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Journal Basic Education

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Knowledge Area

The works must be unpublished and refer to topics of Basic education, higher education, higher education, comprehensive education reform, national agreement for modernisation, basic education and other topics related to Humanities and Behavioral Sciences.

Presentation of Content

In the first article we present, *Prior tutoring, a model for the cultural diversity of applicants to the Centro Universitario del Norte* by Solano-Pérez, Gabriel, Mota-Macías, Silvia Elena, Huizar-Ruvalcaba, Diego, Trujillo-García, Fabricio Raúl and Esparza-Rodríguez, Antonia, with adscription in the Universidad de Guadalajara, Centro Universitario del Norte, as the following article we present, A-*Didactic moments as a means of management for meaningful learning of multiplicative problems: A Case study in elementary school*, by Hernández-Gutiérrez, Francisco Javier, Rosales-Posada, Norma Susana, Lizarde-Flores, Eugenio and Ayala-Del Villar, Erik, with adscription in the Escuela Normal Rural "Gral. Matías Ramos Santos", as the following article we present, *Impact of personal and contextual factors on academic performance in the Tecomán Valley, Colima: An analysis of the 2024 grade point average in relation to teaching experience, use of ICT, level of support, and marital functionality* by Lino-Gamiño, Juan Alfredo & Cruz-Matías, Irene del Carmen, with adscription in the Universidad de Colima, as the following article we present, *Simulation tools as a flipped classroom strategy for competency development in Higher Education* by Dorado-Espino, Julio César, De la Cruz-Solís, José Guadalupe, Herrera-Mancilla, Brenda Dafne and Terrazas-Montoya, Dulce Montserrat, with adscription in the Universidad Tecnológica de Torreón.

Content

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Article

Prior tutoring, a model for the cultural diversity of applicants to the Centro Universitario del Norte

La tutoría previa un modelo ante la diversidad cultural de los aspirantes al Centro Universitario del Norte

Solano-Pérez, Gabriel * [a], Mota-Macías, Silvia Elena [b], Huizar-Ruvalcaba, Diego [c], Trujillo-García, Fabricio Raúl [d] and Esparza-Rodríguez, Antonia [e]

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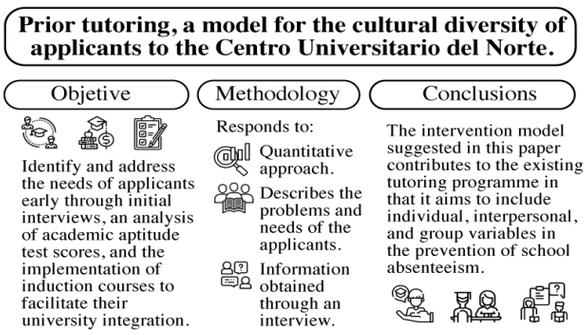
Abstract

In higher education, the development of tutorial activity is essential for the comprehensive training of students. The work presents a multi-stage prior tutoring model. The objective is to identify and address the needs of applicants early through initial interviews, an analysis of academic aptitude test scores, and the implementation of induction courses to facilitate their university integration. The methodology responds to a quantitative approach that describes the problems and needs of the applicants as a result of the survey, information obtained through an interview. Therefore, it is necessary to favor the implementation of actions that facilitate the transition of students from the middle to the higher level, to know their needs and expectations so that through the prior tutoring action model they can develop attention activities.



Prior tutoring, Applicants, Problems, Native peoples

Resumen

En la educación superior, el desarrollo de la actividad tutorial es fundamental para la formación integral de los estudiantes. El trabajo presenta un modelo de tutoría previa multietapas. El objetivo es identificar y abordar tempranamente las necesidades de los aspirantes a través de entrevistas iniciales, un análisis de los puntajes de la prueba de aptitud académica, y la implementación de cursos de inducción para facilitar su integración universitaria. La metodología responde a un enfoque cuantitativo que describe los problemas y necesidades de los aspirantes cómo resultado de la información obtenida a través de una entrevista. Por consiguiente, es necesario favorecer la instrumentación de acciones que faciliten la transición de los estudiantes del nivel medio al superior, conocer sus necesidades y expectativas para que a través del modelo de acción de la tutoría previa desarrollar actividades de atención.

Tutoría previa, Aspirantes, Problemáticas, Pueblos originarios

Area: Advocacy and attention to national problems

Citation: Solano-Pérez, Gabriel, Mota-Macías, Silvia Elena, Huizar-Ruvalcaba, Diego, Trujillo-García, Fabricio Raúl and Esparza-Rodríguez, Antonia. [2025]. Prior tutoring, a model for the cultural diversity of applicants to the Centro Universitario del Norte. Journal Basic Education. 9[20]1-11: e1920111.

Introduction

The Centro Universitario del Norte [CUNorte] began its activities in March 2000, offering academic programmes relevant to the needs identified in the region at that time, thus expanding the possibility of students entering higher education. Consequently, several factors or dimensions can be observed, such as equity in access, retention, and relevant and socially significant plans and programmes that can transform people's lives for the better.

In this regard, the various federal sectoral programmes in education aim to ensure greater equity and coverage for all population groups. To this end, it is necessary to promote new practices reoriented towards the prevention of dropouts, including support for students and, in the case at hand, from the moment they apply for admission.

The area of influence of CUNorte, as shown in Figure 1, includes the municipalities of northern Jalisco and southern Zacatecas, as well as students from other states and countries as a result of student mobility programmes. As expected, classrooms are by their nature multicultural spaces that must be understood in the interaction between teachers, students, content and everything related to educational practice.

Box 1

Figure 1

Main area of influence of the CUNorte

Note: Map including the municipalities of northern Jalisco and southern Zacatecas

It is important to note that the region's terrain makes access to CUNorte difficult, which is why it is important to seek options that promote student integration and retention so that they can complete their studies.

There is a significant influx of students from different backgrounds, such as indigenous peoples, rural areas, ~~from~~ nearby and distant cities, which makes it necessary to understand the most relevant background and processes in which students and teachers must interact in order to improve the unfavourable school performance indicators. Given this diversity of students, the findings reveal deficiencies in previous academic training, limited availability of vocational guidance programmes, high rates of socio-economic marginalisation, and ineffective study habits. These situations converge in the serious problem of student dropout.

In 2024, the enrolment of students from indigenous peoples [Wixaritari] was 330, equivalent to 9%, mostly from Mezquitic and Bolaños, which are recognised as two of the poorest areas at the national and state level [Nuño-Gutiérrez, 2025]. The educational programmes with the highest enrolment are nursing, law, psychology and nutrition, and the majority of students are men. In this regard, [García-Ríos & García-Ríos, 2014] point out the need to attend to students from indigenous communities, as only 1% enrol in higher education, with notable integration problems, especially in the first semester, in addition to the academic deficiencies of the applicants. Hence, CUNorte's admission policy is to accept all students, provided they complete the process adequately. The poor academic preparation of applicants for higher education is notable, as can be seen in the scores obtained for admission to the different degree programmes at CUNorte. Figure 2 shows that, in the last two years, first-year students admitted to the centre are those with the lowest scores in the entire network on the Academic Aptitude Test [PAA].

Box 2

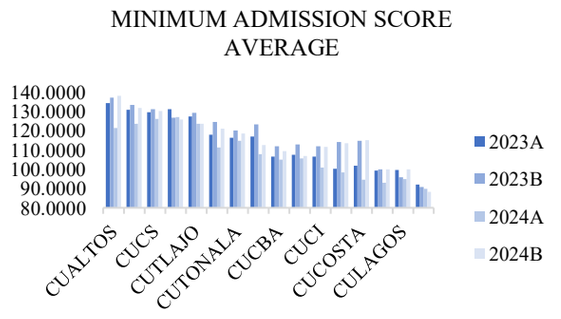


Figure 2

PAA Admission Scores

Note: Own elaboration with information from: https://escolar.udg.mx/estadisticas/puntajes-minimos.

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This score, in addition to including the high school average, includes the results obtained in the Academic Aptitude Test [PAA], which shows that applicants to CUNorte obtain lower scores in key areas such as mathematical reasoning and verbal reasoning compared to other universities. Among the problems that impact student performance are poor study habits and socio-economic difficulties. Similarly, it is common for students to lack sufficient vocational guidance programmes to choose a career path that is relevant to their aptitudes. In addition, there are high rates of migration that motivate young people to seek a future elsewhere, highlighting the need to explore opportunities to optimise the integration of students into higher education.

Therefore, the objective is to identify and address the needs of applicants early on through initial interviews, an analysis of academic aptitude test scores, and the implementation of induction courses to facilitate their integration into university life.

Based on the information obtained, it will be provided to the Institutional Tutoring Programme to be integrated into the tutor's action plan in order to improve the applicant's performance as a student by creating better study conditions and establishing the necessary corrective actions to improve terminal efficiency. The methodological aspect corresponds to the quantitative approach that allows us to describe the academic situation, areas of lag, and problems of the applicants through a survey. Derived from its implementation, it will be possible to improve the integration of the applicants once they have begun their academic career.

Development

Background

From a conceptual perspective, the National Association of Universities and Higher Education Institutions [ANUIES] defines tutoring as a process of ongoing support in which the teacher incorporates a guiding role into their practice, through which they detect, intervene, monitor and evaluate all those aspects [whether academic, vocational or professional] that contribute to the comprehensive training of their students-tutees, thus improving educational processes [ANUIES, 2001].

Consequently, most institutions took this as the basis for implementing their institutional tutoring programmes at the beginning of the century, making adjustments in their operational phase in accordance with their educational models, all with a view to improving performance indicators by accompanying students in their academic trajectories.

At the University of Guadalajara, tutoring is understood as:

The process of permanent personal and academic support for students, focused on achieving a comprehensive education that is oriented towards identifying, together with the student, the factors and situations that hinder or enrich learning, developing support strategies to prevent falling behind and dropping out, to increase terminal efficiency and promote the development of skills in students. [UdeG, 2007, p. 28]

That is why the tutor must be aware of the situation of the student being tutored and all the factors that present obstacles through continuous monitoring and support. According to Villanueva, tutoring is:

... a process of accompanying students during their education, which takes the form of personalised attention to a student or small group by competent academics trained for this role, based conceptually on learning theories rather than teaching theories. [2004, pp.32]

In this way, tutoring becomes a fundamental affirmative strategy to combat school dropout, understood as the abandonment of studies, which represents one of the most significant challenges for universities throughout the country.

Therefore, tutoring becomes relevant as a factor in reducing school dropout rates, one of the most complex problems facing universities nationwide, understood as the abandonment of higher education by students. Hence, it is necessary to '...conduct studies on the characteristics and behaviour of the student population in relation to the factors that influence their academic trajectory, such as admission, retention, graduation and degree completion' [Fresán-Orozco & Romo-López, 2011, chap. 1, para. 3].

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Tutoring at the University of Guadalajara

The General Academic Coordination of the University of Guadalajara promoted an Institutional Academic Tutoring Programme in response to changes in the institution's departmental academic model, particularly the implementation of the credit system. This initiative highlighted the evident need for tutorial work as an essential component in supporting students throughout their academic career.

The University of Guadalajara has supported tutoring with a series of documents that underscore its relevance. The 2014-2030 Institutional Development Plan [University of Guadalajara, 2015], specifically in the Teaching and Learning section and in its third objective, highlights the strategy of promoting the comprehensive education of students by encouraging tutoring programmes, sports activities, health and culture. Its development is therefore essential for improving student education.

In its Tutorial Action Plan [2022-2024], CUNorte refers to the General Statute of the University of Guadalajara, which states in Article 126, section IV, "Coordination of Academic Services: is responsible for administering, within the competence of the Centre, development programmes in the areas of scholarships, academic exchange, library development, teacher training, as well as career guidance services, tutoring and other support for the teaching-learning process".

Similarly, in the Academic Staff Statute, Article 37, section VI, 'Act as an academic tutor for students to ensure their comprehensive training.' Article 39, section III, 'Mandatory teaching support activities as part of their workload' [...] 'a] Academic guidance, in activities such as tutoring, advising, and guidance in the degree process.'

The 21st-century educational model of the University of Guadalajara [2007] states in the section 'Academic support. Tutoring' [pp. 58-60] that 'Tutoring is an expression of teaching that basically translates into academic support and guidance during the course of a university student's education... it does not constitute an additional or temporary academic activity'.

It also defines the role of the tutor as '...an academic companion during the university education process; an educational guide in different academic decisions; an academic co-manager of the students being tutored; a source of support in understanding the overall education process; and an aid in knowledge management.'

It also states that the objective of tutoring is to Tutoring is a space for designing academic strategies so that each individual is more competent upon graduation and in their subsequent professional practice.

Based on the above, the University of Guadalajara [2010] has established the Institutional Tutoring Programme [PIT], on which the Tutorial Action Plan [PAT] is based in all university centres and which, according to the plan, must be integrated into three stages for its development:

1. **Induction:** for first-semester students, this is considered from the moment the student is admitted. The activities carried out in this first stage are to introduce the student to the university, carry out a diagnosis to detect risk situations, and create a tutoring file.

2. **Trajectory:** for second-semester students and until they have achieved 70% of their total degree credits. In this phase, problems in academic performance are detected and, if any exist, they are channelled, their academic trajectory is closely monitored, comprehensive training is promoted, and topics related to mathematical logical reasoning, learning skills, teamwork, and life planning are addressed.

3. **Graduation:** For students who have earned 71% of their total degree credits and up to graduate students. The activities in this phase include providing students with support in the areas of social service, professional internships, degree completion, job placement, continuing education, research, and professional specialisation.

Tutoring at CUNorte

Upon admission, students present factors that need to be addressed, which, if left unaddressed, can contribute to an increase in dropout rates.

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From this perspective, it is necessary to generate activities that reduce this problem and improve their integration, retention, and academic performance. Seen in this light, prior attention can be supportive in addressing the problem observed and reducing dropout rates.

Therefore, it is not surprising that this occurs more frequently in the early stages, and it is at this point that institutions can take action to prevent early dropout and improve academic performance. Relatively simple measures can have immediate and lasting effects on retention.

Support from advanced students as counsellors, advisory and guidance sessions, the formation of study groups, and the establishment of academic tutoring for groups of new students are some possible interventions that can help overcome obstacles in students' trajectories.

At CUNorte, the academic model is strengthened by the PAT, whose central purpose is 'to promote the comprehensive training of students through the systematic coordination of tutorial activities to improve retention, performance, and terminal efficiency indicators' [CUNorte, 2013, p.10]. Similarly, the plan also establishes as specific goals the accompaniment of students during their admission, academic trajectory and graduation, as well as collaboration in initiatives to reduce failure and dropout rates and increase terminal efficiency.

It should be noted that in many cases, the implementation of tutoring is overshadowed by factors such as poor academic conditions, lack of vocational guidance, and admission without selection processes, since there are no rejections in most degree programmes.

It often happens that not all students attend the induction course or do not get involved and drop out. Some of them arrive through the available quota option and only attend the first few days of class, eventually dropping out before they have the opportunity to engage with tutoring.

On the other hand, and based on the multicultural context it serves, CUNorte provides the opportunity to pursue higher education to students from urban, rural, and indigenous communities.

The latter present particular problems that are generally invisible in the daily routine of the educational process, including: marginalisation, political and legal situations that have contributed to the racism and discrimination suffered by these young people, which exacerbates their poverty and prevents their access to quality educational services. Low levels of schooling and instruction aggravate this problem, leading to reduced access to economic and employment opportunities.

