

AC 2007-1662: INTERNSHIP AND NEW STRATEGIES IN CIVIL ENGINEERING: A DEEP ANALYSIS OF BUILDING SITES

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Internship and New Strategies in Civil Engineering: a deep Analysis of Building Sites

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Abstract

The real challenge for all the Engineering Schools lately is to form the professional to act in the new work market. Nevertheless many Institutions have been searching hard for the best way to do so. Some of them have promoted new kind of curriculum more flexible and more adequate to the new student. One question remains: How to prepare the engineer for professional life? For some it is the internship that will provide the student the taste of what is to be an engineer. In Civil Engineer, the best way is also the internship at the building site if the choice of the student is to make constructions. For Civil Engineering the work force has an important role in the accomplishment of building a house or a skyscraper or any other engineering entrepreneurship in modern cities. Added to this among the challenges to be faced today by the developing countries are the changes in the extent of the production stimulated by new technologies and the impact of such changes in the education field occupy the central point. It is in fact part of a huge research in Civil Engineering in a very deep analysis of its history in the construction of a city in Atlantic Forest Region. It is worth to stand out that the relationship among learning and the workers' education level of the building site in Praia Grande city is approached through information picked in the workers' speech adding to the records of building companies. "Knowing how to do" of those workers happens in the building site and it is part of a structure of occupations, in which unqualified workers apprehend an occupation side by side with more experienced workers. Finally to recognize that a better education degree is fundamental in the absorption of new technologies that demand new productive processes and consequently a new profile of hand work in the building site.

1. Introduction

The so called global work market has been changing drastically the workplace and the practices. Therefore reflecting about the data of the field research and of the permanent dialogue with the subject of the investigation, it was built a referential to think the object study the worker and therefore to understand him/her from inside of his/her educational, cultural and professional context. It was defined as objective of this work the relationship between education and the workers of the building site learning, therefore, "knowing how to do" related to the low education level and the transfer of knowledge facing the innovations of productive process.

As for the chosen theme, its relevance appears when it is confronted with more general subjects, as: the incorporation of technological innovations and the demand for new qualifications and/or competences in de compass with the section of construction, whose workforce is absorbed in an intensive way and it is characterized by the semi qualification and low education. The contact happened initially with the interview of more than a hundred and thirty workers of the building site in three building companies in Praia Grande city. The obtained data should be analyzed carefully, because they are samples. In that way, the justification of that work appeared of the observation of the urban context of Praia Grande city, in which the building site has fundamental paper in the growth and embellishment of the city, in other words, to investigate the subjects involved in such context, particularly the workers of the building sites, holders of a low education, unfounded to the acquisition of a professional degree due to the own characteristics of the site and consequently easy objectives not only of the professional marginalization, but, above all, social.

Continuing the research, to investigate the education process, knowledge and those workers' learning process that are in the majority little educated who learn the "occupation knowledge" in the building site, aspect that reflects a disagreement between technological innovations and the demands of a new labor profile in the building site. The conclusion reflects central subjects of the approached theme, as well as, the investigations and reflections that were built along this study.

2. Implications of Education in the Building Site Environment

In the context of the building site marked by the intense presence of a workforce of low education and little or any professional qualification there is an apparent disregard with the potentialities of those workers' formation in their multiple dimensions, mainly of the scholars knowledge.

According to the researches on the level of those workers' education, it was verified¹:

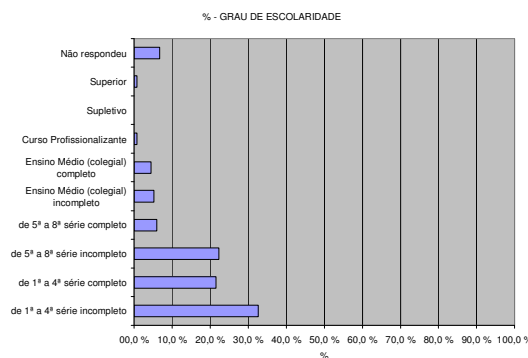


Figure 1 – Scholarship degree

The data above shows that 33% did not get to complete the 4th year of first degree, while 22% have ended the 4th year of first degree. Those percentages demonstrate that more than a half of those workers have low education degree. It is observed in the sequence that 23% did not end to 8th year of first degree and only 7% concluded the First Degree or Fundamental Degree. Among

