Revista Iberoamericana para la Investigación y el Desarrollo Educativo
ISSN 2007 - 7467

https://doi.org/10.23913/ride.v15i29.2219

Scientific articles

Desarrollo de una aplicación para gestionar el seguimiento docente en nivel preescolar

Development of an application to manage teacher follow-up at the preschool level

Desenvolvimento de uma aplicação para gestão do acompanhamento de professores no nível pré-escolar

Camacho-Herrera, Cialett Itzel
Universidad Autónoma de Querétaro, México
cialett_ch@hotmail.com
https://orcid.org/0000-0002-8169-0458

López-Martínez, Rocío-Edith
Universidad Autónoma de Querétaro, México
rocio.edith.lopez@uaq.mx
https://orcid.org/0000-0002-5209-3523

Resumen

El desarrollo de aplicaciones o programas de *software* se emplea en entornos de gestión educativa para la administración de diversas actividades de los directivos y docentes. Es necesario detectar, analizar y atender en las instituciones educativas las dificultades que se presentan en la organización e intervención del personal administrativo. Para este estudio se examinó el efecto de un *software* de gestión directiva en escuelas preescolares, empleando un enfoque cuantitativo, del tipo cuasi experimental con análisis de datos de pretest y postest. Los resultados pretest revelaron una baja consistencia interna del instrumento de evaluación y una alta dispersión de los datos, lo que indicó una ineficiencia en las tareas administrativas de los directores antes de la intervención. En contraste, los resultados postest mostraron mejoras significativas en la gestión directiva, con puntuaciones más altas y mayor consistencia en las prácticas de gestión. La adopción de Tecnologías de la Información y la Comunicación (TIC) también experimentó un notable incremento, acompañado de una disminución en la variabilidad de las puntuaciones, sugiriendo una implementación más uniforme de las nuevas prácticas de gestión. La discusión de estos resultados resaltó la importancia de una administración

eficiente para asegurar una educación de calidad. Las conclusiones indican que el *software* potenció la eficiencia administrativa, la coherencia en las prácticas de gestión y el uso de TIC.

Palabras clave: Administración de la educación, Aplicación informática, Gestión de la educación, Gestión del personal, Procesamiento de la información, Programa informático didáctico.

Abstract

The development of apps or software programs are used in educational management environments, for the administration of various activities of school principals and teachers. It is necessary to detect, analyze and implement in educational institutions the difficulties that come from in the organization and intervention of administrative staff. This study examined the effect of a management software in preschools, using a quantitative focus, of the quasi-experimental type, with pre-test and post-test data dispersi. The pre-test results revealed a low internal consistency of the evaluation instrument and a high dispersión of the data, indicating inefficiency in administrative tasks of school principals before the intervention. In contrast, the post-test results showed significant improvements in directive management, with higher scores and greater consistency in management practices. The adoption of Information and Communication Technologies (ICT) also experienced a notable increase, accompanied by a decrease in the variability of scores, suggesting a more uniform implementation of the new management practices. Discussion of these results highlighted the importance of efficient management to ensure quality education. The conclusions indicate that the software enhanced administrative efficiency, coherence in management practices and the use of ICT.

Keywords: Educational administration, Computer applications, Educational management, Information processing, Educational software, Staff management.

Revista Iberoamericana para la Investigación y el Desarrollo Educativo
ISSN 2007 - 7467

Resumo

O desenvolvimento de aplicativos ou programas de software é utilizado em ambientes de gestão educacional para a administração de diversas atividades de gestores e professores. É necessário detectar, analisar e abordar nas instituições de ensino as dificuldades que surgem na organização e intervenção do pessoal administrativo. Para este estudo, foi examinado o efeito do software de gestão em pré-escolas, utilizando uma abordagem quantitativa, quase experimental, com análise de dados pré-teste e pós-teste. Os resultados do pré-teste revelaram uma baixa consistência interna do instrumento de avaliação e uma elevada dispersão dos dados, o que indicou uma ineficiência nas tarefas administrativas dos diretores antes da intervenção. Em contrapartida, os resultados do pós-teste mostraram melhorias significativas na gestão gerencial, com pontuações mais altas e maior consistência nas práticas de gestão. A adopção de Tecnologias de Informação e Comunicação (TIC) também registou um aumento notável, acompanhado por uma diminuição da variabilidade das pontuações, sugerindo uma implementação mais uniforme de novas práticas de gestão. A discussão destes resultados destacou a importância de uma administração eficiente para garantir uma educação de qualidade. As conclusões indicam que o software melhorou a eficiência administrativa, a coerência nas práticas de gestão e a utilização das TIC.

Palavras-chave: Administração educacional, Aplicativo computacional, Gestão educacional, Gestão de pessoas, Processamento de informações, Programa computacional educacional.

Reception Date: August 2024 **Acceptance Date:** December 2024

Introduction

Preschool education in Mexico is conceived as a fundamental phase in the national educational system, representing the first level of institutionalized contact for many children with the world of formal learning. This level serves children from three to six years old, thus facilitating a gradual transition between family life and basic education. Its main objective is to promote comprehensive and balanced development, which implies that children not only acquire cognitive skills, but also socio-emotional, physical and linguistic skills, all in an environment that promotes freedom, respect and responsibility.

Education in the early years of life is crucial for children for several reasons (Rincón-Gallardo, 2024; Ríos and Hernández, 2023):

- Cognitive foundations. During the first years of life, the brain experiences rapid growth and the formation of neural connections. Quality educational experiences at this stage can enhance cognitive development and establish a solid foundation

for future learning.