According to a study published in 2003 by the National Association of Universities and Higher Education Institutions [ANUIES], cited by Smelkes [2003] in Mexico: "only 1% of indigenous young people between the ages of 18 and 25 enter higher education institutions, and of those, one in five graduates and obtains a degree, in contrast to 22.55% of young people of the same age in the country who access such education, with half of those students graduating and obtaining a degree" [cited by Didou and Remedi, 2006: 28].

The academic trajectory of indigenous youth is characterised by having received a lower than average quality of education, mainly due to the fact that in indigenous regions the national education system lacks adequate infrastructure. As a result, students have difficulty passing the entrance exams for higher education institutions and, if they do manage to enter, they find themselves at an academic disadvantage compared to their peers.

Thus, there is a precedent for an Academic Support Programme for Indigenous Students [PAAEI], implemented in 2003 under the auspices of the Ford Foundation, which was considered an affirmative action to improve students' academic trajectories. Subsequently, the programme was integrated into the University's PIT, from the perspective that affirmative action was seen as positive discrimination.

As mentioned by García-Ríos and García-Ríos [2014], a mentoring model has been designed for the indigenous population, whose central purpose is to ensure that students remain in university. This model is characterised by being multi-stage and by adopting the action research methodology to solve a problematic situation that is considerably similar to ours.

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Considering the above, the experience of the Central University of Uruguay [Contera, Perera, & Sánchez, 2008] is relevant, as it proposes the implementation of various mechanisms to reinforce its tutoring programme.

A key strategy they use is pre-tutoring, which involves students from higher semesters.

Ortega and Andrade [2011] also propose the need to transform the classic tutoring model. They suggest that it should cease to be a merely mechanistic process or a simple requirement and become an integral process that incorporates significant aspects of the student's daily life, both inside and outside the university.

Methodology

A clear methodological structure underpins the work and supports the results obtained in the research process. The work presented here takes a quantitative, descriptive, non-experimental, cross-sectional approach which, according to Hernández, Collado and Baptista [2014], seeks to specify the properties, characteristics and profiles of individuals, groups, communities, processes, objects or any other phenomenon that is subject to analysis [p. 80].

The survey used to obtain the information was implemented during six school years from 2022 'B' to 2025 'A'.

In this regard, the instrument is aimed at recognising economic aspects, vocational guidance for choosing a degree, study habits and available time, among others, with the aim of providing support or guidance within the scope of the agency.

The instrument was applied directly to the applicants through an interview, using a structured questionnaire with open-ended and mostly closed-ended questions, which, according to García, Alfaro, Hernández, and Molina [2006], has the advantage of avoiding third-party influence, requiring less effort from the interviewee, and achieving higher response rates.

The mechanism for establishing the time, place, and date and who will carry it out, in this case the coordinator of each educational programme, is through an information sheet, which is given to them on the day they take their admission exam.

To carry out the interview, a specific instrument has been designed to obtain information for the general diagnosis of each of the applicants, which considers the following sections:

1. *Reference of the person conducting the interview:* Identifies the interviewer conducting the interview, the educational programme to which they belong, as well as the time and date of the interview.

2. *Applicant information:* personal details, including school of origin, marital status, desired degree, children, address, telephone number.

3. *Work experience:* This section asks about the type of job, tasks performed, working hours, and the possibility of attending face-to-face classes.

4. *Family background:* This section asks about the parents' occupation and level of education, who the applicant lives with, and whether they have the support of their family in their development as a student.

5. *Defining financial information:* provides information related to the applicant's financial capacity, as well as clarifying whether some type of scholarship support is essential.

6. *Distinguishing study habits:* study practices, time spent on the activity, and attention to tasks are observed, which gives an insight into their performance as a student.

7. *Choice of degree programme:* in relation to vocational guidance, determine whether the applicant had support in choosing their degree programme, whether it was their first choice or was not offered by the institution, and whether they have already completed another degree programme or other higher education studies.

8. *References from the University Centre*: clarify the choice of institution for their studies, their references in the environment and their views on the way of working or blended learning.

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9. *Health information*: identify any healthy or problematic aspects of their health that may impact their performance, as well as guide and prevent care measures in the different areas of referral available, nutritional, psychological and medical.

10. *Record for the interviewer:* This is the most important section, as it allows the interviewer to identify the main problems of the applicants and promotes attention to the information obtained in each case, establishing a value judgement as to whether the applicant is a potential dropout from the selected educational programme.

With regard to validity, according to Hernández and Mendoza [2018], three types of validity can be used: content, construct and criterion. The validity of the instrument took into account content validity, which was established by the judgement of seven experts [career coordinators] in terms of relevance, significance and clarity. Therefore, as it is an instrument used to obtain a diagnosis of the conditions and problems of the applicants, its reliability lies in obtaining similar results in its cyclical implementation with the applicants.

The total number of applicants who enrolled in the six school years analysed for the bachelor's degrees offered by the university centre was 1,985. The interview coverage was 1,452, which corresponds to 73% of the total who voluntarily attended and responded to the instrument. The information obtained was processed using Excel to represent the corresponding data and graphs.

Therefore, prior tutoring is presented as an area of opportunity to approach applicants upon admission, learn about their problems through diagnosis, and allow them to integrate more smoothly into higher education.

Thus, the model includes two identified processes: the first related to the diagnosis, which includes the aforementioned interview and the analysis of the scores in their admission process; the second related to their attendance and retention in the courses offered as an introduction to their university development, which are programmed based on the greatest needs identified in the interview.

Results

The instrument was implemented in the 2022B, 2023A, 2023B, 2024A, 2024B and 2025A academic years, covering 73% of applicants, as shown in Figure 3. The instrument was administered to 1,452 students, i.e. all those who did attend the exam and were therefore admitted.

Box 3

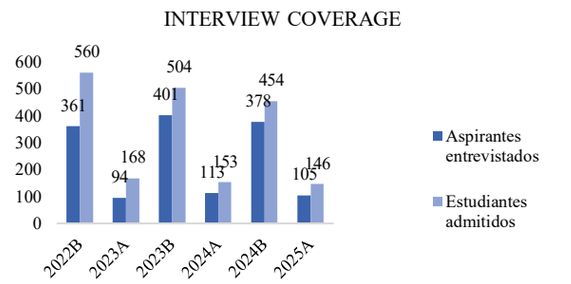

Figure 3

Total, of respondents 2022B-2025A

Note: Own creation with the data obtained.

Below are the most relevant results identified in the interviews, which are considered to provide valuable information for addressing the needs of applicants.

The economic aspect is one of the most important areas analysed through the applicant interviews. The socioeconomic level of their households of origin is identified using the estimation model designed by the Mexican Association of Market and Opinion Intelligence Agencies [AMAI, 2024], which uses six questions to determine seven socioeconomic levels: A/B, C+, C, C-, D+, D, and E. The highest economic level is A/B and the lowest is E.

According to the data analysis, it was found that, in the six generations studied, 35% are in the highest levels [AB/ and C+], 26% in an intermediate level [C] and 29% in the lowest levels [C-, D+, D and E].

In this context, it can be seen that almost a third of the students who enrol could have financial problems throughout their degree. Another important aspect analysed is related to the financial solvency to cover expenses throughout the degree programme.

When asked how they will do this, 69% consider that they will have the support of their family, 51% say they hope to have the support of a scholarship, and 48% hope to have a job as financial support.

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Another factor that may affect the academic performance of future students is related to employment or employability. The study found that more than half of them are employed, with 52% stating that they have a permanent or temporary job.

Fortunately, of those who said they had a job, 96% said they had the means to attend classes. Thus, although employment issues may influence the development of extracurricular activities, applicants will be able to attend face-to-face classes. Aspects related to vocational guidance and life planning are fundamental to the academic success of future professionals. The absence of adequate vocational guidance has a strong impact on dropout rates.

The results show that 43.6% received guidance, while the rest made their choice based on their personal aspirations or the information provided by the university centre. Of those who received vocational guidance, the activities they reported were the application of a vocational guidance test, talks with experts, and visits to universities.

With regard to life plans, Figure 4 explains the results in career choice. Seventy-three per cent explain that their choice corresponds to their first option, thus showing the differences that exist when choosing a career.

Box 4

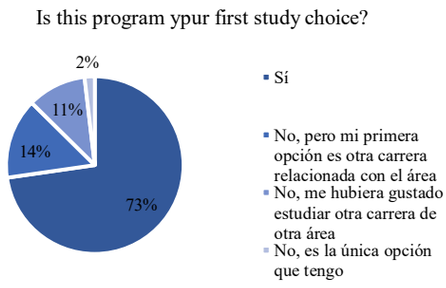

Figure 4

Career choice

Note: Own creation with the data obtained.

Interviewer's section

The information presented is highly relevant, as it allows the educational programme coordinator to identify the main problems faced by applicants. In this section, the educational programme coordinator who administers the survey and interview makes the corresponding notes on the information requested according to what has been identified.

With regard to the problems identified in the applicants, it is noteworthy that the main one is the financial difficulties that students may encounter throughout their studies, as shown in Figure 5. This confirms that socio-economic factors have a decisive impact on applicants and their academic success.

Box 5

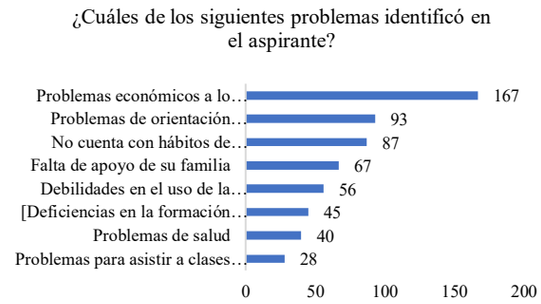

Figure 5

Applicant problems

Note: Own creation with the data obtained.

Secondly, the lack of adequate vocational guidance is identified, ranging from the total absence of guidance to deficiencies in it. Thirdly, a lack of appropriate study habits.

The combination of these factors [poor prior education, financial and study problems, and lack of vocational guidance] puts applicants at a clear disadvantage.

Another aspect reported by the interviewees is the need for special attention, i.e. that they consider themselves an important case to be addressed. In this sense, it was possible to identify that 13% require special attention in guidance in order to reduce the particular problems they present, as shown in Figure 6.

Box 6

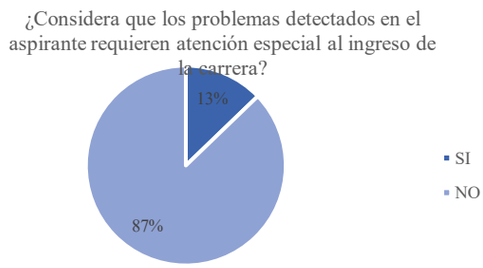

Figure 6

Specialised attention needs to be given to the applicants' problems identified during the pre-tutorial.

Note: Own creation with the data obtained

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Furthermore, based on the interview and the data reported in the survey, the interviewer can infer whether an applicant may be a potential dropout, which requires special attention. Figure 7 shows that 14% of all interviewees may be potential dropouts. This is a high percentage, so it is necessary to pay special attention to students who present this possibility.

Box 7

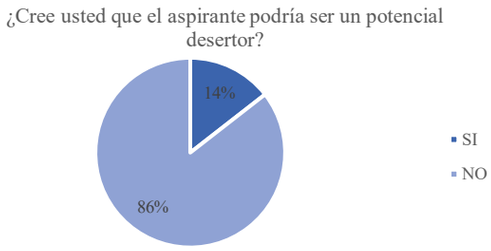

Figure 7

Percentage of potential dropouts detected through prior tutoring

Note: Own creation with the data obtained.

It is important to mention that according to the latest report by the Rector [Nuño-Gutiérrez, 2025 p. 5], school dropout rates decreased by 35%, achieving the highest retention rate in the last six years, as 76% of admitted students remain active after one year. In addition to interviewing applicants, the university analyses admission scores to assess their academic levels.

Subsequently, upon enrolment, students are offered induction courses divided into two phases. The first consists of a general course for all degree programmes, focused on providing the necessary skills for the management and use of the technological tools of the institutional educational platform, as well as registration and management in the Comprehensive Academic Information System of the University of Guadalajara [SIIAU].

The second stage includes a series of courses and assessments designed to provide comprehensive support. These cover an introduction to the educational programme, library information management, life planning, tutoring, scholarship and internationalisation opportunities, reading comprehension, study techniques, spelling and writing, and health culture. Nutritional and health assessments are also carried out. All of this content is taught by specialists and an interdisciplinary team.

In this way, the pre-tutoring model is integrated with institutional programmes by offering crucial information that allows for the development of targeted strategies.

Thanks to this, the tutor can identify the student's needs and the red flags that require intervention. This information is then delivered to the programme manager to ensure proper follow-up.

Conclusions

This model represents one of the many strategies that has allowed us to obtain a clearer picture of our new students. It is especially valuable because most dropouts occur during the first two semesters. Thanks to preventive diagnosis, we can identify and assist at-risk students before they enrol, which has resulted in a reduction in dropouts, as well as efforts to compensate for failure and falling behind.

It is highly recommended to establish a career guidance centre.

This centre would help potential students choose a career according to their tastes, skills and aptitudes, and would offer specific support to applicants who, after interviews, reveal poor choices. The lack of vocational guidance in career choice is one of the most significant findings, as it contributes directly to dropout rates and changes in undergraduate aspirations.

Another aspect to consider is the prior training of applicants. The interviews conducted identified serious deficiencies in study habits, low achievement, and low scores on the entrance exam. This suggests the urgent need to establish an academic levelling programme that includes remedial courses and workshops to enhance students' cognitive skills and strengthen their preparation for university life.

It is crucial that other strategies, such as peer tutoring, be incorporated. In addition, induction courses are essential to provide students with a comprehensive overview of their future university experience.

The intervention model suggested in this paper contributes to the existing tutoring programme in that it aims to include individual, interpersonal, and group variables in the prevention of school absenteeism.

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Finally, for future studies, it would be useful to analyse the impact and functionality of the model with students nearing graduation in order to continue identifying areas of opportunity for improving conditions for new students.

Declarations

Conflict of interest

The authors participating in this article declare that they have no financial, personal or any other type of conflict of interest that may have influenced the presentation of this work.

Author contribution

Solano-Pérez, Gabriel: Provides all the information obtained from the interviews, as well as its interpretation and elaboration of the results.

Mota-Macías, Silvia Elena: Reviewed the document in terms of its articulation and structure.

Huizar-Ruvalcaba, Diego: Developed the entire theoretical basis of the document.

Trujillo-García, Fabricio: Contributed to the use and management of Excel for the preparation of results and graphs.

Esparza-Rodríguez, Antonia: Collaborated in the preparation of the introduction and background information.

Availability of data and materials

The data from the results obtained in this study are available at the Centro Universitario del Norte, University of Guadalajara, by requesting them at the following email address: gabriel.solano@academicos.udg.mx.

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Abbreviations

1] AMAI: Mexican Association of Market and Opinion Intelligence Agencies.
2] ANUIES: National Association of Universities and Higher Education Institutions.
3] CUNorte: Northern University Centre
4] PAA: Academic Aptitude Test.
5] PAAEI: Academic Support Programme for Indigenous Students.
6] PAT: Tutorial Action Plan.
7] PIT: Institutional Tutoring Programme.
8] SIIAU: Comprehensive Academic Information System of the University of Guadalajara.

References

Background

Centro Universitario del Norte, Plan de Acción Tutorial 2022-2024.

Fresán-Orozco, M. & Romo-López, A. [2011]. Programas institucionales de tutoría una propuesta de la ANUIES.

