

Educational Evaluation and Prediction of School Performance through Data Mining and Genetic Algorithms

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Abstract— *The educational evaluation requires of analysis and continue strategies to adapted the current context, so that this research presents the need to define models of educational evaluation with adaptive characteristics to the area of knowledge and the students to predict behaviors of academic performance and support the decision making in the educational context. This need is based on the theoretical framework and with the integration of state of the art to outline and define alternative solutions based in Intelligent Computing.*

Keywords— *Models of Educational evaluation, strategic of evaluation, intelligence computing.*

I. INTRODUCTION

Public primary education is one of the pillars in the educational training of citizens in any country and Mexico is no exception, so it must maintain and increase efforts to raise educational quality. In this sense, this proposal is aligned to the specific demands of basic education sector in the areas of transformation and innovation of school management and analysis of data, indicators and surveys on educational development. Which in turn they are embedded in the National Development Plan of Mexico 2013 - 2018.

This research studies are preceded by the research about the control of management of administrative and operational processes in public primary education in Mexico, whose purpose was the development of a model through data mining and genetic algorithms. This had been implemented in a sample of public primary schools in the municipality of Ecatepec de Morelos, State of Mexico. Was conducted in the years 2011 - 2013, this proposal was applied in two public schools. In this project, they were able to identify various procedures, whose objective was to enrich the proposal, and several of them began the preparation of this.

Derived from the above, it is intended to collaborate with this effort, in the developing a model of educational evaluation and prediction of academic performance of students in public elementary schools, and thereby influence the rates of academic performance of students. This with the use of

scientific and technologies methodologies, including the integration of the theoretical framework and the state of the art.

Moreover, technology plays a key role in supporting the administrative and operational processes in the aforementioned demands. For this, the state of the art including the efforts made by the educational authorities as well as academic research, with the aim of enriching this research.

Educational Evaluation impact on the ongoing training of students, making contributions that will generate strategies according to the characteristics of the current educational context and it focuses on three aspects are required: institutional, teacher and student, all of which collaborate the best teacher performance.

The first approach through the Ministry of Public Education, the National Institute for the Evaluation of Education and the National Plan of Evaluation of Learning, foster the necessary measures to ensure student learning conditions and articulates evaluation tools necessary to raise student learning. The second approach from the perspective of the teacher, serves as a mediator and direct evaluator of acquired student learning through the implementation of teaching strategies (governed by the institutional approach) to ensure learning and targeting opportunities for improvement in the students. Finally, in the third approach converge different evaluations, such as: Psychological, Socioeconomic and School Performance in the latter the skills and knowledge acquired by students through indicators such as valued: tests, practice, participation, exhibitions, assistance, conduct, teamwork, oral dissertation, terminal project, summary of articles, use of English, panel discussions, mental and conceptual maps, among others.

In the latter approach and specifically on school performance it is where the opportunity for improvement is identified, given the way in which it is evaluated, which is susceptible to perfect. Currently, teachers apply fixed indicators to assess the skills and knowledge in all grades and subjects, which causes the results of each indicator, not conducive to the identification and development of their own abilities of students in each

discipline and precludes the creation specific thereto as control strategies to improve performance.

II. PROBLEM STATEMENT

While it is true that with the emergence of proposals and technological implementations certain targets are met, these provide opportunities to generate new proposals or to improve existing. In this sense the existing problem is that "do not exist the systematized the process before the student's grade", i.e. educational assessments or indicators that led the student obtained his partial qualification and final.

III. PREVIOUS STUDIES

This research begins with previous studies about assist in the control of management of administrative and operational processes in public primary education, whose purpose was the development of an information system with data encryption and projecting the grades and compares students' grades. This in a sample of public primary schools in the municipality of Ecatepec de Morelos, State of Mexico. This research was conducted in the years 2011 - 2013, did used scientific and technological methodologies, field research and data collection to enrich the investigation and implementation of this proposal in two public schools were applied. In this project, they were able to identify various Improvement opportunities, whose objective was to enrich the proposal.

IV. RESEARCH TYPES

This research is supported by the following types of scientific. *Descriptive*, is the characterization of a fact, phenomenon, individual or group in order to establish its structure or behavior [1]. *Explanatory* research. It is responsible for searching the reason of the facts by establishing cause-effect relationships. It will be including *field research*, in which the main technique employed is the survey. Is a technique for acquiring information of sociological interest through a questionnaire previously developed [2]. *Propositiveresearch*, indicate that part of a diagnosis, set goals and strategies are designed to achieve them [3].

Type of technological research. The type of technological research is used the following:

Technological research of intervention. Aims to generate objects tangible or intangible to modify reality, leading to a model actually posed in artifacts. I.e. is a finished item, which includes the application of knowledge in a specific product that solves a problem, meets a need, facilitates the task, a task made efficient or provides comfort [4]

V. INVESTIGATION METHODOLOGY

In relation to scientific research methodology, were used the following:

Method of analysis and synthesis which. The analysis. It is a theoretical procedure by which a complex whole is broken down into its various parts and qualities [1].