those workers 6% possess incomplete Medium Degree and 4% completed the Medium Degree, only 1% possess vocational course, 1% university, among the engineers of the site and 3% did not answer. Once again it is necessary to consider that, differently of other productive sectors the building site lives together with the lack of professional perspective, so that it is difficult for the companies determine that their workers study again. On the other hand, that perspective lack turns difficult to the worker to notice what are the "earnings" of his/her education as worker of the building sector. In a "master's of works" words: "... I studied until the 8th year of first degree. To work here it is not necessary so much study, what we need is experience ... we have practice, we do well, we learn with the practice ... I didn't need the school, only the fact of knowing to read and to write ...". Those depositions portray the "culture" type that permeates the world of the construction and that can be felt in the interviews with the workers about the continuity of the studies. In the obtained percentile only 10.4% continued studying, while 89.6% answered that they do not frequent any course type. Among the 10.4% they are workers holders of an occupation as: plaster master, technical auxiliary and work with marbles and granites.

It is important to mark still, a certain embarrassment of those workers when asked on the reason of their no return to the school. The return to the school many times means on one side, to assume his/her precarious domain of the basic abilities openly as reading, to write, to accomplish elementary arithmetic operations. On the other hand, that worker comes from an existence in which the request of the abstract knowledge, formalized at the school, is very small². That situation repeats in his/her urban existence, once, for the low own education, he/she goes for occupations that demand manual abilities and physical effort and no abilities of how to read and to write. Added to this evaluation it shall associate the own nature of the accomplished work, which demands manual abilities and a great physical effort, ally to the schedule of the classes, after exhausting work day, resulting in fatigue that will interact in the quality of the learning process. In a worker's deposition: "... here the work is very heavy, we enter at seven in the morning and we leave at five in the afternoon. He/she wants to arrive home soon and to take a bath, to watch television to distract, to study won't change anything else ... he/she sometimes has another job after the work, to go to school is difficult ...".

In the contact with the workers there are depositions similar to that and this takes to the conclusion that, it seems there is a distance, an almost incommunicativeness among the teaching process in the school and the work world, carting the motivation lack and the workers' cessation. On the other hand, when interrogated on the importance of the study in his/her profession 86.9 % answered yes and 84.4 % declared that they would take a vocational course. This shows that these simple men still see in the studies a chance of future opportunity in order to obtain better life conditions. Among the interviewed workers 22% chose the course of electricity, 14% opted for person in charge of works, 12% bricklayer, tied with 7% dry construction, settler of marbles and granites and hydraulics, while 6% chose safety in the work. The other courses obtained less than 5%.

It is noticed in each worker's speech an anxiety as for the perspectives of the entrepreneurs' sensibility in supplying such courses. This is explained in the difficulty that the sector possesses for the workers' ascension in the hierarchical structure of the occupations. A lot of times, that ascension feels not only for the capacity, but also, for characteristics difficulty to evaluate, such as the sympathy between the master of works and the worker. As for the researched builders'

entrepreneurs it is verified that these do not understand or they do not want to understand those workers' anxieties especially because they are small, traditional enterprises and that even they are adapting to the new needs of the market.

In what refers to the learning process in the context of the building site, some subjects deserve prominence, among them: How does the learning process happen in the building site? To what extent is "knowing how to do" of the worker related to the construction and the insight interpretation of meanings that are important to them related to their external relationships? The learning process of the workers' of the building site most of the time happens in the own building site. In agreement with the research of the workers interviewees' field 50% had his/her learning process in the own building site, 17% learned with the family, 15% with the friends and 15% in the observation of the day by day out of the stonemason while 3% didn't answer.

Therefore, that learning process happens in the building site and it is part of a structure of occupations in that the master, the official and the apprentice interact. That process that aims the transfer of the occupation "knowledge", not only it has been destroyed, once, some activities were transferred outside of the stonemason and with that the worker started to have the domain on a part of the product, as well as that "knowledge" was not incorporated by the managerial segments. "The Know How" is common denominator in the processes of professional learning. Unqualified workers acquire his/her qualification working, side by side, with more experienced workers, while, the qualified workers make his/her road through companies enlarging experiences and occupying places of command, as for instance, the person in charge of all works. In the absorption of the knowledge and in the need of the learning, the worker as any other individual receives internal incentives (his/her interests in knowing) and it ends transforming them in according to their own needs.

3. Engineering Education and Building Site: Reflections about New Technologies and work development

In according to the deposition of some entrepreneurs, engineers and master-of-works the work in the building site when accomplished satisfactorily, it seems to be resulted of voluntary actions that emerge of some workers. How does that process happen then, in which some workers "know how to do" and do they "do well" and others not? In that sense, it is noticed that, the learning of the work happens when some conditions are present. It is necessary to count with the good will to learn, to transfer knowledge and experiences.