Universidad de Guadalajara [2015]. Plan de Desarrollo Institucional 2014-2030.

Universidad de Guadalajara [2022]. Estatuto Orgánico. Universidad de Guadalajara.

Basic

ANUIES [2001]. Programas Institucionales de Tutoría. Una propuesta de la anuies para su organización y funcionamiento en las instituciones de educación su- perior. México: anuies.

ANUIES 2003 - Encuentro Internacional "Intercambio de experiencias educativas: vincular los caminos a la Educación Superior". Guadalajara.

Centro Universitario del Norte [2013]. Plan de Acción Tutorial 2013 - 2015, Coordinación de Servicios Académicos.

Didou Aupetit, Sylvie y Eduardo Remedi Allione [2006] Pathways to Higher Education: Una Oportunidad de Educación Superior para Jóvenes Indígenas en México. México DF: Asociación Nacional de Universidades e Instituciones de Educación Superior, ANUIES.

Nuño-Gutiérrez, U. [2025]. *6to Informe de Actividades. Centro Universitario del Norte*.

ISSN: 2523-2452
RENIECYT: 1702902

Solano-Pérez, Gabriel, Mota-Macías, Silvia Elena, Huizar-Ruvalcaba, Diego, Trujillo-García, Fabricio Raúl and Esparza-Rodríguez, Antonia. [2025]. Prior tutoring, a model for the cultural diversity of applicants to the Centro Universitario del Norte. Journal Basic Education. 9[20]1-11: e1920111.
https://doi.org/10.35429/JBE.2025.9.20.1.1.11

Ortega-Andrade, N. A. [2011]. Un modelo de tutoría universitaria para el aprendizaje de materiales instruccionales. *Educación y Educadores*, 14[1], 85.

Schmelkes S. [2003]. Educación superior intercultural, el caso de México. Conferencia dictada en el Encuentro Internacional Intercambio de Experiencias Educativas, "Vincular los Caminos a la Educación Superior", los días 17 a 19 de noviembre de 2003.

Universidad de Guadalajara [2007] Modelo Educativo Siglo XXI.

Universidad de Guadalajara [2007] Modelo para la Implementación de la tutoría académica, Guadalajara, p. 28. Documento de trabajo.

Universidad de Guadalajara [2010]. *Programa Institucional de Tutoría.*

Villanueva, A. [Coord.] [2004]. *La tutoría académica y la calidad de la educación, Universidad de Guadalajara*.

Support

Asociación Mexicana de agencias de Inteligencia de Mercado y Opinión, AMAI [2024]. Niveles socioeconómicos [NSE].

Contera, C., Perera, P. & Sánchez, E. [2008]. *Relevamiento tutorías universitarias en la formación de grado CSE. Universidad de la República*.

García Alcaraz, F. Alfaro E. Antonia H. M. Antonio M. M. Diseño de Cuestionarios para la recogida de información: metodología y limitaciones Revista Clínica de Medicina de Familia, vol. 1, núm. 5, octubre, 2006, pp. 232-España.

García-Ríos, A.R. & García Ríos, Z. M. [2014]. Tutoría en estudiantes indígenas de nivel superior. *Revista Global de Negocios*, [1] pp. 95-104.

Hernández Sampieri, R., Fernández Collado, C., Baptista Julio, P., Méndez Valencia, S., & Mendoza Torres, C. [2014]. *Metodología de la investigación* [6.ª ed.]. McGraw-Hill Education.

Hernández Sampieri, R., & Mendoza Torres, C. P. [2018]. *Metodología de la investigación. Las rutas cuantitativa, cualitativa y mixta.* McGraw-Hill Education.

Discussions

Nuño-Gutiérrez, U. [2025]. *6to Informe de Actividades.* Centro Universitario del Norte.

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RENIECYT: 1702902

Solano-Pérez, Gabriel, Mota-Macías, Silvia Elena, Huizar-Ruvalcaba, Diego, Trujillo-García, Fabricio Raúl and Esparza-Rodríguez, Antonia. [2025]. Prior tutoring, a model for the cultural diversity of applicants to the Centro Universitario del Norte. Journal Basic Education. 9[20]1-11: e1920111.
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Article

A-Didactic moments as a means of management for meaningful learning of multiplicative problems: A Case study in elementary school

Momentos a-didácticos, como medio de gestión para un aprendizaje significativo de los problemas multiplicativos. Estudio de casos en educación primaria

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Abstract

The research work presented proposes an analysis of a case study comparing two realities of professional practice. The aim is that, through a qualitative research approach and a methodological perspective of case study, it becomes possible to understand the potential of planning and intervening in the teaching of multiplicative problems through the use of a-didactic moments. The results show a relevant and significant relationship between the use of a-didactic moments and improved teaching and, consequently, better learning of multiplicative problems in elementary school.

Resumen

El presente trabajo de investigación propone un análisis de un estudio de casos comparando dos realidades de práctica profesional, la finalidad es que mediante un enfoque de investigación cualitativa y con una perspectiva metodológica de estudio de casos, se logre comprender la potencialidad de planificar e intervenir en la enseñanza de problemas multiplicativos mediante el uso de momentos a-didácticos. Los resultados expresan una relación pertinente y significativa entre el uso de momentos a-didácticos y una mejor enseñanza y por lo tanto, un mejor aprendizaje de problemas multiplicativos en la educación primaria

Area: Promotion of frontier research and basic science in all fields of knowledge

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Introduction

Knowledge of the Theory of Didactic Situations [TSD] [Brousseau, 2007] emerges as a crucial element for managing student autonomy and independence. TSD not only provides a theoretical framework, but also guides the teacher's presence throughout the activities, requiring strategic interventions and the creation of a-didactic moments.

This research suggests the need to move away from traditionalist practices in mathematics teaching. The constant evolution of the field of education requires teachers to be informed and to apply methods that reflect the best practices supported by research. The teacher's specialised knowledge, enriched by a combination of personal conceptions and institutionalised theories, is key to implementing relevant strategies.

A deep understanding of theories and the ability to integrate them in a contextualised manner allow for the design of educational strategies that reflect students' learning potential. In summary, this work reveals the interconnection between educational planning based on institutionalised theories, the application of TSD to foster student autonomy, and the critical importance of the teacher's specialised knowledge. These results provide valuable elements for the continuous improvement of pedagogical practices, promoting a dynamic approach focused on student learning.

Diagnosis

Identifying an initial benchmark of students' knowledge is important for guiding teaching practice and adjusting teaching planning strategies and/or activities, if necessary. Current educational conditions make it necessary to start from the evidence gathered in session 1 of the experimental and control groups to determine the students' level of knowledge regarding the topic at hand, ‘multiplicative problem solving,’ considering a comparative analysis of two positions in the specialised knowledge of two teachers when teaching mathematics and observing the implications and differences that become evident in their professional practice.

Control group: lesson 75 Will there be anotherone? When solving a ratio-grouping problem: There are 354 tiles to cover the floor of the school hall. After doing some calculations, the workers realised that it would be best to arrange them in rows of 9 tiles. How many rows can they lay? Will there be any tiles left over?

Box 1

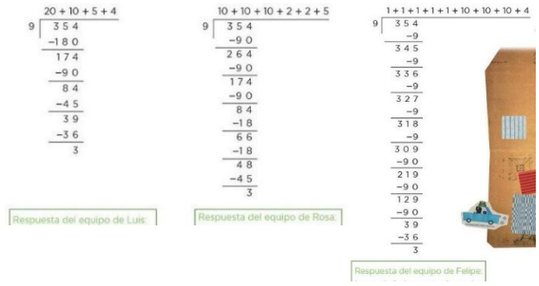

Figure 1

Evidence 1. Experimental Group Approach

Source: Own elaboration

The questions derived from the procedures described above focus on the differences between the algorithms used, the calculation that is considered the fastest and whether they know of another way of making it even shorter. The knowledge expressed by the students oscillates in the answers presented below, being the product of the student Isabela the one that is recovered physically.

Box 2

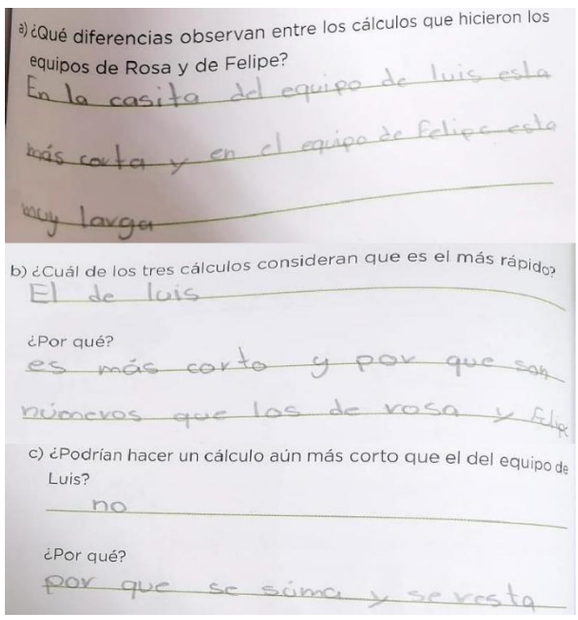

Figure 2

Output: Control group.

Source: Own elaboration

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The written words refer to a visual description of the extension of the algorithms in question, attributing the presence of large numbers in the quotient as a factor in achieving a shorter procedure. It also mentions the presence of addition and subtraction as part of the division algorithm calculations. However, there is no reflective analysis of the distribution, considering the relationship between the quotient and partial residues with respect to the dividend.

Similarly, in lesson 1, the experimental group, when faced with the following type of problem involving ratio and distribution:

Box 3

Figure 3

Evidence 3. Experimental Group Approach
Source: Own elaboration

This is a problem applicable to the students' real-life context in which they have to distribute 75 stamps among 8 children, i.e. a two-digit number in one digit. It is visually supported by the elements of the problem as shown in the image. Some of the responses to this first approach were as follows:

Box 4

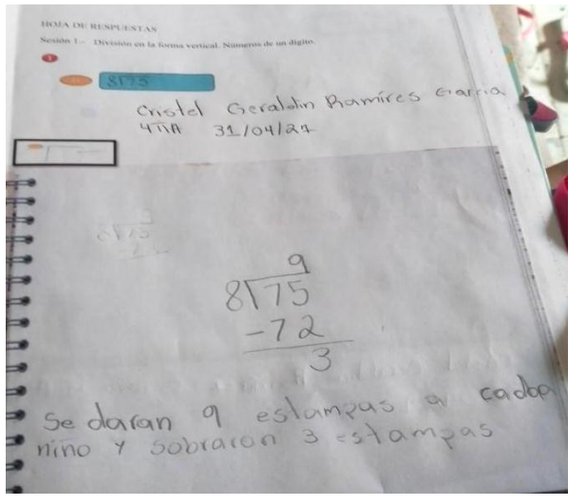

Figure 4

Evidence 4. Experimental group output
Source: Own elaboration

The student who solves the problem gives an answer based on the development of the division algorithm, including explicit subtraction to determine the remainder, formulating a written answer to the question posed by the problem: "9 stamps will be given to each child and 3 stamps will be left over". The student communicates a conventional development of the algorithm, as well as mastery of the place value of the numbers and the relationship between the elements of the division. Likewise, the evidence of the following pupil is also recovered in response to this approach

Box 5

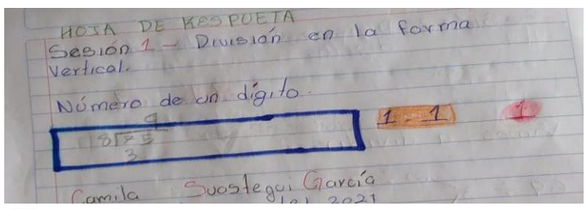

Figure 5

Evidence 5. Evidence from the experimental group
Source: Own elaboration

The student in the evidence [Figure 5] expresses a conventional algorithm in which she implicitly subtracts the remainder. The quotient is 9, which is the correct answer; however, she places the remainder, which is 3, in the tens position. This shows a lack of conceptual knowledge; a mechanised procedure is evident, with a lack of knowledge about the value of the position of the digits within the conventional algorithm.

Both groups reflect prior knowledge that is sufficient to advance and achieve the consolidation of learning necessary for solving multiplicative problems, but at the same time, areas of opportunity in both conceptual and procedural knowledge on aspects that are important to reinforce in order to appropriate the curriculum content, achieving meaningful learning that transcends work lessons, terms in the school year and, above all, situations in the real context where such knowledge has satisfactory applicability to respond to the demands required. In this sense, there is a need for teacher intervention based on didactic knowledge to optimise the teaching-learning process, where knowledge of mathematics teaching [KMT] must be the theoretical lens for analysing learning outcomes, managed by the Specialised Knowledge of the Mathematics Teacher [MTSK] [Carrillo, et al. 2014].

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Research Question and Objective

Once the desired area of exploration has been identified, it is necessary to establish a guideline for the present research. The following question represents the basis for focusing, acting and achieving depth in the area of mathematical problem solving based on the teacher's knowledge. How is specialised knowledge of mathematics teaching linked to the learning of multiplicative problem solving in fourth-grade primary school students?

Intentions are present in everyday life; the actions and activities we carry out are aimed at fulfilling a previously established purpose. The same is true in education: the teaching-learning process is governed by a series of purposes and objectives. This research addresses the following objectives:

To identify the relationship between the presence of non-didactic moments and the learning of multiplicative problem solving.

To recognise how the teaching theories put into practice by teachers influence the learning of multiplicative problem solving.

Theoretical Framework

The Specialised Knowledge of Mathematics Teachers

[Shulman, 1986] is a pioneer in the study of specialised knowledge; he establishes two domains of knowledge: substantive and syntactic, as shown in the following diagram:

Box 6

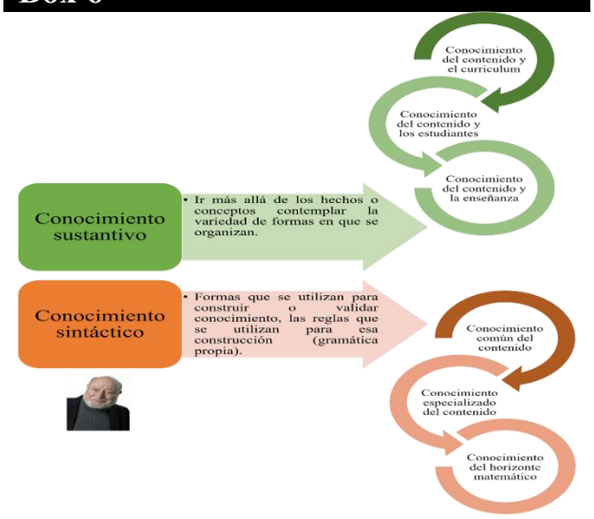

Figure 6

Specialised Knowledge Scheme.

Source: *[Shulman, 1986]*

Following this line of study, [Carrillo Et. al, 2014] cites Ball, Thames and Phelps [2008], expressing the characteristics of MKT that relate teacher knowledge and mathematical content. With a specific contribution on the difference between common and special knowledge, that is, the teacher's knowledge compared to other users. MKT [Mathematical Knowledge for Teaching]

1. Content knowledge

- Common knowledge of content; specialised knowledge of content
- Knowledge of the content horizon
- Knowledge of content and students

2. Didactic knowledge of content

- Mathematical and teaching knowledge
- Mathematical and learning knowledge
- Mathematical and curriculum knowledge

[Muñoz-Catalán, 2015] presents the MTSK [Mathematics Teacher's Specialised

Knowledge] model, which focuses on the diversity of knowledge possessed by a mathematics teacher, which should be characterised as specialised knowledge.