The analysis allows mental division of the whole in its multiple relationships and components. Synthesis. Mentally establishes the link between the parties previously analyzed and allows discovering the essential relations and general characteristics between them. The synthesis occurs with the results previously obtained in the analysis, allows the systematization of knowledge.

Induction-deduction: The induction and deduction are theoretical procedures of fundamental importance for the investigation. Induction: Is a procedure by which singular facts from general propositions are made, helping to formulate the hypothesis [5]. This research process is always connected to the deduction.

Deduction. Forming part of dialectical knowledge and reality inextricably [1].

Systemic structural functional. Its action is evident in the interplay of ideas, connecting concepts, systems and recommendations together with the methodologies and strategies, it becomes thereby an important channel for the explanation of the research object.

The purpose of Qualitative research is to understand and interpret reality, as it is understood by the subjects participating in the contexts studied, but this understanding does not only apply to the investigator [6]. The results are to be shared, communicated, as the case with the participants, and contribute to scientific knowledge about the kind of realities.

VI. TECHNOLOGICAL RESEARCH METHODOLOGY

For purposes of this research, it will make use of the following technology research methodologies.

Life cycle. The life cycle is a framework that contains the activities and tasks involved in the development, operation and maintenance of a software product, ranging from identification to completion of its use [7].

SCRUM. It is a process that regularly applies a set of best practices for working collaboratively as a team and get the best possible outcome of a project. These practices support each other and their selection is rooted in a study of how to work with highly productive equipment [8].

VII. THEORETICAL FRAMEWORK

Below are several concepts of the theoretical framework that consists of prior knowledge that make up the project.

TABLE I. FRAMEWORK OF THE PROPOSAL

research reporting	Word	Definition
Models of educational evaluation and prediction of school performance	Model	A model is a conceptual structure that suggests a framework of ideas for a set of descriptions that otherwise could not be systematized [9]
	Educational evaluation	Educational evaluation, it can be seen as an instrument to raise the academic work and facilitate innovation [10]
	Prediction	The concept of prediction in science, is the reasoning or argument made to obtain a predictive conclusion [11]
	School performance	School performance is the parameter by which one can determine the quality and quantity of learning of the students and also because it is social, because not only covers students, but the entire teaching situation and its context [12]
	Models of educational evaluation and prediction of school performance	From my point of view: it is a conceptual framework to suggest a framework of ideas, and thereby generate instruments to sensitize the educational work and facilitate innovation, and through them, to obtain a predictive conclusion, by which one can determine the quality and quantity of student learning

Source: Own, based on the concepts of these authors

VIII. STATE OF ART

I investigated about the contributions made in the field of educational assessment from three different perspectives: pedagogical, technological and using Intelligent Computing techniques, making emphasis on the latter.

From a pedagogical perspective, there have been various solutions regarding student performance, which aim to improve the quality of teaching and learning through educational evaluation. Most of these works propose models and mechanisms for evaluating the training process, some of which are based on competencies [13], [14], [15]. On the other hand, it has also investigated about the usefulness of formative assessment processes and information technology in student learning [16]. However, they are made under traditional schemes based on physical documents, resulting in delays for the analysis of information, besides being very general focus for both the learning process and the student context (environment).

From a technological perspective, there have been alternative solutions that focus to in systematize and integrate information from educational evaluation from an institutional perspective where statistical systems of the students and teachers are generated in relation to the operation of schools [17], [18], [19]. In addition to this, investigations found that focus on the systematization of knowledge, evaluating the quality of information poured in classrooms, as well as assessing the quality of teachers [20]. However, in none of these work contributions on educational evaluation they are made from the student point of view, where you can identify assessment indicators that are subjected them to assess their learning.

As for the jobs that have incorporated Intelligent Computing techniques on proposals involving educational evaluation the following are presented:

1) Student performance analysis, visualization and prediction using data mining techniques. a system in which different data mining techniques on student performance on tests / exams [21] intends to apply. In this work use a Decision Trees algorithm is used to predict student performance and helps identify the strongest and weakest subjects. However, merely to make predictions of performance in examinations / tests and leaves aside other indicators that makes up the educational evaluation.

2) Determining the student's performance using artificial neural network tool of The authors. Propose a model that allows the prediction of student performance using a neural network. The model helps to accurately predict students at risk of dropping and reduce dropout rates. The comparison between planned and actual performance indicates that the model works in the estimation of student performance [22]. Unfortunately, it is focused on specific aspects of

performance without considering other related student performance.

3) Evaluation of student's performance of an institute using clustering algorithms. In this research, data mining for continuous student learning as you go to school year is used, this applying algorithms hierarchical clustering to identify the performance of students of the University Institute of Engineering and Technology, Panjab University, India [23]. However, this research is limited to considering only the student learning mechanisms (methods of studies, didactic aspects) to find certain groups in them.