According to Mussak³: "The human being is an animal that learns and makes it during all his/her life. All have capacity to learn, inside of the concept that considers learning a phenomenon of receiving incentives, to process, to classify and to store them, with the purpose of creating a new conscience of itself and of the world, provoking behaviors modifications".

Maturana states that "life is knowledge"⁴. So the learning is a social and biological process and, therefore, it cannot be explained only by sociological perspectives, but also through that worker's individual motivation to learn and to absorb knowledge.

It is noticed that, knowledge belongs to any life form; it doesn't come from outside but in the way as the individual organizes their relationships with the external world. Therefore, the worker in his/her learning process, introduces an order in what sees, since s/he in a glance recognizes similarities, regularities and establishes what is more or less important. The process of assimilation of information is not in the dependence of the assimilation quality, but, as that information is seen by the dynamics interns of the individual. To understand the learning process and consequently "knowing how to do" is above all to speak about the construction of meanings. A worker only learns content when it is capable to print in him/her a meaning. Therefore to "know how to do" or "to do well" it is an individualized process of each worker, "through which intrinsic properties of the individuals' autonomy did not capture the information of the exterior, but they welcomed their spills as interpretative phenomenon"⁵. The learning in the building site is a process of transmission of knowledge and experiences. In that cognitive transfer among the workers it happens an accompanied mental process of the reflection / action that supposes that that worker is capable to recognize the techniques that are being taught and to recreate them in new situations. That learning process demands initially that the worker "wants to learn". Through an intuition more or less explicit that s/he has resources to invest in the understanding and in the domain of the learning situation based without a doubt, in a trust form in their own internal resources: I "can", I "want" and I "learn".

For the worker it is not enough to hear simply of other how to put tiles correctly and to follow that procedure precisely to act in an effective way. The capacity to integrate knowledge, the observation and the experience is decisive for "knowing how to do". It is the capacity to find, to select, to integrate the cognitive resources that she/he disposes. "The transfer of knowledge and learning mobilizes inference outlines of generalization, of resolution of problems, of reasoning, outlines those that are constituted very unevenly, according to the subjects. Nevertheless, it is not acquired 'a universal competence' from the transfer, but it is acquired through the experience and of the reflection on the experience and instruments, outlines or mental postures to facilitate it". It is noticed that the electrician's practice in the building site is considered a specialized activity and it is noticed that the cognitive transfer is so immediate that it disappears as specific moment of the action and as problem. In that sense, the preparation for the transfer of the knowledge becomes just a "substratum" of the experience and of complete practical-theoretical domain.

The concern of the cognitive transfer is worth, above all for the worker beginner that should dominate knowledge through the practice of the reflection / action as object of the knowledge, becoming a specialist or holder of a "knowledge of the occupation" after some time of assimilation of the learning and of the exercise of the experience. It is noticed that the occupation worker stands out for his/her capacity to relate and to transfer situations that the beginner judges be same, because this doesn't notice the existent structural similarities under the several activities that come in a construction site. Like this, so that it happens transfer of the learning is necessary to unite to know and experience. Any worker can simply learn giving a limited sense to the work and the knowledge. "The transfer process becomes then unlikely if it is not accompanied by any of the representations that turn its usage imaginable and pertinent, out of that context of the acquisition"⁶.

So when the learning happens with the union of the knowledge and of the experience the worker acquires "know how" or to "do well done"; on the other hand, when the worker simply learns limiting the knowledge and the experience what happens is "to do". It is the professional learning the best example of "learning doing", in which, the workers learn with other workers, before even of they can understand rationally what they are doing and the reason they are doing. It is noticed, that in the professional activity a lot of learning process of new competences depend on the imitation of the beginner worker observing the activity developed by the occupation worker.

According to Shon: "... the imitation is more than a mechanical pantomime; it is a form of creative activity. If I have to imitate the skilled action of one of you, I have to understand what there is in its essential. But the essential elements of your action do not appear identified as such. The trivial and the essential are mixed: that is why the disciples have tendency to imitate his/her master's ways of doing. When I imitate you, I try to build what I understand as essential of your action and to test my construction when carrying out of my own the action"⁷. So the beginner worker tries to rebuild what learned of essential in the occupation worker's ability and try acting through his/her own creative action. To learn it is important to understand the sense of what is learned. For such, it is not enough the "knowledge" to be intelligible and assimilable. It is necessary that the worker understands why it was developed, transmitted and why it is convenient to acquire it⁸.

