordinates, for x and y values, and different data, like the National Exam of Student Performance (ENADE) classification, the start year of the course and the investment index of the course's university for setting z values. From it with Delaunay triangulation creating a kind of data topography, where it is possible to observe geographical tendencies regarding education, equally as combine different the data topographies from different indexes to analyse if they are related. The visual discrimination the public, private and special universities are was represented by the population of spheres to its geographic original points and setting specific colours for each, red to the public, blue to the private, green or grey to the special ones (see Image 1).

The analysis of the graphical data shows that, in its major part the schools of architecture are private. Although the number of private institutions is high it does not mean necessarily a tradition regarding quality. The analysis of the ENADE's results shows that the public universities tend to be balanced the results and geographic location (see Image 1).

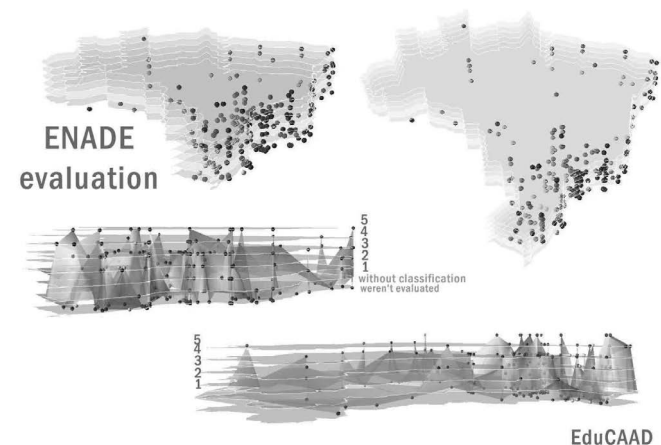


Image 1

The analyses of the year of start of the universities

shows, that the schools of architecture are usually very new, normally younger than 50 years. The geographical area of São Paulo show a huge mass of architecture courses in the region appearing in the last 20 years. The over layering of the ENADE's mesh with the Investment mesh shows that high investments reflect in the ENADE's results.

## The web based questionnaire

The EduCAAD's questionnaire is 24 questions long, of which 8 are multiple choice questions, 6 are check box questions, 2 are rating scale questions and 8 are text style questions, where there are just numbers being asked for. The link with the EduCAAD's online address was sent 276 universities accounted in the research. The people chosen to receive it were the coordinators of the programmes, who are teachers. And the heads of the school's Academic Centres, who are students. The idea is to spread the research to the highest number of involved people, for this reason at the body text of the emails there is an invitation to forwarding the emails to other teachers and students from the school. This means that the method chosen for the dissemination of the inquiry is like a tree, where the trunk is the course coordinator and the head of the Academic Centre and the branches are the forwarded teachers and students.

Because the questionnaire is designated to students and teachers, the first question of it is a multiple choice, classifying the research participants between students, professors and coordinators. To make feasible a posterior statistical analysis of the research, the following two questions are directed only the programme's coordinators and they as for the total number of students actually registered in the course and the total number of teacher in activity in the course. These ones have a text-type answering format, however the answers are going to be given in the form of numbers. The fourth question inquiries about the level of satisfaction of each participant, regarding the quality of the programme. It is a rating scale question, in which the lowest value would be 0 (zero) means the world "insipient" and the highest value, which is 10 (ten), means "excellent". Values from one to ten were chosen because in the Brazilian scholar system this is the current used, so people are used to this classification domain.

According to the assumptions set by the article "The Ideal Computer Curriculum", the use of computers in design education will possibly occur in certain ways in the near future, among which, it is said that "1. *Computer based media and design methods will integrate into the background of most courses such that their basic use will no longer carry any special significance.* 2. *Specialized courses focused on the use of computer technology will still be needed*" (Mark; Martens; Oxman, 2007, 168). One aim of the EduCAAD's inquiry is to verify how close to this assumption is today the Brazilian academy.

Considering this assumption in the elaboration of it, two questions were formulated. The first was to mark which are the computing techniques actually being supported by the architectural programme in your university — a checklist question was chosen, because it quantifies a list of behaviours simply by checking whether each item occurs, and the research participant can help building the scope of the answers by adding new items into it.

The sixth question asked how could him/her classify the presence of digital computing media in the disciplines of him/her programme. A multiple-choice question was set with the following answering possibilities: a) never occurs; b) rare; c) esporadic; d) frequent; e) very frequent.

