

## DIDACTIC STRATEGY ITCJ EDUCATIONAL BINOMIAL MODEL: RESULTS AND FUTURE WORK

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**Abstract** -- The Binomio Educativo - MBE Model, implemented at IT Juárez, is a strategy to reduce the failure rate in the area of basic sciences and focuses on developing and measuring collaborative learning through learning activities specifically designed for work between binomials, pairs or interactive groups of students with common goals. The model presents six stages for its implementation and encourages the development of intellectual skills such as critical thinking, problem solving, providing solutions, teamwork, and above all fostering values and principles such as loyalty, commitment, honesty and respect; all key skills for their professional and human development. These skills are identified [1] as skills of a human being to form competitive beings for the 21st century. The empirical results show a reduction of more than 30.0 % in the failure rate in the control group of teachers trained in the MBE, compared to teachers who do not use the model.

**Keywords:** Binomio Educativo model, Peer tutoring, Failure rates, Didactic strategy, Collaborative learning.

**Abstract** -- The Educational Binomial Model - MBE, implemented in the IT of Cd. Juárez, is a strategy to decrease the failure rate in the area of basic sciences and focuses on developing and measuring collaborative learning through learning activities expressly designed to work between pairs, pairs or interactive groups of students with common goals. The model presents six stages for its implementation and encourages the development of intellectual skills such as thinking critically, solving problems, providing solutions, working as a team, and above all promoting values and principles such as loyalty, commitment, honesty and respect; all of them key skills for their professional and human development. These abilities are identified [1] as abilities of a human being to form competitive beings for the 21st century. So far, the empirical results show a 30.0% reduction in the failure rate in the control group.

of teachers trained in the MBE, compared to teachers who do not carry the model.

**Key words** - Educational Binomial Model, Peer counseling, Failure rates, Didactic strategy, Collaborative learning.

### INTRODUCTION

The Educational Binomial (BE) focuses on collaborative learning, where students work as a team (peers) inside and outside the classroom, where they develop their own values, knowledge, experiences and skills to solve problems in their respective subjects, specifically in the area of Basic Sciences.

Nowadays, education is undergoing a significant transformation, especially in the search for new educational strategies that allow students to learn, understand, analyze and make decisions about what they have learned in the classroom, which are transported to the workplace so that the student realizes the real and practical application, especially based on the improvement of administrative processes, manufacturing and technology, responding to the phrase that many students realize 'what good is this going to do for me'.

At the ITCJ, this alternative was initiated to significantly reduce the failure-attrition rates of Basic Science subjects [2].

The research proposal of the **Binomial Educational Model - MBE**, proposes, in its initial stage in the department of Basic Sciences, specifically the subject of Mathematics, which historically have the highest rates (or percentages) of failure, causing a higher student dropout, and subsequently spread to other subjects and departments [3].

The model is intended to be a teacher-student exercise where the concept learning is carried out.

collaborative, specifically with the work of students in "Pares". The proposed implementation strategy is framed in the concept of "Competency-based teaching", a model used in the Tecnológico Nacional de México system [4, 5], so its main objective is to increase student achievement through collaborative learning, and therefore, reduce the levels of failure and dropout in basic science subjects.

In this dynamic, this work presents the implementation of the didactic strategy called Binomio Educativo, which is based on collaborative learning for the construction of knowledge of the subject.

This strategy consists of intervening with the group of students through the selection of various tools such as phenomenology, diagnostic, formative and summative evaluation, among others, to generate work groups based on various criteria, in order to develop a synergy between collaborative learning and peer counseling in the classroom during the period of teaching/semester of the class [6, 7].

At the IT of Ciudad Juárez, the MBE is implemented in some subjects of Basic Sciences, Administration and Accounting, identifying that the impact of the Model has had favorable results [3].

In the literature, studies of didactic learning and evaluation strategies are presented [8, 9], and the team intends to continue the studies of two evaluation : inverse exams ( $E^{-1} = ma$ ) and exact exams ( $E^2 = ma$ ), where statistics show that there was significant improvement in student learning and this would help the BE to be more robust, efficient and effective to reduce the failure-defection rates at the institutional level.

Currently this rate is above 50% only in the Basic Sciences department, taking into consideration that this rate has been maintained for several decades.

