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A Project for an Easier and Significantly Improved Academic Performance

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Abstract: The objective of this study is to present an Educational Project, to make less difficult the lives of millions of Students around the world and, at the same time, improving significantly their academic performance. Also, the work of Teachers will be better. The main part of the involved Methodology is a Mathematical Model representing the Teaching-Learning and the Integral Performance Capacities processes, considering all the variables in these processes. More than 50 Course Workshops, guided by the Model, are presented.

An analysis created by Artificial Intelligence, states that a one-week Course Workshop is crucial to properly apply the Model. This Course Workshop has a Multiplier Effect (Participants will be Instructors of other courses). Best results are obtained by applying the Model in its stage of Integral Performance Capacities.

By applying the Model, a “True Education” (unfortunately, this kind of Education is needed more than ever) is obtained; definition and advantages of this concept are included. In any course, Integral Performance Capacities are developed, but not significantly, due to at least two reasons.

On the other hand, now humanities and strategic thinking are explicitly included in the Model, integrating science, technology, humanities and strategic thinking; this is known as “Engineering Diplomacy”, involving a very important synergy effect. Also, Engineering Diplomacy is needed more than ever.

This research might be classified as an Educational Project; the topic of particular interest was stated above (“to make less difficult the lives of millions of Students around the world and, at the same time, improving significantly their academic performance”). This presentation is considered the most important of the Educational Project.

Keywords: Learning; Integral performance; Capacities; Model; Significant

1. Introduction

This Project is based on a Methodology developed and applied since about 55 years, as in [1] and [2]. The objective of the Project is to make less difficult the lives of millions of Students

around the world and, at the same time, improving significantly their academic performance. Also, the work of Teachers will be better.

Considering the broad development and applications of the Educational Project, which involves a Methodology



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based on a Mathematical Model (it will be called the Model), representing the Teaching-Learning, T-L and the Integral Performance Capacities, IPC processes, as in [3], starting in the study of this concept, a one-week Course Workshop of training is required. An Artificial Intelligence, AI analysis established that this Course Workshop is crucial to properly apply the Model; this Course Workshop has a Multiplier Effect.

On the other hand, integration of science, technology, humanities and strategic thinking, results in a concept known as “Engineering Diplomacy”, as in [4].

The “easier and significantly improved academic performance” will be developed by effectively applying the Model; doing this, the lives of Students will be less difficult, while being a tool to guide the work of Teachers, as in [5]. This is considered that will be the most important application of the Educational Project.

2. Literature Review

The development and applications of this research started about 55 years. Since having excellent teaching Professors from the worldwide petroleum industry, teaching in graduate courses, there were poor learning results. The first response to this problem was to design and use teaching materials, as in [6]; also, one conclusion was that learning of Students in a course is a function of other variables, besides the Professor’s teaching, as available didactic material, attitude of Students to learn, etc. This resulted in a methodology to develop “An Educative Project Based on Integral Performance Capacities”, as in [3].

This Methodology has been subject to a process of continuous updates and improvements, since about 55 years, as in [1], [2], and [7]. The basis of the Methodology was awarded by the Academy of Engineering Mexico, Ministry of Energy and the National Council of Science and Technology, on May 30, 2018; receiving recognition in the Category “Innovación en la formación de Ingenieros” (Innovation in undergraduate engineering studies), as in [8].

The main stages of development and some applications of the Methodology are presented in [1] and [2].

3. Methodology

The Methodology involves the concept of Integral Performance Capacities, IPC as described in [9].

Now, since July 2025, humanities, Hum, and strategic thinking, S Think, were included; this is known, in [4], as Engineering Diplomacy and integrates science, technology, humanities and strategic thinking.

Unfortunately, due to the situation, a “True Education”, as in [7] and Engineering Diplomacy, are needed more than ever.

In any course, Integral Performance Capacities are developed, but not significantly because two obvious reasons: IPC to be developed are not specified and there are unknown variables in the process. The main part of the Methodology is a Mathematical Model, in the stage the IPC concept, now involving knowledge, attitudes, values, emotional intelligence, humanities, critical thinking and strategic thinking. On the other hand, this Methodology is the basis of the Educational Project presented in this paper.