Box 7

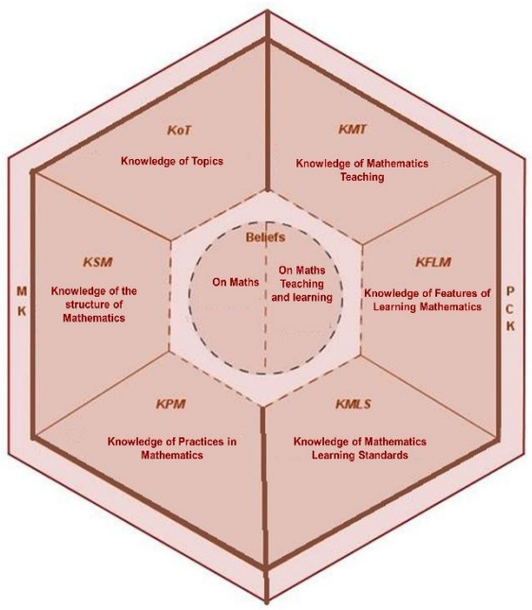

Figure 7

MTSK model

Source: [Carrillo, et al. 2014]

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The model refers to knowledge in the field of mathematics; it is divided into two domains: Mathematical Knowledge [MK] and Pedagogical Content Knowledge [PCK]; three subdomains in each, integrating beliefs and conceptions about teaching and learning the discipline at the centre. Researching the intervention based on this model requires expressing the aspects referred to in each of the subdomains.

Mathematical Knowledge [MK]:

Knowledge of the Subject [KoT]: aspects of concepts, contextualisation, meanings, properties.

Knowledge of the Structure of Mathematics [KSM]: cross-cutting, complexification, simplification and auxiliary connections.

Knowledge of Mathematical Practice [KPM]: Different ways of proceeding in class, ways of demonstrating, resolution processes, communication and mathematical argumentation.

Pedagogical Content Knowledge [PCK]:

Knowledge of the Characteristics of Mathematics Learning [KFLM]: learning theories, how students learn, difficulties, aptitudes, and student interaction with mathematical content.

Knowledge of Mathematics Learning Standards [KMLS]: official curriculum; content required to be taught, expected level of conceptual and procedural development, and sequencing of topics.

Knowledge of Mathematics Teaching [KMT]: personal or institutionalised theories of teaching, strategies, and material resources.

The MTSK model, according to [Muñoz-Catalán, 2015], through its subdomains, covers the areas of knowledge necessary for teachers to convert their actions into optimal results with mathematics students. As expressed in the previous lines, it is a diversity of important elements that can generate relevant data when they are the subject of research, allowing for a deeper understanding of each of them, recognising strengths and areas of opportunity that arise in the real context.

The MTSK model integrates six subdomains around the specialised knowledge of the mathematics teacher, all of which are interrelated but with a particular object of analysis. On the one hand, those that make up the domain of mathematical knowledge [MK] refer to the teacher's knowledge as a scientific discipline; on the other hand, the domain of pedagogical content knowledge [PCK] considers aspects related to content as an object of teaching and learning.

There is a wide range of categories that can be derived from each of the subdomains. For analytical research purposes, the focus is on PCK in order to deepen the teacher's knowledge by putting it into practice in class sessions to detect obvious patterns in teaching practice that can contribute to the field of teaching. The object of study focuses on the subdomain Knowledge of Mathematics Teaching [KMT], seeking to understand the knowledge that teachers demonstrate when they conduct a session working on multiplicative problems, analysing the characteristics of that knowledge and reflecting on achievements and areas of opportunity in teaching, which have an impact on and are reflected in educational outcomes.

Mathematics Didactics

This work is based on the analysis of the specialised knowledge of mathematics teachers, specifically in the area of teaching, i.e. mathematics didactics. This originated in the Institutes for Research on Mathematics Education [IREM] created in France.

The initial objective was to train teachers both in teacher training colleges and in service, as well as in programmes. Similarly, classroom support materials were produced, such as texts, worksheets, educational games, exercise collections, lesson sequences, etc.

Based on reflections on the activities carried out, new proposals have emerged that are not aimed at producing means to influence teaching, but rather at promoting knowledge to control and produce such actions in teaching.

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Box 8

Action	
-	Make appropriate feedback if students express doubts when carrying out the task
-	"When 7 bags of 10 marbles are given out, are there any bags left over, how many marbles are there in 7 bags of 10, how many should be given out in total?

Figure 8

Planning. Action phase

Source: Own elaboration

The planned fragment was given in the implementation, with omissions in the suggested questions, but fulfilling the purpose of the intervention by not solving the problem, but promoting reflections. Likewise, the visual aids that were included in the presentation of the work activities, represent trigger phrases that give an intentional orientation on the part of the teacher, to focus actions on the learning that the students are expected to achieve.

Box 9

Figure 9

Guiding phrases

Source: Own elaboration

Under the same lens of analysis, elements are identified in the control group in the teaching actions to manage non-didactic situations. In the third session, using the textbook, lesson 78. In practice, task 2 is addressed: in line *Mo: We are going to focus on page 145, where there are several coloured boxes. There we find divisions, we are going to base ourselves on item d] which is 957 divided by 6. Correct? Aos: Yes.* The teacher has worked on the division algorithm in two previous sessions, which gives rise to the intervention *Mo: Use whatever process you like for the division. Isabela commented that some use subtraction, some skip it, let's see how you work it.*

The teacher participates with a general comment, which encourages the recovery of processes and procedures worked on in previous activities. No specific instructions are given on how to complete the task, and when some students take action, line *Aa: I'm done, teacher.*

The teacher suggests self-review of the procedure performed *Mo: You can use the time you have left to analyse and review your division to make sure everything is correct.* This intervention promotes autonomous actions in the students and, as a result, highlights the management of a non-didactic moment.

However, significant interventions are identified in the control group, which prioritise actions that favour non-didactic situations. In the same session, task 1 was worked on: "In pairs, analyse these divisions.

Then describe in writing how you solved them." After completing the activity, an instruction was added: 78. *...write in your notebook a situation in which I must use these divisions to arrive at a result... a situation in which I say, I have to divide 885 by 7...*

This instruction was difficult for some students, such as Ivanna, who repeatedly expressed her doubts:

Aa: Do we have to do divisions and multiplications? I'm already lost.

Mo: Divisions, Ivanna.

Aa: It could also be in this case, teacher. That...

Mo: We'll talk about them in a moment. Let's leave them until the end, after you've written them down, so that your ideas don't get in the way.

The students work and everyone remains silent/

[Control group; record 3]

The teachers' interventions reflect more than taking advantage of the action phase as an opportunity for autonomous learning management, limiting personal reflections in the learner.

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The record shows a lack of understanding of the activity to be carried out, which is answered directly and generally, as the doubt persists, trying to explain it with an example of the idea they have about what they can do. that opportunity for guidance within the activity is lost by cancelling their participation, thus opposing the learning process, which, in the words of [Carrillo et al. 2014, p. 35], refers to: 'the learning process will allow the student to contrast their knowledge, offering them ways to adapt and progress'.

It is important to refer to the literal conceptions expressed by the teacher of the control group through the interview in this regard. When asked: Do you consider the presence of the teacher necessary throughout the development of the activities? -Yes- To what extent? -The teacher must fulfil their role as a guide and facilitator of learning and then let the students act-. These words refer to the presentation of processes and/or procedures for subsequent practice. He refers to guiding and facilitating learning so that the student can then act, however, this action will be predetermined by the tools obtained from the facilitator and not by those that the student himself has been able to discover and, consequently, appropriate for the cognitive challenge that it may represent.

A challenging experience for the student will generate meaningful learning. As the main actor in the construction of their learning, it must be the strategy that leads teachers to obtain professional satisfaction through the construction of knowledge in their students, with non-didactic situations being a means of converting actions into rewarding results.

Feedback

The Theory of Didactic Situations focuses on the construction of learning in such a way that it is constructed by the students as the main actors. Starting from their prior knowledge, mobilising knowledge and giving rise to socialisation under the criterion of autonomy, teaching actions must be converted into satisfactory learning outcomes. A-didactic situations address the management of this autonomy, and part of this is feedback, which is 'the act by which the teacher makes the student accept responsibility for a learning situation [a-didactic] of a problem and accept the consequences of this transfer' [Brousseau, 2007, p. 38].

As mentioned in the previous section, a-didactic situations are not characterised by the absence of the teacher during the work phases, but rather by relevant interventions, one of which is feedback. When students encounter difficulties or doubts, the teacher must intervene with feedback that makes the student responsible for creating their own learning. In this sense, the practice is analysed in the research groups.

Session 3, 'Division with two-digit numbers,' is addressed in the experimental group. It begins with the sharing of exercises that were done as homework, followed by the introduction of the session with the first approach to a ratio-grouping problem. Before reading it, the teacher gives the instruction:

Teacher: We are going to look at another slide with a problem. We are going to analyse it and check the key words that determine the operation I am going to perform. Then you will have five minutes to do the activity. Did you understand the instructions?

[Experimental group; record 3]

This moment reflects an important space for the teacher's intentionality, allowing her to verify both the group's attention and their understanding of the instructions. This is essential in order to allow students to clarify issues that might later, in the action phase, prevent them from optimally solving the problem. As expressed in the records, a student asks:

Can you repeat that? I could hardly hear you here. The teacher responds to the student's request by asking a classmate to participate, thus promoting student-student interaction that can lead to clarification and a better understanding of the instructions given. The communication took place in the following terms.

Teacher: OK, can you help me by explaining the instructions I just gave, please?
Student: Yes.

Teacher: What did I tell you we were going to do?

Student: We have to do a problem to answer this sheet [shows a sheet to the camera]. It can be division, multiplication, subtraction or addition.

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Teacher: Was that the instruction?

[Experimental group; record 3]

Repeating the instructions allows the teacher to verify that the pupils understand the dynamics of the activity they are going to work on during the action phase, i.e. reading a problem, identifying the operation they are going to apply, with the understanding that they have a time limit of five minutes. The function of repeating the instructions is fulfilled because the teacher identifies the level of understanding achieved by the students. However, she notes that there is no clear communication that would allow the activity to continue in the best possible way.

The record shows Leonel's general understanding of what he must do: solve a problem using an operation. It is not a verbatim repetition of the instructions given by the teacher, but the student knows what he has to do. However, the teacher considers it necessary to mention the instructions once again, expanding on the specifications of what needs to be done. Once again, she gives feedback on the instructions:

Is it clearer now? Teacher: Gloria, please explain the activity to me. Repeat the instructions for us. What are we going to do? In response, the teacher asks, *Teacher: How much time do we have?* This completes the specifications given in the instructions to minimise and/or eliminate any doubts the pupils may have about what they need to do to obtain the evidence required for the activity.

Strengths are detected in the teacher's practice, managing non-didactic situations by making use of feedback. This resource is not limited to feedback on the instructions. In the action phase, students encounter difficulties in developing procedures or making decisions based on the knowledge at stake, so they often turn to the teacher in search of solutions to their doubts, which is an ideal space for the teacher to provide feedback. However, the distance learning modality influences students to try to find the answer on their own, even with restrictions on using the support of other people or tools such as calculators. In the action phase, they do not express doubts about the development of the procedures in the operations they perform.

One of the central purposes of the analysis of practice is to improve and professionalise teaching around the results of the teaching-learning process. Under the theoretical lens of TSD, a practice has been identified that is characterised by the management of non-teaching moments; along the same lines, it is necessary to reflect on areas of opportunity in the actions that took place in practice. Such is the case presented in the following excerpt from the record, derived from session 2 when working on the problem mentioned in record 2: *Aa: You want to distribute 69 marbles among 3 children so that they each get the same number. How many marbles should each child receive? Write the operation that solves the problem.* Some dialogue emerges:

Ao: I thought each child could get 23.

Teacher: We will check that later. Have you written down the operation?

Aa: Yes, 3 divided by 69.

Teacher: It would be the other way around, 69 divided by 3, because 69 is what we are going to divide.

[Experimental group; record 2]

It is important to reflect on the record that issues a direct correction with no feedback, limiting personal and/or group reflection based on an area of opportunity for the student, which can provide conceptual understanding by delving deeper into the reasons for making changes to her records. It is not an easy task to omit these actions in teaching practice, even when they are the main objective in planning, as in practice, interventions such as the one mentioned above are used.

Box 10

Action
- Give feedback if students express doubts when developing the task. - In 80, how many groups of 20 are formed?

Action
- Make appropriate feedback on the doubts expressed by the pupils. - "When decreasing the number of leaves and decreasing the number of children, how is it reflected in the result? - Compare with 100 by 50 and 10 by 5".

Figure 10

Planned action phase

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The images show examples of intentionality that arises from planning. It is important to highlight relevant actions in order to anticipate the interventions to be carried out and their consequences, and to become accustomed to best practices to counteract actions that detract from reflection and the construction of meaningful learning in students. Introduce them to independent work by managing non-teaching moments where feedback is given rather than the teacher providing an answer or correction to the students' work.

In line with these reflections, relevant aspects are identified in the interactions that take place within the experimental group, where situations that take precedence over feedback, and consequently over non-teaching moments, are frequently evident. Feedback is characterised not by giving answers to students or solving problems or explaining step by step what they should do to resolve the situation that has been presented to them, but rather by responding to the student with the aim of guiding them, promoting the mobilisation of knowledge and recovering concepts or learning that they have studied previously, which allows them to be applied in the current situation by readjusting or modifying them. The following lines set out important moments to reflect on in teacher-student interaction.

The activity consists of solving the problem proposed in the textbook, lesson 76. What is needed. Get: In pairs, write the necessary data in the spaces so that each division is correct. Then record the results you obtained.

Due to the distance learning format, working in pairs is not possible. The teacher begins the analysis of the algorithm shown in the following image with some questions [control group; record 2] *The first question would be: where do you think the number 700 came from? Mo: What do we have to do with 100 and 7 to make it 700? Mo: Multiply 7 by 100 and that way we get 700. Where do you think the 222 came from?* Up to this point, the pupils gave correct answers, identifying multiplication as the means of obtaining 100 in the quotient, as well as the partial remainder 222 as the result of 922 minus 700. However, their participation changed after the teacher's question: *Mo: The question would be, where does the number 210 come from? Think about it, I'll give you some time.*

The students remain silent and vaguely come up with two answers: *Aa: 200 + 10 and; Ao: Teacher, if we multiply 70 x 3, we get 210.*

Box 11

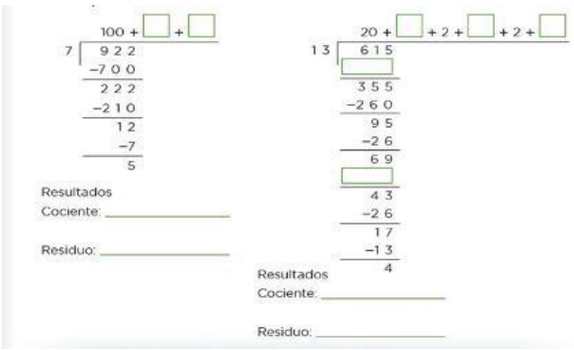

Figure 11

Textbook, session 2

Source: Own elaboration

The pupils search in isolation for the division procedure, an operation that gives a result of 210, as suggested by the teacher. This shows a lack of understanding on the part of the pupils, both conceptually and procedurally, of the division algorithm. As they were unable to obtain the correct answers to move forward with the activity and find the necessary data in the quotient, the teacher intervened with the following dialogue.