Therefore, the search for new strategies is used to raise the completion rates of students at the institutional level and help the National Technological System to be more efficient in order to improve this rate in the teaching-learning process and thus raise the quality of this process, based on modern concepts and strategies [10, 11, 12].

## DEVELOPMENT

The Vision of the project is that, through the Binomio Educational Model, as a didactic strategy, the percentage of approval in the different subjects taught in the area of basic sciences will increase, as well as having a positive impact on the terminal percentage in this Institution, goals aligned with the state and national vision that we currently have based on collaborative learning [13, 14, 15].

The participation of teachers in the BE focused on the Teaching-Learning Process is to break old paradigms of traditional education and now with these new strategies there is opposition from teachers due to the fact that most of them are teachers who have worked for more than a year.

25 years in the system and this causes difficulties in the implementation of these strategies.

On the other hand, if we focus on teachers with little time within the system, there would be less resistance to such changes and it is believed that this could be the key to the success of such a model and its implementation in all the country's Technological Schools.

Figure 1 shows the general method, as well as a brief description of each of the six stages of EBM [3].

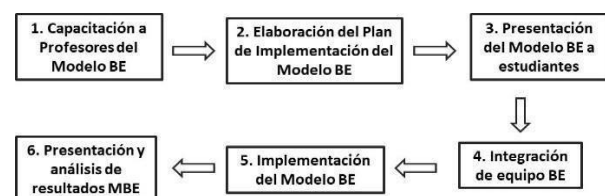


Figure 1. Educational Binomial Method - ITCJ.  
Source: Own elaboration.

**Stage 1. Teacher training.** The first stage of the model consists of familiarizing the teacher with the Educational Binomial. This stage is carried out through a theoretical-practical training course, where the teacher learns and discusses the concepts, scope, strategies, implementation, analysis, results and comments of the EBM.

**Stage 2. Implementation plan.** In the next stage, the responsible teacher, based on his/her didactic instrumentation of the subject, elaborates a program of activities under the MBE, indicating responsible persons, starting dates and dates. termination.

**Stage 3. Presentation of the Binomial Education Model to students.** In this stage, the teacher explains the work plan to the students highlighting the importance, evaluation criteria when forming the binomials, tasks, exams, rules and roles of the teacher-student relationship at the beginning of the semester, emphasizing collaborative-cooperative learning and working in binomials/pair counseling; as well as the very high probabilities of passing a subject.

**Stage 4. Integration of teams - binomials.** The next step for the teacher is to form heterogeneous teams based on the thematic experiences of the teachers. There are several ways to integrate the binomials: pre-instructional actions, diagnostic exams, by list, by gender, by students' averages of previous semesters, students who are taking the corresponding subject for the second or third time, etc.

**Stage 5. Implementation of the MBE.** The responsible teacher, with prior agreement of the students, during the semester and based on the didactic instrumentation and the TecNM's subject accreditation guidelines, carries out step by step the implementation of the BE Model, as well as the feedback of the degree of learning of the students, indicating the areas of opportunity and strategies for a better use.

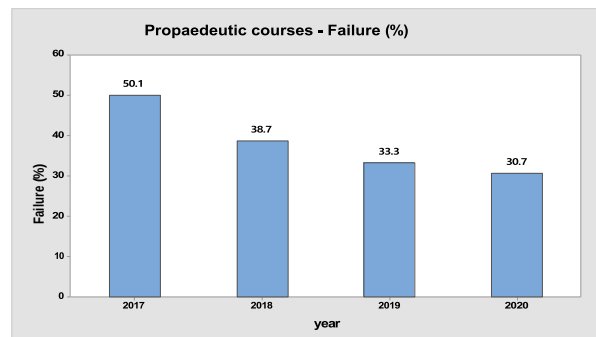
**Stage 6. Analysis of EBM results.** Preparation of a final technical report and an executive presentation of results. The MBE implies a dynamic of transformation to reach autonomy and adaptation to the different roles, this allows to build knowledge, design strategies, make decisions and evaluate the process. The teacher is co-responsible, focusing on guiding the learning process, motivating the student to develop ideas, talents and competencies using new teaching methodologies.