4. Results

Course Workshop

It is based on the main stages of the Model, corresponding to the Teaching-Learning, T-L and the Significant Development of Integral Performance Capacities processes, IPC. A one-week Course Workshop of training is required; an analysis created by AI established that this Course Workshop is crucial to properly apply the Model. It is important to point out that a Multiplier Effect is involved, because Participants will be Instructors of other Course Workshops, C-W and, in the near future, many Teachers will be trained.

Course Workshop Characteristics

The developed Methodology is applied. Continuous and organized participation of Students. Clear responsibilities of Students and Professors in the processes. Better and fast performance in academic activities. Presentation and continuous application of the depth of knowledge concept. Application of Diagnostic, Formative and Summative Evaluations.

Course Workshop Results

More than 50 Course Workshop results are presented in [1] and [2].

Artificial Intelligence Analysis

An analysis of theory, arguments and obtained results, by Artificial Intelligence, gives a general and some specific conclusions:

General conclusion

The presentation by slides about themes distribution,

inclusion of figures, published information and appropriate conclusions, is much better than the provided presentation without Artificial Intelligence.

Specific conclusions

1. A one-week Course Workshop, C-W training is crucial to properly apply the Model. This C-W has a Multiplier Effect (Participants will be Instructors of other courses; this is an additional information, to that of the AI analysis).

2. Theory, arguments and given results reinforce the fact that the Educational Project facilitates and significantly improves the academic performance.

3. Results obtained in Petrobowls represent a case of international success, and show the impact of the Integral Performance Capacities concept.

4. The systematic development of concepts is a strong support of the Educational Project.

5. Curricula in terms of Integral Performance Capacities results in an Easier and Significantly Improved Students and Professors Performance.

Research Classification

This research might be classified as an Educational Project; the topic of particular interest is “To make less difficult the school lives of millions of Students around the world and, at the same time, improving significantly their academic performance”. This Project considers all the variables on which depend the Teaching-Learning, and the Significant Development of Integral Performance Capacities processes.

Development and applications started since about 55 years; this was reported in [6]. The first answer to the problem of almost no learning in the courses, was published in 1972.

Applications

The applications have been mainly in:

1. The planning, development, and evaluation of many engineering courses, as in [1], [2], [5] and [7].

This is the basis of “An Easier and Significantly Improved Academic Performance”; the courses were guided by the Model.

The planning, development, and evaluation of many engineering courses, have been carried out as follows: Starting from Learning Objectives, taking into account the programs of the subjects, so that in the planning the Students and their learning are considered as the central part of the process, unlike the education that has been called traditional, in which the basis are the

teachings of the Teacher. With the application of the Methodology, the following characteristics of work in a course have been applied (for these characteristics, it has been called a Course Workshop, as in [1], [2], [7]).

It is based on the Model to optimize the T-L process (where appropriate, IPC development). Continuous and organized participation (guided by the Model) of Students. The evaluation is carried out in a continuous and integral way (also considering the development of skills, attitudes, values, critical thinking and strategic thinking).

Presentation and application of the concept depth of knowledge. In continuous improvement, through the experiences obtained semester by semester. Application of Diagnostic, Formative and Integration (Summative) Assessments. Explicit and systematic application of the concepts of critical thinking and strategic thinking.

2. Preparation for International Competitions, as in [2], [7], and [10].

The comprehensive preparation includes knowledge, skills, attitudes, values and active thinking, in an integrated manner, of groups of Students, mainly undergraduate, for international competitions (Petrobowls). Now, humanism and strategic thinking are explicitly considered.

In the integral preparation, of one of the groups participating in the Petrobowl, the Model was applied in its stage of Integral Performance Capacities; the context and results are presented in [11], [12] and [13]. Basically, this application was considered as one of the most important of “An Educative Project Based on Integral Performance Capacities”, in [3]. Firstly, because the Model that underpins it was already at a more advanced stage of development and, secondly, because even in the case of a successful team (it had already obtained the First Regional Place, in a competition in which teams from Mexico, the United States and Canada participated), weaknesses were found in its preparation, that could be significantly strengthened, for which a Work Program was designed, as in [13], with Specific Objectives, Contents and References by Theme to be developed. The result of the “2017 San Antonio Petrobowl Team” is that they won the World Championship, both as a team and individually.

