

Games in Architectural E-ducation

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Abstract:

Although technical simulation programs are used to simulate many technical issues related to architectural practice, they can not fully solve other ones related to education. Issues like social impact on the design process, negotiation phase of multi specialists which is a core phase of the profession, the mutual impact of technicians' actions, the decision making experience which is achieved through a long period of practice, and other issues, all of them can not be taught with the help of current technical simulation programs. Hence, because of this lack of practical training, students graduate missing what *Peter G. Rowe* calls the "Actionable Knowledge" and they are only aware of the theoretical knowledge which is not sufficient to deal with the real life problems.

Problems similar to the ones mentioned before exist not only in architecture, but also in other fields such as economics, politics, urban design and others. Technical programs in these cases also do not offer a full solution. Thus, games, either digital or traditional, have been used to deal with these problems. This paper starts an analytical investigation to:

- Investigate, by a literature review, the contemporary educational needs in the architectural field from the point of view of education theorists and architecture educators.
- Do an analytical comparison between these needs and the characteristics of a *digital game* that is thought to be a convenient base to build upon other games that may be used as educational tools in the field of architectural education.

Keywords: Architectural education, Edutainment, Games, Simulation, Education process

Introduction:

Researches in the history of architectural education indicate that prior to the mid 19th Century architectural education existed as an apprentice system where aspiring architects would serve under the guidance of an experienced architect [1]. Consequently, the field of architecture has relied on the transmission of symbolic capital through chains of masters and pupils, webs of personal contacts, to reproduce itself. This apprentice system of reproducing architecture matched with and moderated by craft guilds that arose in Europe in the 12th Century, which served as the major way of organizing work, exerting control over membership, workplace conditions, markets, and relations to the state [2]. An extreme deviation of this vocational education of architecture occurred in the 17th Century due to the French model of formal education.

The first model of teaching architecture out of the apprentice system and the craft guilds was in France [3]. In 1648, a school has been founded there originally to guarantee a pool of artists available to decorate the palaces and paint for the Royalty. Studies in architecture, drawing, painting, sculpture, engraving, modeling, and gem cutting have been developed there. This school which had been brought under control of the government was the, laterly well known, École des Beaux Arts. In 1863 the school became independent by Napoléon III due to his concept of reformation of higher education. This reformation established two defining characteristics of the profession: service for the state, and state-certified academic credentials from one of the elite grandes écoles [4]. Because of the great influence of the École des Beaux Arts, its model of the

architectural education was the most spread one for about 150 years. Due to this, separation between professional practice and formal academic education became a normal phenomenon.

Despite the wide spread of the French system of architectural education, few architectural educational systems have emerged through the 19th Century and the beginning of the 20th Century. One of the most famous systems was the German model of architectural education introduced by the Bauhaus. Although the French and German systems were different from each other in some major things, both were alike in doing a separation between profession and education. Researchers [5] stated that whether it was the Beaux-Arts or the Bauhaus model, the end product is similar despite different professional, technological, and socio-cultural contexts, since the main concern of the Beaux -Arts was to follow the design rules which were formulated as principles that should not be avoided. On the other hand, the main concern of the Bauhaus was to combine arts and crafts to form universal ideas within the requirements of technology. Laterly, all architectural institutes depended on these two systems as a base for their curriculum definition. This is what has been defined as the conventional educational systems of architecture [5].

Inabilities of Conventional Educational Systems:

The main characteristic of conventional architectural educational systems depends on the "Design Studio" as being a kiln in which architects of the future are being shaped. In the past, practitioners disagreed with the studio system introduced by the École des Beaux Arts. According to their point of view the studio system was: *"a fantasy world in which incompetent professors who are the centre of petty personality cults encourage bizarrely unrealistic expectations in students, while avoiding the teaching of anything actually to do with the hard realities of life"* [4]. Nowadays also, many voices call for a substantive change in the architectural education. They find the conventional systems incapable of making students competent to deal with real life situations. Researches in architectural education point out that the conventional educational system of architecture oversimplifies, and some times neutralizes, essential issues that are supposed to play a major role in shaping any architectural solution [1]. Issues like economical factors, social impact of the design, urban context, client needs and interferences and others, all of them have been jumped over and margined in conventional systems.