## DISCUSSION AND ANALYSIS OF RESULTS

In the period from January 2016 to December 2019, 87 teachers from IT Cd. Juárez have participated in the teacher training course Modelo Binomio Educativo ITCJ, of which 45 teachers belong to the basic sciences department.

As of 2017, the head of the Basic Sciences department promotes that professors who teach propaedeutic courses for incoming students are previously trained in MBE through inter-semester courses, observing a

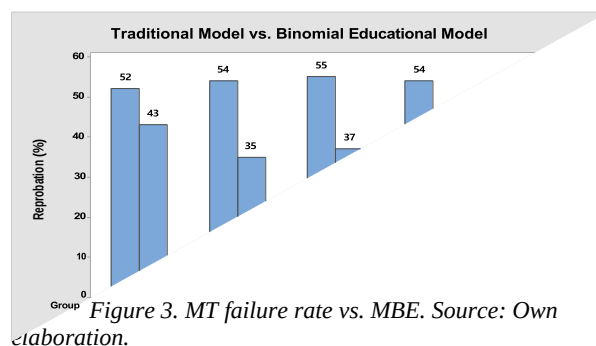
positive impact on failure rates as presented in Figure 2.



*Failure rates of propaedeutic courses.*

Source: Own elaboration.

One way to measure student achievement is through failure rates, so the failure rates of the control group (MBE) were compared with the failure rates of a group of teachers who continued to "teach the subjects in the traditional way", in order to evaluate the impact of the MBE.



*Figure 3. MT failure rate vs. MBE. Source: Own elaboration.*

Figure 3 shows the failure rates of the control group (MBE-Control) vs. the traditional group (MT) during the period from August 2017 to December 2019. The failure rates were calculated based on the information provided by the department head and an improvement is observed in the evaluated period.

As can be seen in Figures 2 and 3, the Binomio Educativo model reduces the failure-attrition rates without modifying the quality of the educational program, promoting collaborative and cooperative learning to have a significant impact on terminal efficiency at the institutional level.

## CONCLUSIONS

Based on the empirical results, which show a downward trend (Figure 2 and 3), it could be affirmed that the MBE is a didactic strategy to reduce the failure-desertion rates without modifying the quality of the educational programs, promoting collaborative - cooperative learning.

The MBE represents a proposal for the resolution of a school problem, as well as the linkage with governmental actors and, consequently, its implementation is recommended in other institutions, both at the middle and high school level and in basic education.

In addition, it represents a great challenge for this model to have a forum in the vision of the instances of the educational field and consequently with the participation of the Tecnológicos de Cd. Juárez, Orizaba, La Laguna, Saltillo, Guaymas and Valle del Jaqui, Tepic for its implementation at a national level along with the authorities of the Tecnológico Nacional de México.

The TecNM has a great innovative commitment, creative of new educational strategies so that the student has a greater probability of accreditation of their respective subjects and consequently their degree and give support for a better quality of life for our graduates.

Changing the traditional teaching model requires continuous training and commitment on the part of teachers, breaking old paradigms for continuous improvement.

Finally, when the teacher feels like a student and the student feels like a teacher, there is a positive synergy of knowledge between the two [2, 3].

## FUTURE WORK

Through the MBE educational research project, we seek to corroborate the statements found in past research or refute them, as the case may be.

For example, that the student who performs the role of advisor gets more benefit, as well as the degree of excessive responsibility that can be exerted on the leader; that combining students who present better scaffolding than others does not always reach the educational objective, as well as not increasing the level of challenge that the advisor may face.

Two assessment strategies that are being tested with students as a fundamental part of BME are Accurate Tests and Reverse Tests.

The didactic strategy E2=ma (for its acronym Examen Exacto igual a Mejoramiento en el Aprendizaje), with the purpose of reducing the failure and dropout rates of students taking basic science subjects.

It consists of providing them with the results of the exams so that they can be more confident that the process they are developing is the right one, in order to have a greater probability of accrediting the competency and/or unit.

The E2=ma method consists of 4 steps: Result, Resolve, Review and Feedback (4R). The inverse test E<sup>-1</sup>=ma is another strategy that has the purpose that the student experiences a meaningful learning by constructing his own evaluation test (self-evaluation). This will help them to see the real application of what is seen in the classroom to a work situation.

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