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Integration of the Education, the Investigation and the Practice through a geotechnical case

Intégration l'Éducation, de la Recherche et la Pratique à travers un cas géotechnique.

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ABSTRACT

By means of the presentation of a real case of the application of the ground mechanics in stability of slopes, in rural ways, one is to the connection of the education with the investigation and the application of engineering, in this geotechnical case. In an introduction one widely justifies the necessity and convenience of using this model to train the engineers in order that, without a doubt, they respond with efficiency and effectiveness to satisfy the needs that the development of the countries of Latin America raises.

RÉSUMÉ

Par la présentation d'un cas réel de l'application du mécanicien de sols en stabilité de pentes, sur des chemins ruraux, on montre la liaison de l'éducation avec la recherche et l'application de l'ingénierie, dans ce cas géotechnique. Dans une introduction on justifie largement la nécessité et la convenance d'utiliser ce modèle pour former aux ingénieurs afin que, sans doute, ils répondent avec efficience et avec efficacité à satisfaire les nécessités que pose le développement des pays de l'Amérique latine.

1 INTRODUCTION

Mexico at the moment undergoes the beginning of a new governmental administration and it has caused in its population and its new leaders the analysis and the reflection on the conditions in which it is lived, on the reasons of it and the desirable conditions of life and the form to obtain them; yes they have arisen propose for the call "National Project", through the document written down thing (ref. 1), (ref. 2) (ref. 3). It is to be made notice that in three documents it is located like "very important column" in the attainment of the objectives to the education.

Thus it is indicated in one of the recommendations: "to locate in center to the education of the project of national recovery"

In another one: "To lift the cost in the education at the level of the developed countries more of the world"

2 ENSEÑANZA-APRENDIZAJE MODEL.

In the reflection that on the matter is realised they consider two facts; on the one hand the external present examples to Latin America; as far as its results, as it is the case of Europe, that generally it modifies the structure of the system of the education superior and also the case of the United States of America where only 2% of their total population in education superior are enrolled in programs to obtain a professional title. The posgrado one is channeled to the masters and to the doctorate and special impulse occurs to the continuous education. The other fact to take into account in the reflection, is to know the present state the education superior and to establish those changes that definitively are adapted to the characteristics that delay has Latin America.

The education-learning model is had ,

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like subject of analysis and reflection; on the matter, until now it is accepted that the professor teaches and the student learns; that the active element of this process is the professor and the liabilities is the student.

He considers himself that before this panorama the student must be able to look for the information by itself, must have the capacity to analyze it and to integrate it in the sense before

written down, separating the solid knowledge of which they are not it; in all this process, the student is the "active actor" reason why the paper of the professor is the one to detonate the process, with transmission to the students of basic and solid knowledge and essentially with the generation in the students of a "supported attitude" in the fact that they have clear and clear answer to questions such as what? and why? (ref. 4) it channels what them to work "in equipment" as becomes in the application of engineering.

In relation to the positive attitude of the students to form with the purpose of to be quality engineers, it is advisable and necessary that the professor generates in them an interest convinced to do hers the personal characteristics that assure the fulfillment that fact, by means of the transmission of the knowledge of facts objectives that demonstrate the undeniable importance of it.

One of those characteristics is to own the "ability" to apply engineering; on the matter, it is possible to be presented the results the extensive investigation that the World Bank realised and whose results published in 2005 (ref. 5)

The present world, in which the national competition is present as as much international, in all the facets of the productive sector; it every time demands with greater emphasis the one than to the professional young people it is equipped to them with "abilities", among them, in high-priority form, the one who know "to apply engineering.

Another characteristic that is advisable has the professionals and that in principle is acquire necessary it they fortify and/or it during his studies of degree is a genuine interest by the investigation, being desirable the one realises that it, but in anyone of the cases the one that causes it at least supports and it. In order to make be born that interest giving turns out suitable to know the students the fact that a great number of countries has entered the total development realising and fructifying several activities and one of them, important, is the investigation; a present example is Korea that in the last 30 years happened of under-development to the development and for it conducted several battles, among them the one to impel the investigation, that today carries out supported, first of all, by the private initiative (fig 1).



The Korean investigation is realised mainly in experimental form (fig 2) with results of “immediate application” that frequently are technological innovations.



Fig. 2

In addition it is to be clear that in the times that are lived on intense competition, countries like Mexico, have almost like unique way that leads to the development, the technological innovation.

3 REAL EXAMPLE OF ENGINEERING GEOTECHNICAL INTEGRATED IN HIS LEARNING, THE PRACTICAL APPLICATION, THE INVESTIGATION AND THE TECHNOLOGICAL INNOVATION.