Another main problem of the conventional systems is the "Individuality" [6]. Conventional systems train architects as individualistic creative people to develop their senses and design ability to create a better world. This individualistic manner contradicts the real life situation where architect has to work within a teamwork to, truly, fulfill the community needs. Teamwork is about sharing control and negotiations. Sharing control means defining the problem with participation of other concerned disciplines and respecting their point of view and role in design decision making. On the other hand negotiations are about mutual respect and understanding acceptance of limitation, flexibility, feasibility, as well as communication. Communication does not mean just clear drawings that make sense but listening to and understanding the other parties involved in the design process.

One more main problem is the separation between the field of architecture and society. As it previously mentioned, prior to the mid 19th Century architectural education existed deep inside the society because of its dependency on the guild system. This coexistence deep into the society granted two main issues. The first was the coincidence between society needs and architect inclinations. The second was the social perception of architect's role in society and its value. But, because of replacing the vocational education with the formal one, contemporary society know nothing about the true role of the architect, in addition contemporary architects have no true role in shaping and developing their societies. Consequently, what an architect does, continues to be a mystery in the eyes of many people, and as a result it is difficult for the public to place a positive value on what is relatively unknown.^(*)

* Salama, A.(1995): *New Trends In Architectural Education, Designing The Design Studio*, forward by Henry Sanoff

What is supposed to characterize new trends in Architectural Educational Systems?

Investigating conventional systems inabilities points out two main characteristics that should characterize any new educational trend. These are:

Real life experience: It's no more acceptable to have new educational trends that oversimplify the forces that impact the meaning and creation of design. It has to be brought clear to students that architecture is a social art, involving countless voices and agendas. Its success is dependent on the application of knowledge from multiple disciplines and perspectives.

How versus What: Any new educational system in the field of architecture "and other fields also" should focus on "How" instead of "What" [7]. "How" means to focus on the knowledge acquisition process while "What" means to focus on the learnt knowledge. We live, nowadays, in a so dynamic world that is full of data which is updated every second. It's not convenient to spend time in spoon feeding students with data and knowledge instead of teaching them how to gain knowledge. Any new educational process must aim at building students' point of view instead of making them espousing those that belong to their lecturers. As some researchers state, *"One who claims to be a graduate, whatever is the degree studied, should have the ability of: communication, analysis, problem-solving, valuing in a decision-making context, interaction, global perspectives, effective citizenship and aesthetic response.Graduateness, therefore, refers to the qualities as well as abilities."* [8] It's clear that a solution to achieve these two points is to work on integrating internships more fully into education. This action will allow students to bring education, experience, and practice together, resulting in a more cohesive learning experience [9]. But what snags educators from depending on this solution?

Many factors contribute to block the offering of a practical training to architectural students; the economical circumstances that control the profession, the increasing numbers of students joining the architectural departments which make it impossible to coach a group of about 150 students through a construction site, and finally, the inequality of time allocated to teach an architectural topic and its corresponding real time, for example think of the needed time to teach building construction by attending a real construction site. Hence, there is still a need to find an educational tool to be convenient for teaching architecture. This educational tool should be:

- **Suitable for self learning purposes:** This means it should be simple and attractive enough to motivate students on using it. Also, because in self learning tutor may be unavailable or has a minor attendance, tutor's role should be hidden deep into the tool's structure. This means issues like evaluation, coaching, supporting and other similar issues should be introduced in a way or another.
- **Following the "Experiential Learning" model:** This teaching model states that meaning could not be imposed or transmitted by direct actions or demonstrations. It asserts that knowledge had to be created by the learner through doing personal actions, observing outcomes, analyzing results and having a personal concept of what happened to build upon in further actions. This is what Kolb [10] called the "learning cycle" which aims at achieving 'deep learning' *Fig.(1)*.
- **Giving a real life experience:** This means all essential forces that have an important effect on actions and decisions must be represented in the educational tool for simulating the real experience as long as it's possible. In the same time, the real time situation should be abstracted to be clear of any complications that have no effective role on decisions or the process of taking them.