4) Prediction of Student Performance Using Weka Tool. This research seeks predicting student performance by Weka tool that uses the algorithm Naïve Bayes, which knowledge describing student performance [24]. However, this study is limited to considering only extra educational information and psychological, personal and student environmental aspects.

5) Supporting teachers in adaptive educational systems through predictive models: A proof of concept. This research aims to collaborate with student learning through PDianet System (descriptive and adaptive web-based learning), which collects information about students and identifies which area requires more attention and through an analysis based on descriptive models and adaptive suggests thematic content that can help students raise their performance [25]. It focuses primarily on identifying areas with weaker students and suggest content to help you improve your performance.

IX. PROPOSED OF MODEL FOR EDUCATIONAL EVALUATION AND PERFORMANCE PREDICTION SCHOLAR

It is based on previous processes, and with reference to the context of artificial intelligence, and administrative approaches on the subject of educational evaluation models.

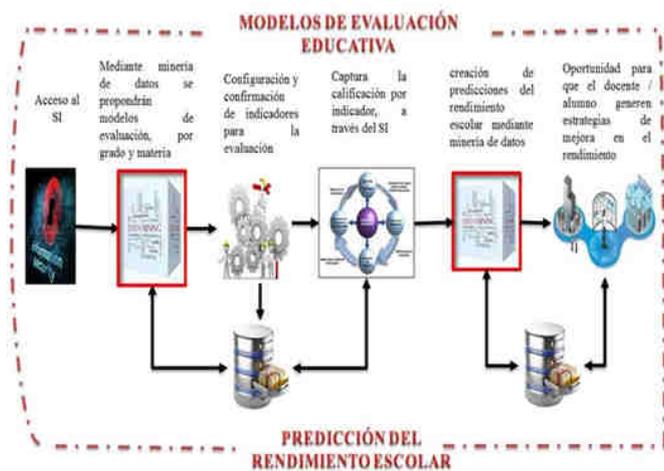


Fig. 1. Propose of model for the educational evaluation and performance prediction scholar

Source: Own

While it is true that with the emergence of proposals and technological implementations certain targets are met, these provide opportunities to generate new proposals to improve existing ones. In this sense, opportunity for improvement is in the primary education sector, because not exist a "model of educational evaluation" and on the other hand, not exist the "prediction of school performance" of students.

From the above, the proposal focuses on proposing educational evaluation models capable of generate models of educational evaluation through of intelligently artificial. And propose relevant indicators of matter and specific degree, and allows feedback. Similarly, the model will be in a position to generate predictions of school performance, in order to propose corrective action and generate strategies to improve student achievement during the school year.

The tools proposed for the development of the model is using artificial intelligence through data mining.

X. DISCUSSION

The analysis of research conducted in the context of Educational Evaluation from the pedagogical, technological and Intelligent Computing perspectives allows us to conclude that they are oriented towards specific goals, however, to visualize new opportunities for research in this area. Then, it is confirmed that there is a possibility for the approach to a proposal to address the educational evaluation focused on student performance that has not been addressed.

This research proposal would way the problem presented, which is currently teachers apply fixed indicators to assess the skills and knowledge in all grades and subjects, which causes the results of each indicator, not conducive to the identification and development of student's own abilities and precludes the creation of specific strategies and control measures to improve their performance, above, based on the ratings of each indicator.

In this regard, the chance of solution through Intelligent Computing is through the generation of intelligent adaptive models and under this concept, three levels of a priori models are displayed.

The first level model considers the indicators and weights school year, grade and subject. This teacher may accept or modify the relationship and weighting of indicators in order to facilitate feedback and thus the power evident in the course of assessments which is the academic performance of students, to implement strategies to raise these performance indicators that require and achieve consistency in the rest.

On the second level considers historical information generated by its predecessor, so the teacher will suggest indicators and weights that have had greater efficiency, according to the

school year, grade and subject. This model will draw partial conclusions and final of the indicators used in successive cycles and will continue to refine the allocation of indicators and weights.

The model of the third level, can generate the indicators and weightings personalized way into a school year, grade and subject, allowing for example, group several grade-level indicators and different weights depending historical capabilities that have generated in previous cycles, in order to customize strategies by grade level.

All levels allow, through indicators, targeting the weaknesses and strengths of students, and proposing strategies to improve school performance, supported by forecasts that could generate the model itself.

Possible solutions can be achieved through the use of intelligent calculation techniques, considering current trends and the inclusion of emerging techniques of computer science, offering them advantages for creating intelligent and predictive models. It should be mentioned that the novelty of the issue lies in the generation of intelligent adaptive models to adjust the indicators according to the school year, grade, subject and group. In this sense and to the national and international context, though not exhaustively, progress has been made on the issue, however, none of them specifically.

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