Teacher: OK, we already have a multiplication. 70 x 3 gives us 210. There's just one small detail: remember that the number we're dividing by is 7, not 70, right? So that 7 is what's going to help us multiply. We're almost there. 70 times 3 is indeed 210, and we're using multiplication, but we need to use the numbers that appear in our division. I'm going to help you a little bit to guide you. In the first green box that appears in your book, you see the sum 100 + and a green box, where we are going to put the number 30.

[Control group; record 2]

The excerpt shows significant areas of opportunity in both learning and teaching. The teacher's interventions are identified where he gives the desired answer, detracting from understanding. This moment presents an opportunity to give feedback and lead students to personal reflections to arrive at the desired result based on an understanding of where it comes from. If 210 has been divided into 7 groups, how much corresponds to each one?

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This leads to future applications of this knowledge. The design of the activity leads to both procedural and conceptual understanding of the conventional division algorithm, involving multiplication, addition, and subtraction in the process, as well as the appropriate assessment of division with a sense of place value in hundreds, tens, and units. However, actions limit the ability to reach these reflections.

The action analysed lacks the characteristics of the TSD approach to managing non-didactic situations and intervening on the basis of feedback and promoting autonomous learning. Likewise, it deviates from the guidelines for teachers set out in the [SEP, 2011] curriculum on clarifying doubts in order to unblock processes and enable students to progress. This characteristic was reflected in the different work sessions when addressing session 3 [control group; record 3]. Practice. And working on task 2, which states: *Mo: We are going to focus on page 145, where there are several coloured boxes. There we find divisions, we are going to base ourselves on subsection d] which is 957 divided by 6.*

The students work on the activity, given a space, and are asked to participate by mentioning answers. Ao: 159 and; Aa: Me, 163. When different results are obtained, the teacher does not intend to question and contrast the procedures that led each student to those results, but rather the action is directed at projecting, as mentioned in the record. *Mo: Two procedures for how to perform this division will appear on your screen, and you are going to tell us which one you used.* However, technical failures prevented this projection at the time, so they were asked to verbally share the procedure they performed, a space that highlights interventions that need to be analysed. Mo: We have a small error. The number that would be closest to 6 to 9, or how many times 6 would fit into 9, is not 3. What would it be? Mo: 1, so you have to change your division.

These lines highlight a practice with little management of non-teaching moments, feedback and, consequently, independent work.

Their actions show a focus on moving through the activities rather than on promoting the understanding that these activities can generate.

There is little reflection on the student-student relationship due to the guided and decisive presence of the teacher's participation. Before drawing conclusions from the students' own contributions, answers, corrections and procedures are dictated, as the following evidence shows.

Teacher: Since we have time, now that you have allowed me, let's look at two ways to solve this division. Ways that another 4th grade student used to divide that operation.
[Control group; record 3]

Box 12

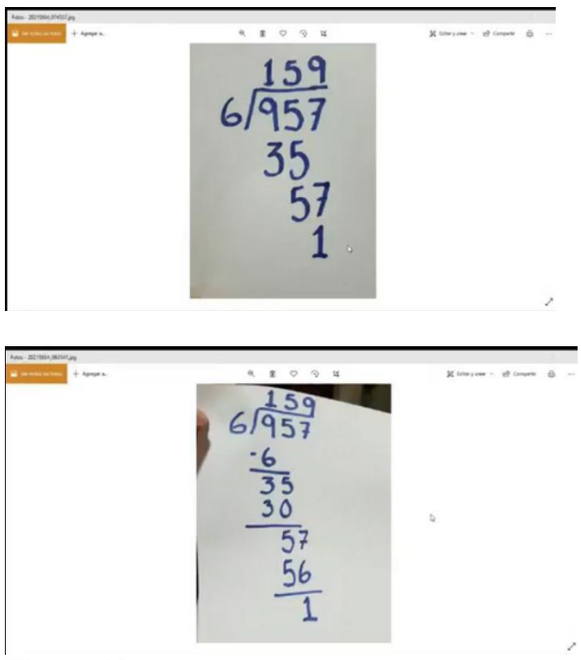

Figure 12

Conventional algorithms with implicit partial subtraction and with explicit partial subtraction

Source: Own elaboration

The practices highlighted in the control group reflect features of a technological trend that prescribes criteria to ensure a direction of learning, but dispenses with relativising criteria that make it possible to negotiate experiences and meanings in the classroom. Without delving too deeply into what is shared and with a corrective interest, this prevents a more in-depth exploration of knowledge. The teacher is solely responsible for validating knowledge, establishing what is right or wrong without dwelling on situations that encourage sharing the meanings of what has been learned [Carrillo, et al. 2014].

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Teaching practice, the teaching process, TSD theory, practice analysis, and research in the field of education, among others, are all aimed at training competent individuals with problem-solving skills in the classroom, but above all in the social context, who can take their knowledge beyond the classroom. This category of analysis needs to ask: do actions in practice favour the development of skills in students?

Specifically, in terms of 'solving problems independently', self-discovery will always generate more and better learning than receiving information through a situation that is not very meaningful. The teaching ability to promote non-didactic situations that give students the opportunity to recover their prior knowledge, mobilise knowledge to restructure it and autonomously generate meaningful learning applicable to different situations and contexts becomes relevant.

Conclusions

Detailed analysis of both groups reveals notable discrepancies in teachers' management of learning during class. In the experimental group, the teacher adopts an approach that encourages self-assessment and reflection among students.

Her involvement focuses on guiding students towards resolving situations that arise, promoting an atmosphere of trust that allows for the open exchange of ideas among classmates. In addition, the teacher's firmness in the face of errors translates into effective management of student participation, facilitating confrontation and self-assessment of procedures. This approach, rooted in institutionalised and personal teaching theories, contributes to meaningful learning in the resolution of multiplicative problems.

On the other hand, in the control group, a more directive teaching style is observed, with specific corrections and a lack of clear reasoning. The lack of attention to the causes of students' difficulties and the omission of guidance at key moments result in confusion carrying over to more complex content. This approach highlights the impact of the teacher's personal beliefs and the teaching plan they implement.

In this sense, the answer to the research question 'How is specialised knowledge of mathematics teaching linked to the learning of multiplicative problem solving in fourth-grade students?' is shown. Teaching strategies derived from existing knowledge have a direct impact on students' appropriation and reflection of meaningful learning, underlining the critical importance of planning and the consistent application of pedagogical theories in the teaching-learning process.

The absence of traditionalist practices and the presence of research-backed approaches that support current theories and approaches reflect the teacher's specialised knowledge. Combining personal conceptions with institutionalised theories becomes key to implementing relevant strategies that reflect the learning that students can achieve, as well as the mathematics teacher's teaching knowledge.

The constructivist approach stands out as a foundation for promoting autonomous learning in students. This approach involves providing relevant support that, while granting freedom, also accompanies the process with the necessary guidance to advance and analyse what the students have constructed. Interaction, especially between students, is representative of achieving meaningful learning. Having a solid plan based on institutionalised theories provides a guideline for teaching practices.

Knowledge of TSD theory is characterised by managing student autonomy and independence, requiring the presence of the teacher throughout the activities, with strategic interventions and non-teaching moments.

As mentioned in the theoretical framework, the Theory of Didactic Situations represents a means of promoting learning in students by placing them at the centre of the activities carried out through the different phases. Theoretically, the essence of each moment is described: the student takes action, formulates procedures, validations take place, managing the student's responsibility to construct their own learning by making use of feedback and promoting non-didactic moments.

However, it is not an easy task to stay in line with institutionalised theories, since, in practice, students may respond in unexpected ways that occasionally persuade the teacher to deviate from the planned intention.

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It is important to recognise the difficulties involved in putting theory into practice, as well as the fact that having a solid foundation in educational research can lead to areas of opportunity in the results, but dispensing with it takes us even further away from being able to convert actions into meaningful results.

The work proposal in the control group shows an approach that seeks to generate both conceptual and procedural knowledge on the subject of divisions. Through a progressive sequence of activities, an attempt is made to promote reflection on how the elements of a division are related. However, despite these efforts, the expected learning outcomes are not achieved.

The absence of knowledge of mathematics teaching [KMT] in the design of the activities limits the effectiveness of the proposal. Presenting the conventional algorithm is insufficient if understanding of both conceptual and procedural knowledge is not managed.

In contrast, the experimental group, with its focus on independent work, demonstrates teaching knowledge and highlights the positive influence of non-didactic moments on the understanding of procedures for solving multiplicative problems. This approach favours both conceptual and procedural knowledge, using different resources and forms of representation of the elements within the algorithm. In addition, the practical applicability in solving everyday situations is highlighted.

The key difference between the two groups lies in the presence or absence of solid teaching knowledge, which directly impacts the effectiveness of the proposal and the achievement of the expected learning outcomes.

In this sense, when characterising both groups, the research hypothesis is confirmed: practices with a traditionalist slant that focus on providing information and direct answers about the knowledge at stake will have less impact on creating meaningful learning than constructivist teaching practices, where the student plays an active role in constructing their learning.

In this sense, the experimental group should present results with a higher level of conceptual and procedural understanding than the control group, due to the intention to put into practice elements that characterise the teacher's specialised knowledge, including the Theory of Didactic Situations, which, from its design, plans the non-didactic moments during the class session, with the teacher being aware of the impact of their interventions, guidance or omissions.

The analysis shows that the experimental group highlights a class dynamic characterised by the active participation of students and constant interaction between them, managed by the teacher. Time is invested in complementary participation to consolidate group learning. On the other hand, in the control group, the teacher's approach is more direct, giving answers that complete activities, with a lack of space for reflection and rigidity in the organisation of class time, which limits conceptual and procedural learning.

The teacher's specialised knowledge of content pedagogy [PCK] for teaching mathematics [KMT] is evident, allowing for the creation of non-didactic moments where knowledge is mobilised around the resolution of multiplicative problems, students take responsibility for creating their own knowledge, and meaningful conceptual and procedural learning is achieved.

Declarations

Conflict of interest

The authors declare that they have no conflict of interest. They have no known competing financial interests or personal relationships that could have appeared to influence the article reported in this article.

Contribution of the authors

Hernández-Gutiérrez, Francisco Javier: Contributed to the final draft of the entire article, significantly constructed each of its sections, and verified the writing with the relevant format, coherence, and cohesion.

Rosales-Posada, Norma Susana: Contributed to the planning and execution of the research project, and wrote a preliminary draft of the general document as part of her master's thesis.

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Ayala-Del Villar, Erik: Contributed to the review and specification of the methodological research route, supported with a general review of the final publication document.

Availability of data and materials

The images presented in this research article are the authors' own work. They are images observed and obtained from the research itself, from specific tasks, responses, and activities carried out during the proposed intervention, as well as non-profit images used solely for research and informational purposes from two children's books: 'Malvado conejito' [Evil Bunny] and 'Cómo atrapar una estrella' [How to Catch a Star].

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Abbreviations

Aa.	Student
Ao.	Student
Aos.	Pupils
Gral.	General
Ma.	Teacher
Mo.	
SEP	Ministry of Public Education

References

Background

Brousseau, G. [2007]. *Iniciación al estudio de la teoría de las situaciones didácticas.* Argentina: Libros del Zorzal.

Carrillo, J., Contreras, L. C., Climent, N., Escudero-Ávila, D., Flores-Medrano, E., & Montes, M. Á. [2014]. *Un marco teórico para el conocimiento especializado del profesor de matemáticas.* Huelva: Universidad de Huelva publicaciones.

Carrillo, J. [2016]. *Didáctica de las matemáticas para maestros de educación primaria.* España: paraninfo.

Castro, E., Rico, L., & Castro, E. [1987]. *Números y operaciones. Fundamentos para una aritmética escolar.* Madrid: SINTESIS.

Gálvez, G. [1997]. La didáctica de las matemáticas. En C. Parra, & I. Saiz, *Didáctica de matemáticas, portes y reflexiones.* [págs. 39-50]. Buenos Aires: Paidós Educador.

Maza, C. [1991]. *Enseñanza de la multiplicación y la división.* Madrid: SINTESIS.

Muñoz-Catalán, C. C. [2015]. Conocimiento especializado del profesor de matemáticas [MTSK]: un modelo analítico para el estudio del conocimiento de profesor de matemáticas. *La gaceta de la Real Sociedad Matemática Española*, 3 [XVIII]. Pp. 1801-1817.

Panizza, M. [2003]. Conceptos básicos de la teoría de situaciones didácticas. En: *Enseñar matemáticas en el nivel inicial y el primer ciclo de la EGB: análisis y propuestas* [pág. 59-71]. Argentina: Paidós.

SEP. [2017]. *Aprendizajes clave para la educación integral.* México: Autor.

Shulman, L. S. [1986]. *Those who understand: Knowledge growth in teaching.* Educational Research, 4-14.

Basics

SEP. [2011]. *Plan de estudios 2011. Educación básica.* México: Autor.

Support

Latorre, A. [2005]. *La investigación-acción. Conocer y cambiar la práctica educativa.* Graó.

Paz, S. M. [2003]. *Investigación cualitativa en educación: fundamentos y tradiciones.* Ediciones Aljibe.

Sampieri, R., Fernández, C., & Baptista, P. [2006]. *Metodología de la investigación.* México: McGrawHill.

Stake, R. [1998]. *Investigación con estudio de casos.* Madrid: Morata.

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Article

Impact of personal and contextual factors on academic performance in the Tecomán Valley, Colima: An analysis of the 2024 grade point average in relation to teaching experience, use of ICT, level of support, and marital functionality

Incidencia de factores personales y contextuales en el desempeño académico en el Valle de Tecomán, Colima: Un Análisis del promedio escolar 2024 en relación con la antigüedad docente, uso de tic, nivel de apoyo y funcionalidad marital

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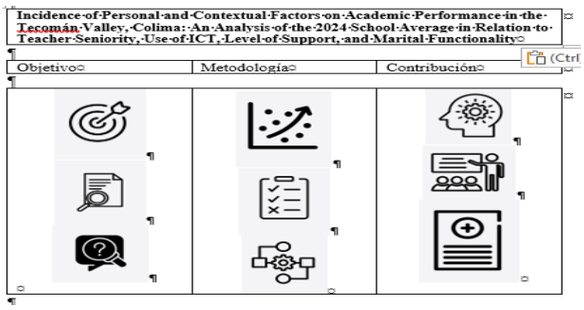
Abstract

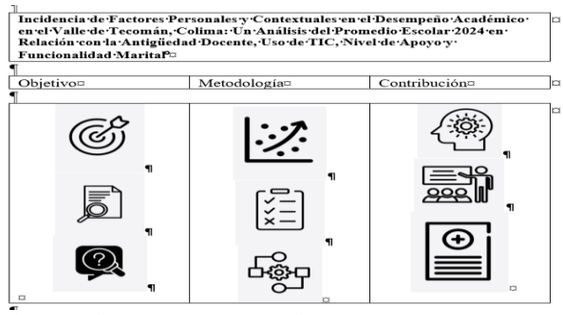
This study analyzes how personal and contextual factors influence the academic performance of basic education students in Tecomán, Colima, during 2024. Four variables were considered: teaching seniority, ICT use, perceived support, and marital functionality. Using a quantitative, correlational, and non-experimental design, a structured questionnaire was applied to teachers and students in public schools. A multiple linear regression analysis conducted with Minitab v.18 revealed that ICT use is the most significant predictor of academic performance, followed by teaching seniority. However, a negative interaction was observed between both: high ICT use combined with greater seniority tends to lower student performance. Perceived support and marital functionality showed marginal effects. The study concludes that school-related factors have a greater impact than personal ones and recommends strengthening teachers' technological training to improve academic outcomes.