Now, the most important application of the Educative Project is to make less difficult the school

lives of millions of Students around the world and, at the same time, improving significantly their academic performance.

3. Preparation of the Theory and Practice of the Decalogue of the Good Student of Petroleum Engineering, as in [9], [14].

The work “Theory and Practice of the Decalogue of the Good Student of Petroleum Engineering”, has been thought as a complement and next stage of the Decalogue itself, in addition to be the basis of presentation-debates (presentation that include a debate, with the greatest possible depth, of the involved topics).

4. Two Projects of Linking the Academy of Engineering Mexico, AIM as in [15]

The Methodology has been applied to design and propose to the AIM, two projects of linking it with the General Directorate of University and Intercultural Higher Education of the SEP; one on the optimal development of innovation and creativity capacities and the other, to significantly develop skills, attitudes, values and critical thinking.

5. A New Way of Thinking in Petroleum Engineering Education, as in [16].

This study was proposed to the Academy of Engineering Mexico, AIM in July 2024 and updated in January 2025. On January 31, 2025 the Proposal was analyzed by CEIP (“Comisión de Especialidad de Ingeniería Petrolera”, which is a work group at AIM).

One result: The study must be taken into account because it is fundamental for any engineer, for a good professional development, including the need of a strong training in Interpersonal Relationships, as it was pointed out.

6. Proposal to Authorities of the Rosario Castellanos University, as in [17]

This Proposal was to apply the Educational Project; a document was handed in. It was presented to Authorities of the Rosario Castellanos University, on October 9, 2025, because its multiple advantages: Better than the concept “Competencies”, experience of many years of applying the involved Model, obtained results, the Multiplier Effect, etc., as in [1] and [2].

7. On behalf of Omniscient Pte. Ltd., I received an invitation to propose a paper for review and publication in “The Journal of Education Insights”. The proposed paper was “Significant Development of Integral

Performance Capacities”. It is published since July 28, 2025.

5. Conclusions

1. The most important application (and objective of this study) of “An Educational Project” is to make less difficult the lives of millions of Students around the world and, at the same time, improving significantly their academic performance. This application is presented in this paper.

2. The main part of the Methodology of the Educational Project is a Mathematical Model, representing the Teaching-Learning and Integral Performance Capacities processes, considering all the involved variables. The Mathematical Model is explicit, systematic, integrated and optimal, as it is explained in a previous work.

3. An analysis created by Artificial Intelligence states that a one-week Course Workshop is crucial to properly apply the Model. The Course Workshop characteristics are presented.

4. This Course Workshop has a Multiplier Effect. Participants will be Instructors of other courses.

5. Best results are obtained by applying the Model in its stage of Integral Performance Capacities. Now this concept explicitly includes humanities and strategic thinking.

6. The Model is a tool to guide and facilitate the work of Teachers.

7. More than 50 Course Workshops, guided by the Model, are presented.

8. By applying the Model, a “True Education” is obtained. Definition and advantages of this concept are included. Unfortunately, now more than ever a True Education is needed.

9. In any course, Integral Performance Capacities IPC are developed, but not significantly, due to at least two obvious reasons: IPC to be developed are not specified and there are unknown variables in the process.

10. Obj, Att and t have been called fundamental independent variables.

11. In applying the Model, a very important synergy effect is involved.

12. Humanities and strategic thinking are explicitly included in the Model. This is known as “Engineering Diplomacy”, involving science, technology, humanities and strategic thinking. Also, Engineering Diplomacy is

needed more than ever.

13. A Proposal to the Authorities of the Rosario Castellanos University, was presented.

14. Results obtained in Petrobowls represent a case of international success, and show the impact of the Integral Performance Capacities concept.

15. The Model was applied in the integral preparation (knowledge, skills, attitudes, ...) of one of the groups of Students participating in the "Petrobowl San Antonio 2017". They won the World Championship, both as a team and individually; this application is considered as one of the most important of "An Educative Project Based on Integral Performance Capacities".