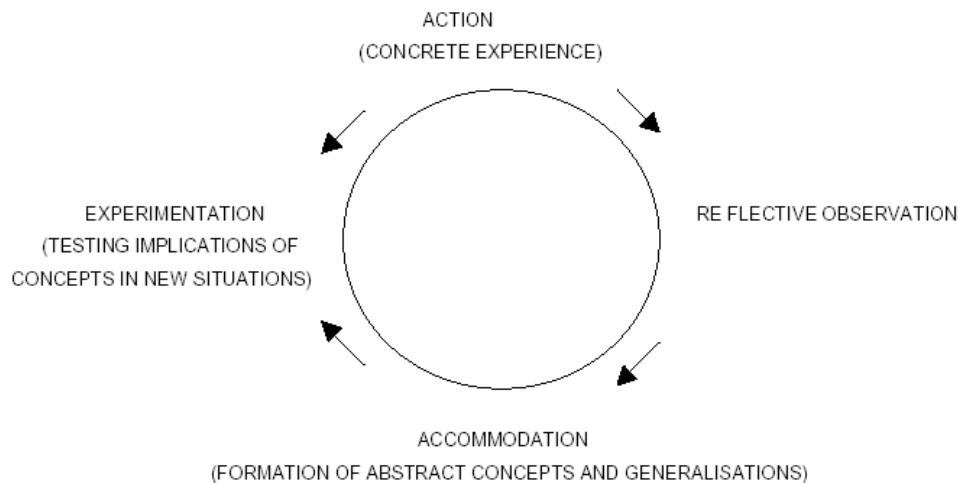


Fig. (1): Kolb cycle of learning

- Focusing on "Process" rather than "Product":** Researchers criticize that [5], design studio, which is the backbone of architectural education, focuses primarily on design as a product instead of designing as a process. They stated that *"it should be important to distinguish between design as a "verb" and design as a "noun". Design as a verb implies the action of design, which is exemplified by the design process, while, design as a noun is the result of this action, which is exemplified by the design product"*. Consequently, the main aim of the needed educational tool should be to learn "How" to deal with a problem rather than "What" is a problem solution might be. This means evaluation of learner's performance should be in the first place on the process of taking an action or decision rather than the action or decision itself.

These characteristics may lead one to think of digital simulation programs as a convenient solution, but do they really represent a fruitful solution?

Can "Simulation Programs" Offer a Solution?

Many technical simulation programs are used to simulate different technical issues related to architecture like acoustics, thermal performance, daylight simulation, sun path analysis, HVAC installations and others. Although, no one can deny the great importance of these programs and how much they improve the performance of any design quality, they can not fully solve issues related to education. Issues like social impact on the design process, negotiation phase of multi specialists which is a core phase of the profession, the mutual impact of technicians' actions, the decision making experience which is achieved through a long period of practice, and other issues, all of them can not be taught with the help of current technical simulation programs. Two main points may be indicated to clear out why these kinds of programs failed to completely fulfill the educational needs; technicality and specialty.

Technicality: These programs are mainly directed towards special technicians, those who are professionals in their fields and know every thing about them. These programs have technical interfaces, scientific terms and some times a complex method of data feeding. Although this may be so convenient with specialists but for sure it is not with students. To make the student deal with some thing like this, the lecturer must first explain every term and theory beyond the function of the interface which will make students loose interest. Also one can not imagine that these programs are suitable for self learning or even capable of giving a perception for pre college students about the architect's role.

Specialty: This means that every program is specialized in one special field, so that in most cases the mutual impact of multi_disciplines can not be demonstrated. So, one can not use them to simulate the negotiation phase nor the decision making process nor deal with clients.

Consequently, technical simulation programs in their current form do not represent a solution. But what about digital games? Can they do the job? In order to answer this question, it's important to investigate the issue of depending on games as educational tools.