Academic performance, Teacher seniority, Information and Communication Technologies [ICT].

Resumen

Este estudio analiza cómo factores personales y contextuales influyen en el desempeño académico de estudiantes de educación básica en Tecomán, Colima, durante 2024. Se consideraron cuatro variables: antigüedad docente, uso de TIC, nivel de apoyo percibido y funcionalidad marital. Con un enfoque cuantitativo, correlacional y diseño no experimental, se aplicó un cuestionario estructurado a docentes y estudiantes de escuelas públicas. El análisis, realizado mediante regresión lineal múltiple en Minitab v.18, identificó que el uso de TIC es el predictor más relevante del promedio escolar, seguido por la antigüedad docente. No obstante, se evidenció una interacción negativa entre ambos factores: altos niveles de TIC combinados con mayor antigüedad reducen el rendimiento académico. El nivel de apoyo y la funcionalidad marital mostraron efectos marginales. Se concluye que los factores escolares tienen mayor impacto que los personales y se recomienda reforzar la capacitación tecnológica docente para mejorar los resultados educativos.



Desempeño académico, Antigüedad docente, Tecnologías de la Información y la Comunicación [TIC].

Area: Advocacy and attention to national problems

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Introduction

The 2022 PISA test, published in 2023, is taken as the basic scenario for this section, as there is no other international benchmark of this magnitude after that date.

The Programme for International Student Assessment [PISA] 2022 assessed 15-year-old Mexican students in three core areas: mathematics, reading and science. In this edition, the results for Mexico showed a worrying trend, especially in mathematics, where scores fell significantly compared to 2018, returning to levels similar to those observed in 2003. In reading, the results remained virtually unchanged from the previous assessment, and in science there was a slight decline with no statistically significant differences over the last decade.

In terms of minimum skill proficiency [Level 2 or above], only 34% of students reached that threshold in mathematics, well below the OECD average of 69%. In reading, 53% achieved acceptable levels, compared to the OECD average of 74%, and in science, only 49% reached the basic level of competence, compared to the international average of 76%. Furthermore, almost no Mexican students reached the highest performance levels [levels 5 or 6] in any of the three areas, while in countries such as Singapore and Japan, more than 20% of students are in those ranges.

Internal gaps are another critical issue. Twenty-seven per cent of Mexican students belong to the lowest socioeconomic quintile internationally, and although on average they score lower, some manage to stand out: 12 per cent of disadvantaged students were among the top performers, demonstrating cases of academic resilience. The difference in scores between students from higher and lower socioeconomic levels was 58 points in mathematics, lower than the OECD average [93 points], although this does not imply greater equity but rather low overall performance.

In terms of gender differences, boys outperformed girls in mathematics by 12 points, while girls performed better in reading, with an 8-point advantage. It should be noted that, in general, both girls and boys performed poorly, especially in mathematics.

School life also reflects some worrying aspects. Although 78% of students said they felt part of their school, a considerable proportion [25%] reported feeling lonely, and 26% said they felt excluded, both percentages above the OECD average. Overall life satisfaction declined in Mexico: in 2018, 8% of students reported being dissatisfied with their lives; in 2022, this figure rose to 14%.

In the classroom, 77% of students indicated that their teacher shows interest in each student's learning, and 79% mentioned that they receive additional help when they need it. However, 25% of students said they are frequently distracted by the use of digital devices during class, and a similar percentage are distracted by their classmates' use of devices.

School safety was also a concern. Twenty-two per cent of students said they did not feel safe on their way to school, a figure much higher than the OECD average [8%]. At the school level, 7% do not feel safe in the classroom, and 11% feel unsafe in other areas of the school such as hallways, bathrooms, or the cafeteria.

During school closures due to the COVID-19 pandemic, 62% of Mexican students faced school disruptions of more than three months. Thirty-six per cent reported weekly difficulties understanding their assignments, and 28 per cent said they did not have anyone to help them with their schoolwork. Despite these limitations, only 20 per cent reported receiving daily emotional support from school staff, although 46 per cent did participate in live virtual classes frequently.

In terms of investment, Mexico allocated a cumulative expenditure per student of approximately $28,900 [in purchasing power parity], significantly lower than other countries evaluated. In addition, 31% of students attended schools where principals reported teacher shortages, up from 25% in 2018.

In terms of educational attainment, 87% of the students assessed were in Year 10 and 98% had attended at least one year of preschool. Nine per cent had repeated a year, which is in line with the OECD average, although higher-performing education systems tend to have lower repetition rates.

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Finally, the level of school autonomy in Mexico lags behind other countries. Only 24% of schools allow principals to have primary responsibility for hiring teachers [compared to 60% in the OECD], and only 51% of teachers choose their own teaching materials [OECD average: 76%].

Educational scenario in Tecomán, Colima

Tecomán, one of the most populous municipalities in Colima, accounts for approximately 14.5% of the state's population. Its educational structure reflects both progress and challenges at different school levels.

Basic level [preschool, primary and secondary]

Basic education in Colima has a coverage rate of 90.1% for children aged 3 to 14.

In primary school, the terminal efficiency [percentage of students who complete their studies within the expected time frame] reaches 96.4%, indicating a relatively solid system.

However, in secondary school, this efficiency drops to 79.6%, and the dropout rate stands at 3.8%, suggesting areas for improvement in the transition between levels.

Upper secondary level

Coverage for young people aged 15 to 17 is 79.4%, but the net enrolment rate is only 65.3%, indicating that a significant proportion of adolescents are not enrolled at the level corresponding to their age.

The dropout rate at this level is high: 11.6%, and the completion rate is only 73.1%.
Higher level

Coverage for young people aged 18 to 22 is 32.8%, reflecting limited access to university education.

The average level of schooling in Colima is 10.4 years, equivalent to just over complete secondary education.

Illiteracy in the state is low, with only 3.1% of the population in that condition.

Overview

According to the 2020 Census, in Tecomán: 49.3% of the population aged 15 and over has at most a basic education.

Only 21.6% has attained higher education.

The young population represents a key opportunity to strengthen educational continuity, especially at the upper secondary and higher education levels.

This scenario suggests that, although Tecomán has made significant progress in coverage and literacy, it still faces challenges in school retention and access to higher levels of education. Would you like me to turn this into an infographic or executive summary for presentation?

Student academic performance is a multidimensional phenomenon influenced by a wide range of personal and contextual factors. In the current educational context, where the quality of learning is a priority, it is essential to analyse the variables that directly affect school average and achievement, especially in a post-pandemic scenario that has reconfigured teaching and learning environments.

Among these factors, teacher seniority, the use of information and communication technologies [ICT], the level of perceived support, and marital functionality are key elements whose interaction can have significant effects on school outcomes.

Several studies have pointed out that teacher seniority may be associated with different levels of pedagogical experience and mastery of instructional strategies, although it could also imply methodological rigidity or resistance to innovation [Ikeda & García, 2013].

At the same time, the use of ICT in the classroom has shown transformative potential in the teaching-learning process, promoting greater autonomy, access to information, and pedagogical dynamism [Villegas Pérez et al., 2017]. However, its real impact depends on multiple conditions, such as available infrastructure, teacher training, and the sociocultural context [Gutiérrez López, 2012].

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On the other hand, the level of family and social support has been identified as a protective factor for academic performance, especially at basic educational levels, by providing emotional security and resources for learning [Twum, 2017]. Likewise, the marital functionality of parents, understood as the quality of intra-family relationships, can act as an important modulator of students' emotional well-being, indirectly affecting their school performance [Cabrera Berrezueta, 2017].

The main objective of this study is to analyse the combined impact of these factors on the academic average recorded in 2024, using a quantitative and cross-sectional approach. The analysis focuses on identifying correlations and possible causal relationships between the aforementioned variables, with the aim of providing empirical evidence to contribute to decision-making in educational policies, teaching intervention programmes and psychosocial support strategies.

Theoretical Framework

Students' academic performance cannot be understood as a one-dimensional phenomenon, but rather as the result of a complex network of factors that interact with each other on multiple levels. From individual variables such as motivation or family history to institutional aspects such as teaching experience and the pedagogical use of technologies, all of these factors form a network that directly impacts academic achievement.

This study is based on a multifactorial perspective, recognising key elements such as teaching experience, the use of information and communication technologies [ICT], the level of support perceived by students, and marital functionality within the family environment. The main themes underpinning this analysis are developed below, with a special emphasis on the context of the Tecomán Valley, Colima, and the challenges faced by educational communities in the region.

1. Teaching seniority: experience, pedagogical knowledge and challenges

Teaching seniority has traditionally been considered an indicator of educational quality, as it is associated with accumulated experience, in-depth knowledge of the curriculum and greater ability to manage the group. Several studies support this view.

Ikeda and García [2013], for example, argue that teachers with more years of service tend to manage school dynamics more easily, adapt better to student diversity, and anticipate pedagogical conflicts more effectively.

However, this relationship between experience and effectiveness is not necessarily linear. Seniority can become a double-edged sword when it is not accompanied by processes of continuous training, reflection, and renewal. Cabrera Berrezueta [2017] warns that a lack of updating can lead to routine practices, resistance to change, and limited use of new methodologies.

From a deeper perspective, Perrenoud [2004] points out that teacher professionalisation should be understood as a reflective process in constant construction. In other words, experience alone does not guarantee better results if it is not accompanied by a critical view of one's own practice.

In environments such as Tecomán, where not all teachers have access to continuing education, seniority can be both a resource and an obstacle, depending on the institutional context and the profile of each professional.

2. Use of ICT in the teaching-learning process: between innovation and inequality

The integration of ICT in education has become increasingly important in recent years, especially in the wake of the challenges posed by the COVID-19 pandemic. Digital technologies can enrich the teaching-learning process by facilitating access to multiple sources of information, promoting collaborative work and encouraging student autonomy [Villegas Pérez et al., 2017].

However, their effective implementation depends not only on the availability of equipment or connectivity, but also on the teacher's preparation and willingness to use them for pedagogical purposes. Gutiérrez López [2012] identified that teachers' attitudes towards ICT significantly influence their use: the more aware a teacher is of the educational potential of these tools, the greater their integration in the classroom will be.

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Twum [2017] also highlights that the pedagogical use of ICT can have positive effects on students' cognitive skills, but also warns that poor implementation can lead to distractions, superficial learning and even widen educational gaps.

In Mexico, the PISA 2022 report [OECD, 2023] warned of a negative association between the indiscriminate use of electronic devices and performance in mathematics and reading.

This underscores the importance of analysing how variables such as teacher seniority and ICT use interact. Teachers with more years of service may face greater challenges in integrating ICT, either due to technical ignorance or resistance to change. This challenge is particularly relevant in regions where the digital divide is still considerable [Imco, 2023].

3. Perceived level of support: affective networks as a support for learning

Academic performance is also strongly influenced by the support networks that students perceive around them. These networks can come from family, teachers, classmates, or even the community at large.

Self-determination theory [Deci & Ryan, 2000] emphasises that intrinsic motivation is strengthened when people feel supported, valued, and emotionally secure. Epstein [2001] argues that collaboration between schools, families, and communities is essential to consolidating an environment conducive to learning.

In practice, this translates into students with higher academic self-esteem, greater commitment to their studies, and a greater ability to cope with difficulties.

However, the Mexican context reveals significant contrasts. According to the PISA 2022 report [OECD, 2023], although a majority of students reported receiving support when needed, a significant percentage also identified themselves as feeling excluded or emotionally alone. This suggests that the level of perceived support is variable and that its absence can become a risk factor that hinders school performance.

4. Marital functionality and family environment: the home as a space of indirect influence

Marital functionality refers to the quality of the relationship between parents or primary caregivers, which has an indirect but significant influence on the student's academic life.

A functional family environment, characterised by communication, respect and cooperation, provides emotional stability, time management and habits that promote academic performance [Álvarez & Martínez, 2016].

Conversely, family dysfunction can cause stress, anxiety, emotional conflicts, and instability that interfere with the student's ability to concentrate, plan, and self-regulate [Cabrera Berrezueta, 2017].

In areas such as Tecomán, where diverse forms of family organisation coexist, it is crucial to recognise that the effects of the home environment are as diverse as the family configurations themselves.

UNESCO [2021] emphasises that any education policy that seeks to improve academic performance must consider the family environment as a key variable, not only in terms of financial support, but also in terms of emotional well-being and emotional bonds.

5. Interaction between factors: an ecosystemic approach

Finally, it is necessary to highlight that none of these factors acts in isolation. Following Bronfenbrenner's ecological model [1994], human development—and with it, academic performance—is the product of multiple systems that interact dynamically: the family, school, community, and sociocultural systems. Understanding how variables such as teacher seniority, ICT use, perceived support, and marital functionality interrelate allows for more realistic diagnoses and more effective strategies. This comprehensive view is especially valuable in complex contexts such as Tecomán, where social, economic, and educational conditions present stark contrasts. Therefore, any intervention aimed at raising academic standards cannot be limited to a single level of analysis. A systemic, intersectoral vision that is sensitive to the particularities of the environment is required.

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Box 1

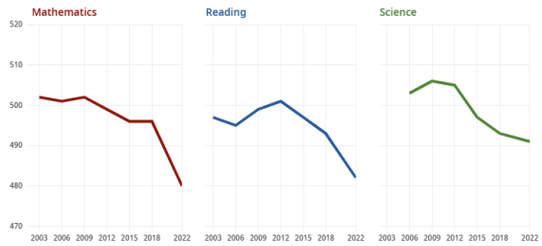

Figure 1

Trends in Mathematics, Reading and Science

Source: Organisation for Economic and Development [2023]

Box 2

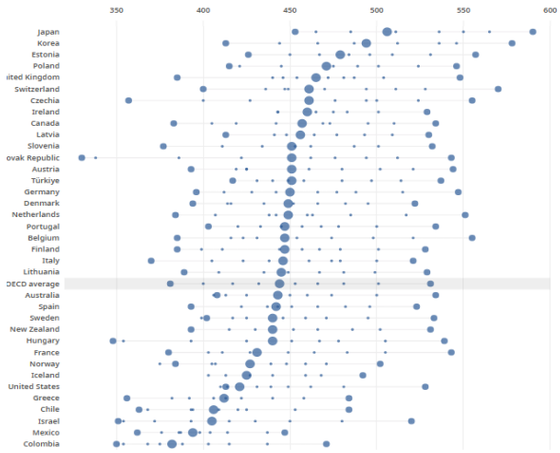

Figure 2

Average PISA mathematics scores by PISA index deciles of economic, social and cultural status.