That perception of the need of acquisition of knowledge by the construction worker happens in the "praxis" of the day by day. His/her understanding is utilitarian once, the learning of certain "know how" allows to transfer them and to recreate in new demanded techniques and consequently to guarantee his/her survival in the job market. An example of that happens with the use of bricks and of the wized plaster. In both cases the measurement of the perpendicular in the rising of a wall is similar. It is noticed that in the wized plaster, the adopted technique is to use the previous experience added to knowledge of new type and experience. It is, therefore, in the knowledge of a new technique that the worker acquires a new "know-how". It is obvious that, a level of higher education presupposes more organized forms of thought, therefore, more advanced levels of learning, making possible larger adaptation to the abstract and sophisticated forms of personal and professional relationship and, consequently, success in those incursions.

So the educational process, in any degree or purpose, always involves the cognitive capacity, because it is through it that the individuals solve their problems and they set out solutions that are fundamental pre requirements for the acquisition of new knowledge about the nature, the culture, the work and the society⁹.

4. The formation of the New Civil Engineer

The real challenge for all the Engineering Schools lately is to form the professional to act in the new work market. Nevertheless many Institutions have been searching hard for the best way to do so. Some of them have promoted new kind of curriculum more flexible and more adequate to the new student. One question remains: How to prepare the engineer for professional life? For some it is the internship that will provide the student the taste of what is to be an engineer. In Civil Engineer, the best way is also the internship at the building site if the choice of the student is to make constructions. The building site is the place where the student will get in touch with

the worker who will make the hard work. It is when the future engineer has the impact of different cultures in the working environment. It is may be one of the most valuable experience for those that will be involved in projects of building house, buildings, bridges or power plants. It can provide the students the dimension of building anything and how important is the good hand work, how to take advantage of new technologies and how important it is for safety¹⁰.

New Technologies helps to accomplish a better work but still men are in charge of new technological devices. New technologies demand more qualified people and so more educated ones. New Technologies in 21st Century is far more sophisticated and so the apprentice requires more formal education. It is the new reality that common men have to face as well as any professional of any field. For civil engineers the contact with workers is part of his/her formation in every level. No matter what is the size of a project the human element and the relationship in internal or external to the project is very important in a daily basis for the accomplishment of it. No doubt that education has proved to be powerful once it altogether with experience form a better worker and a better engineer. Although high education is preached by politicians and the society it is far the accomplishment of at a higher rate of people with high education in the Country. It is due to the social, economical and political situation that does not propitiate the adequate number of universities and the possibilities of payment by the students. It is the result of a historical and complex process of a young nation¹¹.

5. Final Comments

This part of the research had as the starting point the study of the education and the workers' learning of the building site in Praia Grande city as well as the relationship resulted of the interaction of civil engineers in this environment. Nevertheless the debates about the productive restructuring, in the need again of a new worker's profile with higher education degree are just incorporate in speech level and not in practice. The research is supported by some data and it is possible to conclude that, most workers did not complete the 4th year of first degree. This fact takes to the conclusion that the lack perspective for the workers and education increases a little or nothing his/her professional life has collaborated for the current situation. Other factors join to this, standing out the education politics presented to adults that in this country is very bellow the standards of the needs of the work world, mainly in an activity that demands very more ability of movements and physics force than what to read and to write.

Human beings have this outrageous characteristic of adaptability, such as those workers smuggled of the education process, learning in the day by day with other workers. Therefore, "knowing how to do" is passed to the other in a relationship of "learning to learn" and they are common denominators for those workers of the construction sector. The learning process is inherent to the human being, while competences and abilities are potentialized, capable to be developed. The worker cannot understand the chemical processes that contain materials and components of the building industry but s/he adapts and s/he will adapt in the future, in the "know how to do" independent of the productive innovations. The study of the learning process and those workers' education are justified in the social debt not repaired and in the concern with the new generations, so that the adults of the future have conditions of competing at the professional market in equality of education and social conditions. It is not an easy task taking

into account the dimensions of a large Country an ex colony with a young population of almost 170 million inhabitants.

Automation is a reality and sooner or later the building companies will have to face the need of more qualified worker and the state will have to face the social and economical impacts of such changes. To mobilize the professional sector of civil construction in every level is imperative and necessary to overcome the challenge of the new labor market for the sake of the society as a whole.

Finally, for civil engineer's students the experience in a building site in internship period constitutes of a great opportunity to get in touch with the reality of a workplace where the accomplishment of a project such as a house or a high building remains in the ability of non educated workers with a low level of formal knowledge and the capability of just so to execute the tasks in according to the design.

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