Using games as educational tools:

First of all, what is meant by the term "Game"? "Game" is, in the everyday sense, "a competitive activity . . . in which players contend with each other according to a set of rules" [11]. Games have been used as educational tools in many ways from the past. For example, the "Game Theory" has been introduced in 1921 [12]. It is defined as [13] *"a branch of mathematics that uses models to study interactions with formalized incentive structures (games)"*. It has applications in a variety of fields, including economics, evolutionary biology, political science, and military strategy. Game theorists study the predicted and actual behavior of individuals in games, as well as optimal strategies. Thus, it aims to help learners to understand situations in which decision-makers interact. The approach of using games in education spread widely because of their great effect on children. Because of their wide usage, in the start of the 20th century a new term has been coined which is "Edutainment". "Edutainment" [14] expresses the union between education and entertainment in a television program, game or website.

Recently, the spread of the digital technology helped in founding a new form of technology usage which is simulation and digital games. Although games and simulations both are strategies that put a course's principles and ideas into action within an engaging, interactive context, they still differ from each other [15]. Simulations are typically mock-ups of a real-life situation in which students are asked to play various roles, engage in dialogue with others, and observe decision-making constraints. On the other hand, games, by contrast, do not strive to mirror reality accurately, and they tend to occur within a generally playful atmosphere. Many games and training simulation programs are used nowadays to train and educate either undergraduates or postgraduates. A short list ^(*) of some simulation programs and games that are used in this field is represented in *table (1)*.

General Management	• Sigma • Airline • Mega Learning International • Sports Business Simulations
Politics	• Middle East Politics • Foreign Relations • Inter-institutional Policy Simulator
Team Cooperation skills	• Multi Interactive Multi Media Simulator • STORM (Simulation Training on Recovery and Mitigation)
Organizational Behavior	• Change Management ◦ EIS Game (INSEAD) ◦ The Innovation Diffusion Game ◦ Organizational Behavior (Change Management) • Negotiation ◦ Negotiator Pro • Human resources ◦ The Human Resource Management Simulation
Urban, Societies and Civilizations development	• METRO-APEX Computer Simulation Exercise • Community Land Use Game (CLUG) • Community Land Use and Economic Simulation (CLUES)
Economics	• Institute for Fiscal Studies ◦ "Be Your Own Chancellor" ◦ Budget 96 ◦ Tow - Tax and Benefit on the Web • Pro Invest • WinEcon • SimCity - Multi Player Version • Sustainable development • Globally Collaborative Environmental Peace Gaming Project • Real Lives • CyberCampus

Table 1: A short list of some simulation programs and games that are used as educational tools.

* for more information about these programs visit: CALT, The Centre for Advanced Learning Technologies, **Simulation & Games for Education**, under the title (The Games in the different areas) <http://www.insead.fr/CALT/Encyclopedia/Education/Advances/games.html>accessed 12/8/2004

Will games satisfy our needs as architecture educators?

This section will analytically investigate a digital game; SimCity 4000 Fig.(2), that is already available in the market. Investigation will be based on the needs that have been discussed earlier to indicate how much it is convenient to be used as an educational tool. It will be investigated to find out:

- How far does it match the real life situations?
- Does it provide decisions/actions tools?
- Does it provide a mechanism for making analysis?
- Does it coach player's performance?
- And finally, how a player can evaluate his performance?

SimCity 4000



Fig. (2): An analytical representation of the game interface

SimCity 4000 ^(*) is the newest version of an urban management game released by Maxis Co. It may be considered, starting from its oldest version, as a digital version of the traditional game CLUG (Community Land Use Game) which had been designed in the 1960s by Professor Allan Feldt of the department of City and Regional Planning at Cornell University [16]. The game is about building and moderating a new, or already established, community through playing the role of the City Mayor. The game is classified as a strategy, simulation game. The game will be analyzed, in the next section, to indicate how far it is convenient to be an educational tool.

^(*) MAXISTM, <http://www.simcity4.com/>

Does it provide decisions / actions tools?

"SimCity 4000" gives the mayor (the player) a limited budget, in the beginning of his career, to start planning and acting within this limit. He, the mayor, has to put a financial plan within which he can match between income and expenses. As a start the mayor has to zone his city, if it is a new one, and plan where will be the residential, commercial and also industrial zones. He also plans where and what utilities will be raised in the city, this includes utilities and services like: schools, colleges, clinics, hospital, police stations, fire stations...etc.

How far does it match the real life situations?