The seventh, eighth, ninth and tenth questions ask about the existent of a Computing Lab and a Fabrication Lab in the schools. At the Oxmans' introduction for the book "The New Structuralism: Design, Engineering and Architectural Technologies", it is said:

*"With the emerging technologies of fabrication, the current impact of material upon architectural form has become one of the prominent influences in architectural design. Fabrication is not a modelling technique, but a revolution in the making of architecture. The new structuralism designates the cultural turn away from formalism and towards a material practice open to ecological potential".*

Considering this point of view, which positions the Fabrication as new way to approach design, and new way of think the professional in general, changing the participation of the architect in the process of making architecture, as now he accompany a integral design process, from the primary idea through it materialization with digital fabrication. This called revolution called as "New Structuralism" by Oxman, experiences architecture in a way that the focus is the structure, which doesn't follow the function, but it is adapted to it. This still representing a big challenge to apply in the Brazilian schools, when talking with local students and by observing design classes and graduation thesis, it is clear that the design is still strongly tied by the definition of the program needs.

The possession of some machinery like, 3d Printers, Laser Cutters, 3d Scanners or others, influence the approach to new conceptualization in architecture. For its fully exploring it is important to have the domain of specific software skills, which demands the existence of a computing lab for the students. Since 1994 the MEC determined as compulsory the existence of the discipline "Informatics Applied to Architecture", since then the schools started to purchase Computing Labs at their courses. However the existence of the called Digital Fabrication Labs does show that the teachers are from this institution are already aware of new tools, theories and design methods of nowadays. The seventh

and ninth question makes a simple Yes/No multiple-choice question about the presence of a Computing Lab and a Digital Fabrication Lab. If the answer of this one was "Yes", the participant should mark in checkboxes from the next ones, what kind of enumerating what kind of software and machines they do pursue.

The next three questions ask about at which semester of the programme is recommended to the students start to have access to the Digital Fabrication Labs, starting using digital techniques in the design studios, and at which semester of the architectural programme does the discipline "Informatics Applied to Architecture" begins to be offered. The fourteenth, fifteenth and sixteenth questions ask for the participants to classify the Digital Design Studio professors regarding their knowledge about computer media and architecture, if they are favourable to the usage of computing resources during the design conceptual phases, and if they are favourable to its usage just during the more advanced phases and to final visualizations. For this part there were chosen multiple-choice and rating-scale questions at the same way as explained before. The next questions consider, if lately new computing techniques have been introduced at the design studios from the school.

The questionnaire is concluded with six questions directed exclusively to the courses' coordinators. It is questioned the total of minimum hours required for the acquisition of the diploma, the minimum number of hours required in the student's curricula designated to the elective subjects, the total number of elective subjects offered today by the programme, and how many post-graduate students and students in the Scientific Initiation programmes are currently registered in the school.

The questionnaire is embed to the website of the Unicamp's laboratory LAPAC (*Laboratório de Automação e Prototipagem para Arquitetura e Construção*), at the address [revistaparc.fec.unicamp.br/lapac/index.php / educaad/](http://revistaparc.fec.unicamp.br/lapac/index.php/educaad/). The usage of a Brazilian university's website may help its disclosure.

## Conclusion

The present research determinate the rate of universities according to geographical region (North, South, West-Center and Southeast), administrative category (public, private or special), ENADE's results, year of creation, Investment coefficient during the last year, and others. It proved a big discrepancy, between North and South regarding investments in education. It also pointed the proliferation of private schools of architecture after 90's in the Southeast.

A website was created with a questionnaire and redirected to key people from all the universities in Brazil.

This paper represents a work in progress. The next step is to analyse the data to be extracted from the EduCAAD's questionnaire results, after it achieves the expected answered rate, and compare it together with the information collected from MEC.

Through this research it was made clear the necessity of attaching to it a posterior qualitative analyses. Due its scope and enormous number of involved people, it turns more complex questions not feasible to analyses. To "*identify the strengths and weaknesses of traditional methods*" (Jones, 1970, 27), to in what ways current problems are more difficult than traditional ones, what is the main difficulty encountered in solving design problems and what are the new kinds of complexity presented today in design, Jones 1970, 27. Are questions that can be applied in further ethnographic interview with selected professors and students. It would make the analyses more consistent.

At its conclusion, the access to the surveyed information will contribute to a better understanding of the CAAD education in Brazil. It should motivate discussions about curricula and CAAD pedagogy. Through the analysis of its visualizations, maps, tables and statistics, it points out qualities and weaknesses in the education system, as well as give directions for further research and pedagogic proposals.

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