Source: Organisation for Economic and Development [2023]

Box

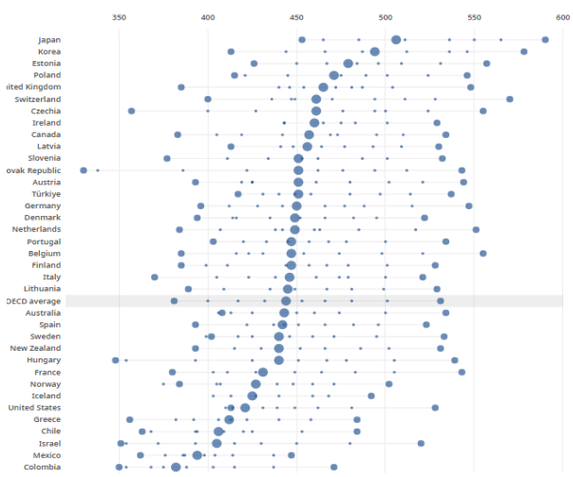

Figure 3

Mathematics level PISA test

Source*: IMCO [2023]*

Box 4

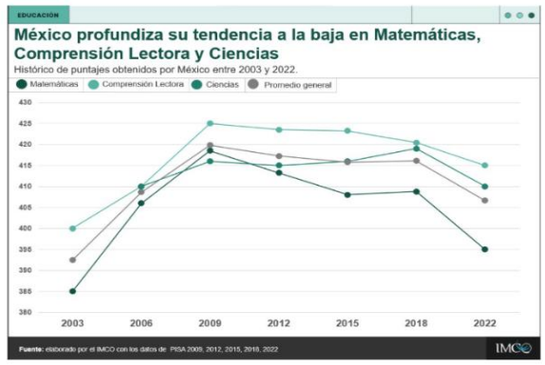

Figure 4

Level of mathematics, reading comprehension and science

Source: IMCO [2023]

Box 5

Figure 5

Level of mathematics, reading comprehension and science

Source: IMCO [2023]

Research questions

General research question

How do personal and contextual factors—such as teaching experience, use of ICT, level of support, and marital status—affect the academic average of students in the Tecomán Valley in 2024?

What is the relationship between teaching experience and the academic average of students in the Tecomán Valley in 2024?

To what extent does the use of information and communication technologies [ICT] by teachers influence the academic performance of students?

How do the level of perceived support and marital functionality affect the academic average recorded by primary school students?

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General objective:

To analyse the impact of personal and contextual factors such as teacher seniority, the use of ICT, the level of support and marital functionality on the 2024 school average of students in the Tecomán Valley.

Specific objectives:

To examine the relationship between teacher seniority and student academic performance.

To evaluate the impact of ICT use in the classroom on students' grade point average.

Determine the influence of the level of family support and marital functionality on students' academic performance.

General hypothesis:

Teaching seniority, the use of ICT, the level of perceived support, and marital functionality have a statistically significant effect on the academic average of students in the Tecomán Valley in 2024.

Methodology

Research Approach and Design

This study takes a quantitative, correlational, and non-experimental approach with the aim of identifying the impact of personal and contextual factors on students' academic performance in 2024.

Multiple linear regression analysis was used as a statistical technique to determine the relationship between the independent variables and the dependent variable.

Data Collection Instrument

A structured questionnaire, theoretically validated through a review of national and international literature, was used to collect information. The questionnaire included specific indicators for each of the variables.

Dependent variable:

School average for 2024 [expressed on a numerical scale from 0 to 10].

Independent variables:

Teacher seniority [years of teaching experience]. Use of ICT [index of incorporation of information and communication technologies in teaching processes].

Level of perceived support [Likert scale from 1 to 5]. Functional marriage [assessment of marital functionality using a Likert scale from 1 to 5]. The questionnaire was administered to a sample of students and teachers from primary education institutions in the municipality of Tecomán, Colima, with informed consent and ensuring the anonymity of the participants.

Analysis procedure

The data collected were systematised in a structured database and analysed using Minitab v.18 statistical software. Multiple linear regression was applied to evaluate the combined effect of the independent variables on the school average, identifying both the degree of association [R^2] and the statistical significance [p-value] of each predictor.

Additionally, a complementary theoretical analysis was performed based on national and international academic sources, with the aim of empirically supporting the findings and contrasting the results of the model with the existing literature on the impact of contextual and personal factors on academic performance.

Results

Considering the information that was collected, the following data are available as results:

Box 5

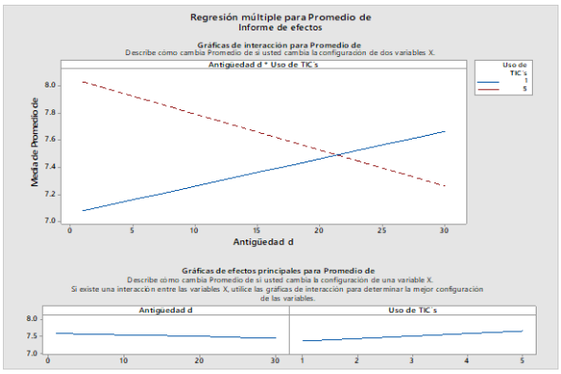

Figure 5

Interaction between seniority and ICT use

Source: Own

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The interaction graph obtained from the multiple linear regression analysis shows how the combination of teaching experience and the use of information and communication technologies [ICT] affects students' academic average in 2024.

Two clearly differentiated trends can be observed. On the one hand, when ICT use is low [value 1 on the scale], the longer the teacher's seniority, the higher the academic average tends to be.

This relationship suggests that the experience accumulated by teachers can have a positive effect on student performance, even without significant integration of technological tools.

In this scenario, the teacher's traditional experience acts as a protective factor for academic performance.

On the other hand, when ICT use is high [value 5], the relationship is reversed: the more senior the teacher, the lower the school average tends to be. This reversal in the direction of the effect suggests that the combination of high experience with intensive ICT use may not be synergistic; it could be due to difficulties in pedagogical adaptation to digital environments by teachers with more years of service, or to less technological training during their professional career.

The intersection point between the two lines at approximately 20 years of seniority marks a threshold beyond which the effects of ICT use and experience begin to have an inverse relationship with student performance. This finding highlights a significant interaction between the variables: the effect of teacher seniority on academic performance is not homogeneous, but depends on the level of technological integration in the classroom.

For their part, the main effects graphs allow us to observe the individual impact of each variable on the school average. Teacher seniority, analysed in isolation, shows a slight negative trend, suggesting that, in general, averages tend to decrease as experience increases, although this effect is subtle. In contrast, the use of ICT has a positive relationship with academic performance: the greater the incorporation of technologies in the teaching-learning process, the higher the average recorded by students.

These findings lead to the conclusion that the relationship between personal and contextual factors is neither linear nor independent. Effective use of ICT can enhance learning, but its impact varies depending on the teacher's profile. This result reinforces the need for continuous training and technological updating strategies for more experienced teachers, in order to ensure effective pedagogical integration that promotes student performance.

Box 6

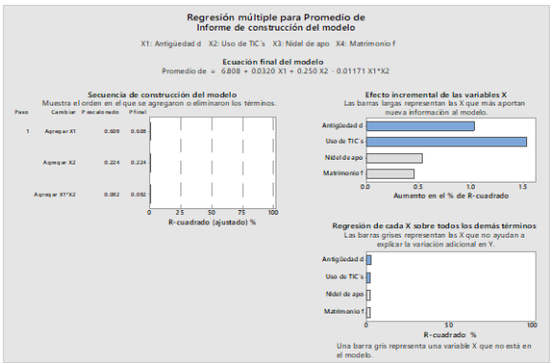

Figure 6

Multiple linear regression for the variables involved

Source: Own

The multiple regression model to explain the 2024 school average was constructed considering four independent variables: teaching seniority [X1], use of ICTs [X2], level of support [X3] and marital functionality [X4], together with an interaction between seniority and use of ICTs [X1*X2]. The resulting equation was:

Average = 6.808 + 0.0320·Seniority + 0.250·ICT - 0.01171·[Seniority × ICT]

This equation suggests that:

- Both teaching seniority and ICT use have an individual positive contribution to academic average.
- However, the interaction term [X1*X2] has a negative coefficient, indicating that the positive effect of one variable may decrease if the other is also at high levels, confirming the interaction observed above.

Model construction

The left side of the graph shows the sequence of model construction, displaying the order in which the variables were added to the model along with their partial significance [p-values]:

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- Seniority [X1] was incorporated first, followed by ICT use [X2] and finally their interaction [X1*X2].
- Although none of the p-values are less than 0.05, suggesting weak individual statistical significance, they were included for their contribution to the model as a whole.

- Incremental effect of the variables

The upper right graph shows the increase in the adjusted R-squared caused by each variable:

- Use of ICTs is the variable that contributes most to explaining the variance in academic average.
- Teaching seniority also contributes significantly.
- Level of support and marital functionality have a much smaller effect in comparison, with increases of less than 0.5% of the adjusted R^2.

This implies that institutional or pedagogical factors [such as experience and educational technology] have a greater impact than personal and family factors in this specific model.

Regression of each X on the others

Finally, the lower right graph represents the redundancy of each variable based on its collinearity with the other variables:

- No variable appears as irrelevant [in grey], although marital functionality and level of support explain very little on their own.
- This suggests that, although included, their impact is limited compared to the variables associated with teaching practice.

Answers to questions

How do personal and contextual factors such as teaching seniority, ICT use, level of support, and marital functionality affect the academic average of students in the Tecomán Valley during 2024? Contextual factors [especially ICT use and teaching seniority] have a greater impact on academic average than personal factors.

The use of ICT is positively related to school performance, while teaching experience shows an effect that depends on the technological context: although it provides experience, its combination with high technology can create difficulties if there is no adequate training.

For their part, the level of perceived support and marital functionality have a marginal influence on the average, although they remain important from a psychoeducational perspective.

Question 1:

What is the relationship between teacher seniority and the academic average of students in the Tecomán Valley during the year 2024?

The relationship between teacher seniority and academic average is not linear. At low levels of ICT use, seniority contributes slightly positively to the average. However, when ICT use is high, greater seniority tends to correlate with a decline in academic performance, possibly due to technological adaptation difficulties among teachers with more years of service.

Question 2:

To what extent does the use of information and communication technologies [ICT] by teachers influence students' academic performance?

The use of ICT is the most significant predictor in the model. The greater the integration of these technologies in the educational process, the higher the academic average recorded by students. Its impact is significantly higher than that of other variables, highlighting its role as a catalyst for learning.

Question 3:

How do the level of perceived support and marital functionality affect the academic average recorded by primary school students?

Both personal variables had statistically marginal effects in the model. Although they were not strong predictors of academic performance in numerical terms, their qualitative relevance is recognised, especially as factors of emotional support and stability that can reinforce or weaken student motivation and commitment.

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Response to objectives

General objective:

To analyse the impact of personal and contextual factors such as teaching seniority, use of ICT, level of support and marital functionality on the 2024 school average of students in the Tecomán Valley.

Partially achieved.

Quantitative analysis using multiple linear regression allowed us to evaluate the relationship and interaction between the aforementioned factors and the school average.

There was clear evidence of the impact of contextual factors [use of ICT and teacher seniority], but personal factors [level of support and marital functionality] showed a statistically weak impact, which limits the overall explanatory power of the model with respect to all variables.

Specific objective 1:

Examine the relationship between teacher seniority and student academic performance.

Achieved.

Teacher seniority was analysed as an independent variable, both individually and in interaction with ICT use. It was identified that its effect is not linear, but dependent on the technological context: it can be positive in traditional environments and negative when combined with high technological demands.

Specific objective 2:

To evaluate the impact of ICT use in the classroom on students' school average.

Fully achieved.

The use of ICT proved to be the most significant predictor of academic performance. Its positive impact was confirmed statistically and in the construction of the model, which validates its importance in improving learning.

Specific objective 3:

To determine the influence of the level of family support and marital functionality on students' academic performance.

Achieved to a limited extent.

Although both variables were included and measured, their effects on the model were marginal and not statistically significant. However, their incorporation allowed for reflection on their contextual value and on the need for qualitative or mixed approaches that better capture their influence.

Therefore, the general hypothesis:

Evaluation of the hypothesis:

Multiple linear regression analysis allowed for the evaluation of the individual and combined effects of the aforementioned variables on academic average. Based on the results obtained, the following conclusions were reached:

Partial confirmations:

- **Use of ICT**: This was the variable with the greatest explanatory power. It showed a **significant positive relationship** with academic average, which validates its importance as a predictor of school performance.
- **Teaching experience**: It had a weakly negative individual effect, but was relevant in its **interaction with ICT use**, showing a **significant inverse relationship** when both variables were combined at high levels. This confirms that its effect is neither direct nor uniform, but statistically significant in interaction.

Hypothesis not confirmed for:

- **Level of perceived support** and **marital functionality**: These had **marginal effects** and were not statistically significant in the model. Although they are recognised as important contextual variables, they **did not demonstrate a clear influence on academic average** in statistical terms in this study.

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Conclusion regarding the hypothesis:

The general hypothesis is partially confirmed. Although ICT use and teaching seniority [in interaction] were shown to have a statistically relevant effect on academic performance, the level of perceived support and marital functionality **did not reach levels of statistical significance**, which prevents the hypothesis from being accepted in its entirety.

Declarations

Conflict of interest

The authors declare that they have no conflict of interest. They have no known financial interests or personal relationships that could have influenced the content of the article presented.

Contributions of the authors

All authors actively participated in the development of this research. The specific contributions were as follows:

Lino-Gamiño, Juan Alfredo. Participated as project leader, developed and standardised the instrument, coordinated the survey, and finally wrote the paper.

Cruz-Matías, Irene del Carmen. Together with the first author, carried out the analysis of the results and the conclusion of the paper.

Availability of data and materials

The data used and analysed during the development of this research are available upon reasonable request to the corresponding author.

References

Antecedents

Ikeda, M., & García, E. [2013]. Grade Repetition in Primary Education: A Comparative Study of Academic Performance and the Perceptions of Teachers and Parents in Mexico. International Journal of Educational Development, 33[2], 146-159.

Imco. [2023]. PISA 2022: Dos de cada tres estudiantes en México no alcanzan el nivel básico de aprendizajes en matemáticas. Instituto Mexicano para la Competitividad [IMCO].

Basics

Álvarez, C. M., & Martínez, M. G. [2016]. La influencia del ambiente familiar en el rendimiento académico. Revista Iberoamericana de Psicología, 13[2], 45-59.

Bronfenbrenner, U. [1994]. Los sistemas ecológicos del desarrollo humano. Paidós.

Cabrera Berrezueta, B. [2017]. Resultados de la estrategia pedagógica para el mejoramiento del desempeño profesional pedagógico de los docentes, con el aprovechamiento de las tecnologías de información y comunicación [TIC]. Revista Cubana de Educación Superior, 37[1], 30-37.

Deci, E. L., & Ryan, R. M. [2000]. The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. Psychological Inquiry, 11[4], 227–268.

Gutiérrez López, C. [2012]. La representación social de las tecnologías de la información y la comunicación entre los maestros de educación básica en México. Psicologia e Saber Social, 1[1], 95-102.

Epstein, J. L. [2001]. School, Family, and Community Partnerships: Preparing Educators and Improving Schools. Westview Press.

Organisation for Economic, C.-o., & Development. [2023]. PISA 2022 Results [Volume I]: The State of Learning and Equity in Education. OECD Publishing.

Supports

Twum, S. [2017]. Impact of Information and Communication Technology [ICT] on Academic Performance of Students in Ghana: The Case of Asankrangua Senior High School [Undergraduate thesis, University of Education, Winneba – College of Technology Education]. Kumasi, Ghana.

Villegas Pérez, M., Mortis Lozoya, S. V., García López, R. I., & del Hierro Parra, E. [2017]. Uso de las TIC en estudiantes de quinto y sexto grado de educación primaria. Revista Actualidades Investigativas en Educación, 9[1], 50-63.