It needs some time, simulated time, to give the chance for the city to develop. Because of this development, city inhabitants start to ask for their needs such as increasing housing lots, commercial markets or industrial zones. The game makes a dependent relation between industry zones, which means job opportunities, and asking for residential plots. It also makes a relation between the type of industry and the educational level of inhabitants.

Does it provide a mechanism for making analysis?

The game provides a set of statistics that give the mayor the ability to analyze his performance. There are graphs representing the history of the city development *Fig.(3)*. It also provides an agenda controlling income, through taxes and financial deals, and expenses like salaries, maintenance costs, public services expenses and others *Fig (4)*

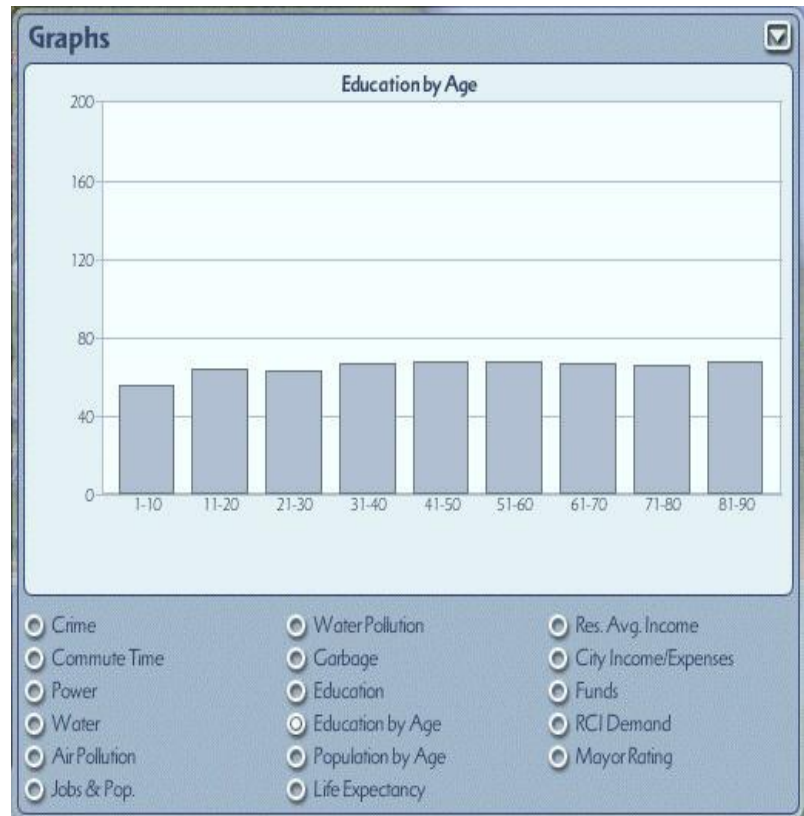


Fig. (3): one of the graphs that represent history of city development

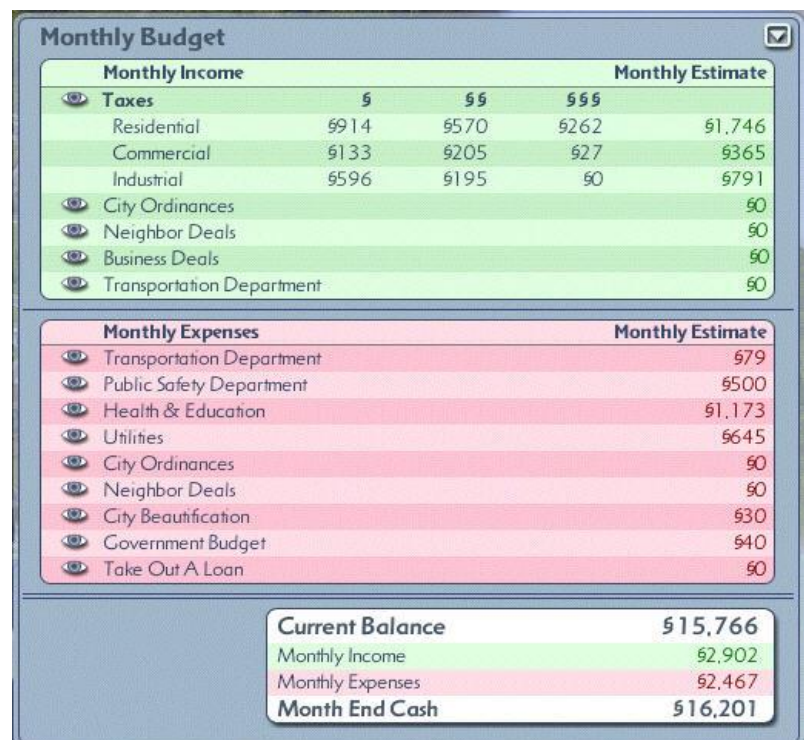


Fig. (4): Income / expenses agenda of the city

Does it coach player's performance?

SimCity 4000 also offers the mayor a group of advisors that always help him by providing an alert in case of finding problems. They give hints about the problem

causes and how it may be solved. They play no role more than advising the mayor and they do not force him to do any specific actions, there advises in major are well matured and valuable. *Figs. (5&6)*

How a player can evaluate his performance?

Finally, by keeping an eye on "City Opinion Polls" and "Mayor Rating" *Fig. (7)* mayor can always know how his city inhabitants evaluate his performance and know his electors opinions.

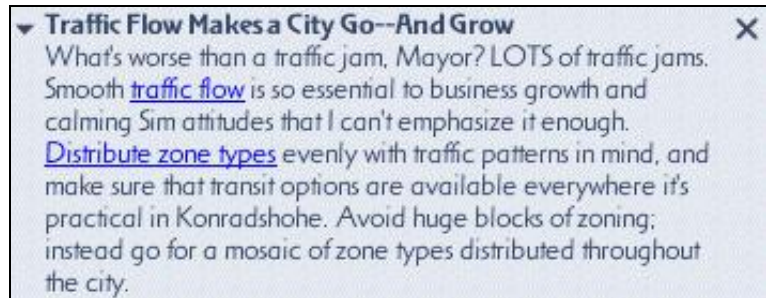


Fig. (5): Traffic Advisor offers the city mayor an advise about a traffic problem and suggests a solving methodology