NOMENCLATURE

AI	Artificial Intelligence
AIM	Academy of Engineering Mexico
Ant	Background of Students
Att	Attitudes
C Think	Critical Thinking
CEIP	A work group at AIM
CIPM	College of Petroleum Engineers of Mexico
C-W	Course Workshop
EI	Emotional Intelligence
Ev	Formative Evaluation
FIUNAM	School of Engineering, UNAM
Hum	Humanities
IPC	Integral Performance Capacities
K	Knowledge
L	Learning
Obj	Learning Objectives
Obs	Obstacles for learning
Other Info	Other Information received by Students in a course
Other Variables	Represent the variables not defined at that date
P Exp	Previous Experiences
Petrobowl	International competition about the petroleum industry
S Think	Strategic Thinking
SD IPC	Significant Development of IPC
SEP	Secretariat of Public Education
Sk	Skills
SLOBJ	Significant Learning of Obj
t	Effective time for learning
Teach	Professor's Teaching

T-L	Teaching-Learning
UNAM	National Autonomous University of Mexico
V	Values

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References

- [1] R. Rodriguez-Nieto and M. Rodriguez de la Torre, *Un Nuevo Modelo Educativo Basado en el Aprendizaje*, 1st ed., UNAM, Proyecto PAPIME PE 101107, 320 pp., November 2008.
- [2] R. Rodriguez-Nieto, *Incremento Significativo de la Calidad de los Egresados. Mejor Educación con CDI*. Copyrighted Book No. 03-2015-052911354700-01, 84 pp., June 2015.
- [3] R. Rodriguez-Nieto, "An Educative Project Based on Integral Performance Capacities", presented at the International Forum on Engineering Education "WEEF & GEDC 2023", Monterrey Mexico. October 24, 2023.
- [4] V. M. Castaño-Meneses, "Las Acciones de la Academia en Materia de la Ingeniería en Diplomacia", work presented at the AIM, July 10, 2025.
- [5] R. Rodriguez-Nieto, "Towards Agile Performance in Engineering Students and Professors". Work presented at the Academy of Engineering of Mexico, in the Cycle "Tuesdays of the Academy", Mexico City, September 7, 2021.
- [6] R. Rodriguez-Nieto, *Matemáticas Aplicadas a la Ingeniería de Yacimientos*, 1st ed., Instituto Mexicano del Petróleo, publicación 75 BH/196-A, November 1972.
- [7] R. Rodriguez-Nieto, *Proyecto Educativo con Bases Científicas y Tecnológicas. Mejor Educación con CDI*. Book with work Registration 2910, National Institute of Copyright, 95 pp., June 2020.
- [8] R. Rodriguez-Nieto, "Model to Significantly Improve Engineering Education". It was proposed to AIM, obtaining the National Award 2018, in the Category "Innovación en la Formación de Ingenieros", 18 pp., November 2016.
- [9] R. Rodriguez-Nieto, "Significant Development of Integral Performance Capacities". It is published

- in “The Journal of Education Insights”. July 2025.
- [10] R. Rodriguez-Nieto, Student Preparation, Evaluation and Selection. Work presented at the Mexican Petroleum Congress (June 2015) and published in the Journal *Ingeniería Petrolera*, September 2015.
- [11] R. Rodriguez-Nieto, Integral Group Preparation of the San Antonio Petrobowl 2017. Work presented at the Secretariat of Teaching Support, FIUNAM, June 22, 2017.
- [12] R. Rodriguez-Nieto, Anecdote on the Integral Preparation of the San Antonio Petrobowl 2017, published in the *Petroleum Magazine of the Villahermosa Section*, CIPM, December 2020.
- [13] R. Rodriguez-Nieto, Work Program to Be Implemented in the San Antonio Petrobowl 2017, presented to the Group to further involve it in its preparation, August 2017.
- [14] R. Rodriguez-Nieto, Theory and Practice of the Decalogue of the Good Student of Petroleum Engineering. Presented at The Congress of Young Engineers of the Future, CIPM, Mexico City, April 28, 2023.
- [15] R. Rodríguez-Nieto, Proposals to the PMEII of Two Projects Linking the AIM, with the General Directorate of University and Intercultural Higher Education, SEP, March 2023.
- [16] R. Rodriguez-Nieto, A New Way of Thinking in Petroleum Engineering Education, Study presented to the AIM, January 31, 2025.
- [17] R. Castellanos University, Proposal to Apply the Educational Model, October 9, 2025.