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Article

Simulation tools as a flipped classroom strategy for competency development in Higher Education

Implementación de herramientas de simulación en flipped classrooms para Educación Superior basada en competencias

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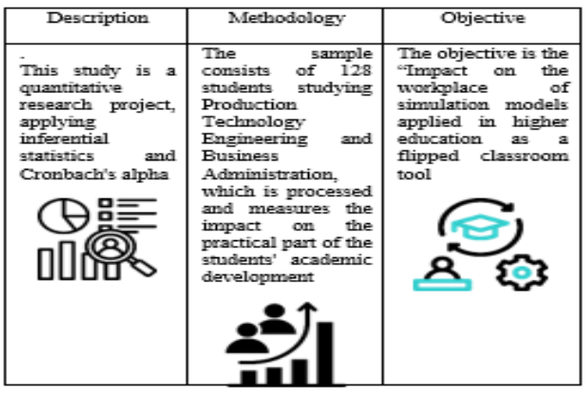
Abstract

In recent years, the flipped classroom has been of great support to teachers as part of meaningful and cognitive learning at the higher education level. The application of ICTs allows for the combination of practice and theory in the construction of new knowledge for better academic development. This study is a quantitative research project, applying inferential statistics and Cronbach's alpha. It has a sample of 128 students from the Production Technology Engineering and Business Administration degree programs, which is processed and measures the impact on the practical part of the students' academic development, as it allows for the application of the teaching-learning process and management skills within the classroom to observe the reality in the workplace. the objective is the "Impact on the workplace of simulation models applied in higher education as a flipped classroom tool."



Flipped classroom, Simulators, Education

Resumen

En los últimos años, el aula invertida ha sido de gran apoyo en docentes como parte del aprendizaje significativo y cognitivo en nivel superior; La aplicación de TIC´s permite la combinación de la práctica y teoría en la construcción de nuevos saberes para el mejor desarrollo académico. El presente estudio es una investigación con enfoque cuantitativo, aplicando estadística inferencial y Alfa de Cronbach. Se tiene una muestra de 128 alumnos de la carrera de Ingeniería en Tecnologías de la Producción y Licenciatura en Administración, la cual se procesa y mide el impacto en la parte práctica del desarrollo académico del alumnado dado que permite la aplicación del proceso enseñanza-aprendizaje y las habilidades directivas dentro del aula, para observar la realidad en el campo laboral, el objetivo es el "Impacto en el campo laboral de modelos de Simulación que se aplican en la Educación superior como una herramienta de Aula invertida".

Aula invertida, Simuladores, Educación

Area: Promotion of frontier research and basic science in all fields of knowledge

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Introduction

Simulation within the flipped classroom allows knowledge to be constructed as part of an academic strategy and gives students a broad vision with the best model that allows them to make decisions through practical cases. Based on the simulation, these cases allow them to make the best decisions for their work environment at the end of their academic training. It is important to highlight that analytical thinking, when developed, allows students to generate better strategies in their environment and, in certain cases, enter the industry with a level of personal confidence, fully assuming their responsibility, which allows them to generate collaborative work with teams for the most efficient decisions for their company or economic environment. In this sense, simulation also allows students to anticipate possible events before they happen and avoid economic losses to the industry.

The validation of different simulation models makes it easier to represent situations that would be similar to real ones so that, when formulating a possible run in certain software, the elements of the process that could fail are identified, thus saving time and work. In addition to supporting the economy of companies, as reality is decisive, they cause losses and market disadvantages.

When planning classes and including the 'Flipped Classroom' methodology, we make the formation of simulation elements part of our strategy, which allows face-to-face education to advance to virtuality, where we access information in real time, without requiring the presence of teachers, and where students take on a key role in their educational learning, which prepares them individually and provides them with the development of decision-making skills. At this point, students take on a key role in their educational process, increasing their commitment and involvement [Vidal Ledo, Rivera Michelena, Nolla Cao, Morales Suárez et al., 2016].

Digital platforms and simulators allow for the virtual continuation of educational learning, which becomes necessary by recreating business scenarios where students learn to make strategic, financial, and operational decisions that improve business environments, making them more competitive and realistic, and allowing them to observe the possible consequences that may arise in order to redirect the course of the company, without these decisions posing serious risks in the real world.

These digital platforms therefore allow participants to experience market dynamics, make decisions in real time and observe the consequences of those decisions without the risks associated with the real world [Altschuller & Benbunan-Fich, 2009].

According to Faria et al. [2009], business simulators have proven to be an effective means of developing practical skills in business decision-making. Students can learn not only theoretical concepts, but also how to apply them in dynamic situations, allowing them to practise complex problem-solving, critical analysis and teamwork.

The flipped classroom in simulators is an active way for students to develop critical analysis and problem-solving skills [Bishop & Verleger, 2013]. Other authors mention that the flipped classroom has transformed learning strategies between teachers and students in the teaching-learning process [Leatherman & Cleveland, 2020; McCord & Jeldes, 2019].

Technological advances have allowed platforms to be used as an interactive medium in teaching and learning, such as web applications, software, mobile devices, electronic platforms, etc., and have increased knowledge in the digital age, performance, personal satisfaction, and motivation in decision-making [Salas Rueda, 2020].

Challenges in implementation

It should be noted that one of the main challenges within business simulators is the preparation and training of teachers in the implementation of the flipped classroom, since the role played by the teacher is to be the transmitter of knowledge and facilitate learning so that the model runs correctly.

Therefore, teachers must master digital simulators, as well as the activities presented in class, which in turn promote meaningful and collaborative learning. According to Herreid and Schiller [2013], many teachers may find this change intimidating, as it requires a significant adaptation of their traditional teaching methods.

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Methodology

For the purposes of this research, a 15-item questionnaire was administered to a sample of 228 students in the fields of Project Management and Evaluation, Business and Project Management, and Industrial Processes, manufacturing area. A sample of 128 respondents was obtained from the total population.

SPSS, AMOS, and PLS software were used to validate the instrument, applying quantitative statistics with Cronbach's alpha processes and correlations of dependent and independent variables. Bootstrapping validation was performed, and these procedures were found to be viable for application.

Application instrument

Use of simulators in higher education, economics, business administration and industrial processes.

Hello, as part of the topic 'Factors that influence learning' and flipped classroom strategies, we are conducting a study to determine the impact of using business management simulators. Please answer each of the questions based on your experience:

* Indicates that the question is mandatory

What is your gender?*

a] Female
b] Male
c] I prefer not to say
d] Other

How old are you?*

a] Under 17
b] Between 17 and 19
c] Between 19 and 21
d] Over 21

What is your level of education?*

a] Studying the first three years of university
b] Studying the fourth to seventh years of university
c] Studying the final years of university
d] Completed university degree

In addition to studying, do you have any other occupation?*

a] I work for a company, part-time
b] I work for a company, full-time
c] I have my own business
d] I am only studying

During your university education, how many times did you use or participate in a simulator?

a] Only once
b] Two to four times
c] More than five times
d] Never

If you have participated in a simulator more than once, please mention their names:

In the Lab Sag challenge simulator, how would you rate the time available for analysis and decision-making?

a] Insufficient
b] Not enough
c] Sufficient
d] Too much time

How stressed did you feel when participating in the Lab Sag simulator?

a] Not at all
b] A little
c] Moderately
d] Very stressed

Did the information for analysis and decision-making allow you to identify areas of opportunity in your professional preparation?

a] A lot
b] Enough
c] A little
d] Not at all

Based on your experience and participation in the Lab Sag simulator, do you think the use of simulators in education is:

a] Necessary
b] Complementary
c] Unnecessary
d] Neither here nor there

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After participating in the Lab Sag simulator, do you now find decision-making:

a] Easier
b] More difficult
c] The same as before
d] I am indifferent

How realistic and reasonable did you find the Lab Sag simulator?

a] Very
b] Sufficiently
c] Not very
d] Not at all

How do you think the use of simulators in higher education contributes to your future career?

a] Positively and efficiently
b] Negatively and poorly
c] It has no effect, it is of no benefit
d] I am not sure

The Lab Sag simulator covered several areas of corporate financial management. Which of these do you think should be explored in greater depth in class?*

a] Decisions regarding available assets [cash on hand]
b] Fixed asset management [machinery, plant and equipment]
c] Debt management [loans received]
d] Stock market investments [sale of shares and bonds]
e] Valuation of share capital [value of shares]

What topics should be considered in a financial simulator?

_____

_____

'Those who have the privilege of knowing have the obligation to act.' A. Einstein

Thank you for your responses.

Results

This research project is based on a 15-item questionnaire administered to 128 students in the fields of Administration, Project Formulation and Evaluation, Business and Project Management, and Industrial Processes.

There were 128 responses, of which 68.8% were female and 31.3% were male. 51.6% of respondents were between the ages of 19 and 21, 43% were over 21, and the remaining 5.4% were between the ages of 17 and 19.

Of the total number of respondents, 64.1% were in the final stages of university, 27.3% were halfway through their degree, and 8.6% had already completed their university degree.

In terms of occupation, 32.8% of respondents work full-time in a company, 37.5% responded that they only study, while 21.1% work part-time, and 8.6% own their own business.

Box 1

Figure 1
The information for the analysis and decision making, allowed you for knowing opportunity areas in your professional preparation?

Box 2

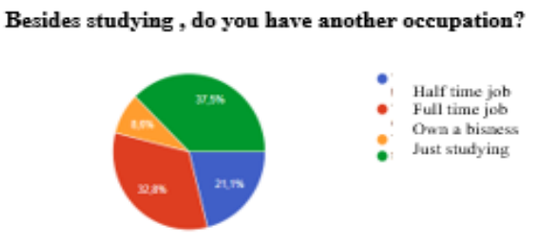

Figure 2
Besides studying, do you have another occupation?

Box 3

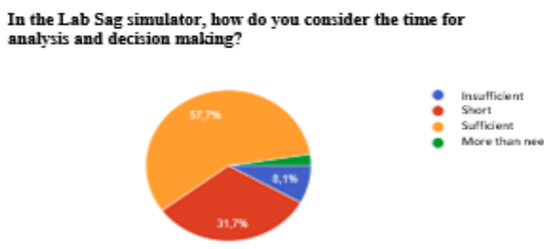

Figure 3
In the Lab Sag simulator, how do you consider the time for analysis and decision making?

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40.6 % of the students answered that they used a business simulator two to four times in their classes, 38.3 % said they only used a simulator once, 17.2 % said they never used a simulator and the remaining 3.9 % said they used a simulator more than five times.

Of the 128 respondents, only 84 responded that they had participated in the use of a simulator, the most mentioned being LABSAG with 28 mentions, 5 for Oddo and the remaining 51 between omissions, various applications, online software such as Microsip, ERP and others.

Of the total number of surveys responded to, 57.7% considered that the time allocated for analysis and decision-making was adequate, 31.7% stated that there was little time, while 8.1% considered that the time was insufficient; meanwhile, the remaining 2.5% said that there was too much time for this task.

Therefore, the perception of the students who responded is that 13% felt very stressed when using the business simulator, 45.5% reported feeling moderately stressed, 27.6% said that using the simulator made them feel slightly stressed, and 13.8% said they did not feel stressed at all when using a simulator.

That is why 59% of respondents consider the use of simulators in education to be complementary and 32.8% consider it necessary, while the remaining 8.2% oscillate between neither adding nor subtracting and considering its use unnecessary.

According to the above responses, of the total number of respondents, 60.2% consider the information on analysis and decision-making sufficient to enable them to identify areas of opportunity in their professional preparation, while 20.3% say that this analysis exercise did little to help them learn, 12.2% say that it was very useful, and 7.3% responded that using simulators is of no use to them.

Of those who responded to the survey, 55.3% consider it easier to make decisions after using LabSAG, while 26.8% of respondents say it is the same as before and 10.6% say they are indifferent.

Thirteen point eight per cent of students consider that the scenarios presented in the simulators are very realistic and reasonable, sixty-five per cent consider them sufficiently realistic and reasonable, while thirteen per cent consider them unrealistic and unreasonable, and the remaining 8.1% consider them completely unrealistic and unreasonable. It can therefore be concluded that simulators can be used to support flipped classrooms in higher education, as 79% of students consider this support to be positive and efficient.

Specifically in the Financial Management category, 47.7% considered that topics related to fixed asset management should be explored in greater depth, while 46.9% responded that decisions regarding available assets should be explored in greater depth, 35.2% responded that the valuation of share capital should be explored in greater depth, and between 32% and 33.6% indicated that the study of debt management and stock market participation should be expanded.

Given the responses to the instrument, topics to be addressed include debt, customers, and management.

Conclusions

All the technological strategies of the flipped classroom converge in prioritising practice through experiences and the gathering of experience by the learner, and simulation is no exception.

Through the varied and diverse business and enterprise simulators, designed to stage real-life business situations, students enjoy a value-added experience that allows them to develop the specific skills to function in simulated business environments, but with real data, instructions, values, and procedures that the companies themselves make available to the specific teaching tool, so that those who participate in reading, interpreting, and analysing can solve problems, design strategies, make decisions, and fulfil organisational objectives, underpinning their knowledge in an almost real environment.

This is reflected in the 79% of respondents who answered that the use of simulators in higher education provides positive and efficient results in the development of skills relevant to working in high-performance teams, as well as in effective business decision-making.

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On the other hand, it should be noted that, in addition to the effectiveness in skills development, 94.6% of the students who responded to the survey suggest that the simulators used as the basis for this study have areas for improvement, mentioning that some of the topics covered should be explored in greater depth. This allows us to infer that the exercise not only demonstrates its effectiveness in the survey, but also allows us to identify other areas that may contribute to the same objective.

It can be concluded that this teaching practice is a powerful and necessary tool in the teaching-learning process, whose use not only allows for the development of specific professional skills, but also helps students, mainly those in advanced cycles at the bachelor's and engineering levels, to identify in advance the areas of opportunity that need to be addressed.

References

Basic

Bishop, J. L., & Verleger, M. A. [2013]. The flipped classroom: A survey of the research. In ASEE National Conference Proceedings, Atlanta, GA [Vol. 30, No. 9, pp. 1-18].

Herreid, C. F., & Schiller, N. A. [2013]. Case studies and the flipped classroom. Journal of College Science Teaching, 42[5], 62-66.

Leatherman, J. L., & Cleveland, L. M. [2020]. Student exam performance in flipped classroom sections is similar to that in active learning sections, and satisfaction with the flipped classroom hinges on attitudes toward learning from videos. *Journal of Biological Education*, 54[3], 328-344.

Salas Rueda, R. A., De La Cruz Martínez, G., Alvarado Zamorano, C., & Prieto Larios, E. [2021]. Use and analysis of the collaborative wall in the teaching-learning process on history considering data science. *Conhecimento Online*, 13[1], 48-66.

Salas Rueda, R. A. [2020]. Use of the flipped classroom to design creative and active activities in the field of computer science. *Creativity studies*, 13[1], 136-151.

Salas Rueda, R. A., Castañeda Martínez, R., Eslava Cervantes, A. L., & Alvarado Zamorano, C. [2022]. Teachers 'Perception About MOOCs and ICT During the COVID-19 Pandemic. *Contemporary Educational Technology*, 14[1], ep343.

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Dorado-Espino, Julio César, De la Cruz-Solís, José Guadalupe, Herrera-Mancilla, Brenda Dafne and Terrazas-Montoya, Dulce Montserrat. [2025]. Simulation tools as a flipped classroom strategy for competency development in Higher Education. Journal Basic Education. 9[20]1-6: e4920106.
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