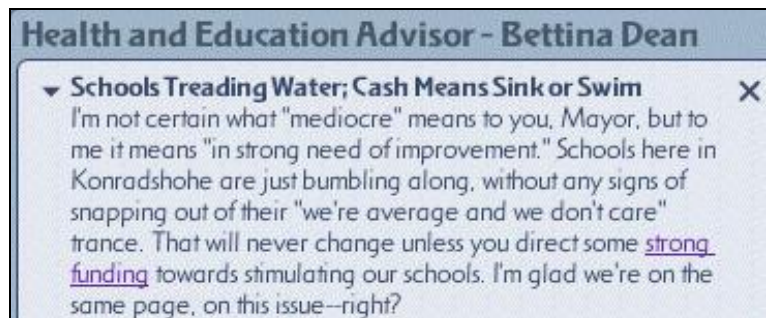


Fig. (6): Education Advisor states an educational problem and suggests a methodology to solve it.



Fig. (7): Evaluation Mechanisms of the City mayor

A windup

As it is clear, in the game, player performance is typical to Kolb's cycle of learning. He investigates city needs then he makes decisions and actions. After actions' results take place, he starts to evaluate his decisions outcomes and the city inhabitants' reactions. According to this, he starts to do other actions and modifications aiming to satisfy his city inhabitants and investors and still fulfill his strategies and plans. Through this cycle of **action** → **review** → **planning** → **action**, players get an experience of moderating communities.

So, the paper represented a digital game follows an educational theory in its performance although its theme, for sure, is not typically architectural. The previous analysis aims only to prove that some games are valid to be used as educational tools in a field whose theme is parallel to the architectural theme. Consequently, it is possible to have games, or to adapt some, for architectural education needs. For instance, one may think of "SimCity" itself to be used in architectural education by changing its main issue to be "Construction Site Management". Also the game "Sims" ^(*) may be used for educating students "Space Organizing" and how space qualities affect users' feelings.

This paper has pointed out that computer games have a strong potential as educational tools, and especially in architectural education. To what extent games can enhance architectural E-ducation is still an ongoing research by the same authors.

^{*} MAXISTM, <http://www.thesims2.com>

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