In which next it is written down is not tried to enter in detail geotechnical, that on the other hand can be consulted in the references that are mentioned, but it is heightened, by means of the knowledge of a real case, the mechanism of connection between the learning of engineering, in this geotechnical case, with the acquisition of the ability to apply the knowledge, realising investigation and of course generating technological innovation.

Mexico is a country that at the moment counts on 340.000 kilometers of terrestrial routes of all type, to serve its 103 million nationals and enters its needs to satisfy, according to diverse studies of prospection which they have been realised, this gliding, projecting, to design and to construct about 100.000 kilometers of rural ways, to unite populations with a small number of inhabitants; in such ways the cost of them, by kilometer of ways of first order, is definitively very small with respect to the cost by kilometer of ways of first order. This fact must be presented the students by the antecedent professor as of the exposition of the real case to wake up in them the interest in generating that “attitude” positive of which before it has been written.

Mexico is furrowed by mountain ranges that do their orography injured and a great amount of rural ways is located mountain range in the heat of, with situations critics, among others, of stability of slopes. The existing grounds, at least in the real case that it appears, are generally fine, constituted by very susceptible muddy clays in their mechanical behavior to the presence and the variation of the humidity.

The analysis of the geotechnical characteristics of the grounds that constitute the potentially unstable slopes, and the common sense, takes to the alternative of solution by means of subdrainage works and specifically to the use of you drain horizontals (ref. 6) constituted by tubes of 5 cm. of diameter, perforated in its lateral surface and introduced in perforations of 10.0cm of diameter and with lengths of until 15m. In the indicated real case, they allow the drainage of the water that contains the ground, with the corresponding discouragement of the pore pressures, the increase of the effective pressures and the increase of the resistance to the shearing strain of grounds,

situation that allows to increase the factor of safety of the slopes transforming them into stable (photo. 1).



The analysis and the design of you drain horizontals in the real case that it is detailed in reference (ref. 6) determined a factor of safety sufficient to be accepted like solution. Nevertheless the cost of this technology since it had considered, escaped in much, the accepted one by the economy of the work; it in principle forced to reject it; nevertheless it generated also the decision to maintain lowering it his cost, which was obtained innovating, using like draining element sand that was used to fill up the perforations, the one that was extracted of a zone located in the immediate proximity of the work (fig.4).

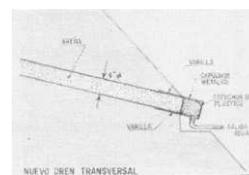


Fig 4

The analysis and the design in this case I determined an increase of 30% in the factor of safety with respect to the obtained one using traditional technology (ref. 7).

The cost was managed to lower, among others done, because the used sand was obtained from a zone located in proximity of the work reason why was necessary to investigate if the sand, in spite of not fulfilling the indicated thing in the respective specification (to be material of filter: sufficiently permeable so that the water flows with facility to its traverse, but at the same time sufficiently impermeable so that the solids of the ground I clay muddy surrounds that it are not dragged by the water when flowing towards her), was guaranteed that it would act suitably like draining element, at least during the life utility of the work. When presenting/displaying the real case to the students, was managed to interest them in him and consequently they formed a “equipment of investigation” (photo 2, photo 3) and advised by the author of this communication in its character of professor and generator of the technology “you drain cross-sectional of penetration with sand”.



Photo 2



Photo 3

The conclusion to that it lead the investigation indicated that yes the sand was suitable using, but perhaps most important it is than a modification to the specification seted out which made it

next to the reality: in order to drain originating fine ground water (clay and the slime) it is enough to use sand constituted by solids of means to fine; what it allowed as well that this technology was used in those works whose economy imposes costs reduced with respect to the usual ones in ways that are not rural.

4. CONCLUSIONS.

The mentioned geotechnical case in that it was managed to increase the security to a cost smaller than the corresponding one to the use of a relatively traditional technology, gave to students and total professor satisfaction to generate outpost technology, but still more because an example on connection of the learning of ingenieriles knowledge was lived, with the obtaining of the ability to apply them, with generation of an investigation on a technological innovation that lead as well to a contribution to the improvement of the technology and consequently can be written down like conclusion the following thing:

The mentioned geotechnical case in that it was managed to increase the engineers generally, and especially the geotechnical ones, must respond with fullness to satisfy the needs that the development of countries provokes like those of Latin America; for it they must own the attitude that allows them to connect the ingenieriles knowledge that received and that day to day they obtain, and the application, with efficiency and effectiveness, of its profession, in addition they must impel, support and generate the innovation technological.

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