- Social-emotional development. Through meaningful interactions, children learn to relate to others, understand and manage their emotions, and develop social skills that will serve them throughout their lives.
- Educational equity . Quality early education can help level the playing field for children from less privileged backgrounds, providing opportunities for optimal development.
- School readiness. Effective preschool education prepares children for the academic and social demands of primary education, easing the transition and fostering a positive attitude toward learning.

The work of teachers in basic education, and particularly at the preschool level, is fundamental for the development and behavior of children. This level allows children to interact with their classmates; through activities such as playing, exploring, coloring, listening, and running, children learn basic skills such as letters and numbers. Communication between students and the teacher is essential to facilitate learning, and activities must be planned by teachers, who in turn must be supervised to ensure compliance with academic activities (Flores and Pimentel, 2023).

In preschool education, teachers use various pedagogical techniques to facilitate children's learning and comprehensive development. These techniques are designed taking into account the developmental characteristics and needs of children at this stage. Each of the pedagogical techniques has its own strengths and benefits, and teachers select them based on the needs, interests and characteristics of the group of children. Most importantly, they focus on supporting the child's holistic development, respecting their individuality and enhancing their capacity for active and meaningful learning.

These activities are supervised by the school director, with the purpose of ensuring the quality of the educational service and guaranteeing the children's learning achievements, as well as conditions of inclusion and equity. Teachers constantly strive to improve the various techniques, verifying that the teaching methods and strategies are planned and systematized actions to achieve an optimal level of learning (Carro and Lima, 2022).

With the type of design applied, data were collected for the analysis of the study through a pretest and posttest, which allowed the evaluation of the impact of the use of a management application. Participants included directors of several preschools, who used the *software* during a specific period. The metrics evaluated included administrative efficiency, consistency of management practices and ICT adoption. The internal reliability of the instrument was measured using Cronbach's alpha, and the dispersion of

the data was evaluated through the variance, obtaining positive results for its application. In the pretest results, most responses ranged between 4 (almost always) and 5 (always), with a Cronbach's alpha of 0.67, indicating a low internal consistency of the instrument. The variance obtained was 0.88, indicating a large dispersion in the data, influenced by outliers. This suggested that before the intervention, the directors spent a lot of time on administrative tasks, reflecting an inconsistency in the frequency of their visits.

Post-test results showed a marked improvement in management performance. Principals used the *software tools* more effectively, reflected in higher scores and greater consistency (0.76) in management practices. ICT adoption also improved significantly, with a decrease in the variability of scores among principals, indicating an innovative implementation in teaching.

The comparison of these results emphasized the need for efficient educational management to provide quality education and promote equal opportunities. The improvement in management observed in the post-test results supports these claims, demonstrating how a technological intervention can optimize and make preschool administration more efficient, as well as contribute to an education in which students are surrounded by better teaching practices.

Materials and methods

A quantitative approach was adopted, highlighting the collection of data through surveys and tests, with the purpose of statistically analyzing the relevant variables to evaluate the effects of the educational proposal (Martínez and Benitez, 2016). The research question was: How can managers be supported to provide support, advice and monitoring to the teachers under their charge using technology?

The hypothesis that was sought to be verified was:

The use of an observation instrument for educational practices in the classroom will facilitate the support and feedback to teachers by their directors, which will improve teaching practices.

The objectives of the research include the design of an application to optimize management in preschool education, as well as improving support and monitoring of teaching staff through the use of technology.

Quasi-experimental research is a type of study that shares characteristics of both experimental designs and observational studies (Martínez and Ibarra, 2018). Unlike traditional experiments, in which researchers randomly assign participants to treatment and control groups, in quasi-experimental studies this random assignment is not

performed; instead, participants are assigned to groups based on certain characteristics or preexisting conditions.

Quasi-experimental design is a before-and-after study where a variable is measured from the application of a treatment or intervention. This can be useful in situations where it is not ethical or practical to randomly assign participants to different conditions, such as in studies on educational or public health interventions (Hernández-Sampieri et al., 2020).

Construction of the sample

The sample was selected by convenience in schools with a principal. In order for them to participate during the time that this research was being conducted, they were provided with a pamphlet with general information regarding the aims of this research. The same procedure was applied to the participants, both for the principals who would form the control group, and for the experiment. Likewise, they were given an informed consent form as part of the ethical requirements, in which it was established that, of their own free will, the anonymity of the 10 participants who were chosen by the aforementioned procedure would be maintained.

Due to the nature of the research, the sample size was not intended to ensure the probability that the results would be statistically significant in relation to what is intended with the use of ICT in management. In accordance with the type of research carried out, the need to systematize the visits made by the principals to the teachers to monitor their practice and identify tools that, while facilitating it, could offer them formal feedback and guidance on it was highlighted.

Research techniques and instruments

A working hypothesis was proposed related to the application of ICT in the management work of monitoring teaching work at the preschool level. To do so, it was necessary to identify the correlation between the independent variable and the dependent variable. For this purpose, a Likert scale was used, both with the experimental group and in the control group of teachers.

The process used was the following: 1) application of a pretest (01,03) to identify the range of the dependent variable (Y); then the treatment was started to influence the independent variable (X). Finally, the posttest was applied to both (control, experiment) to identify the effects of the intervention on the dependent variable (02, 04). The design is shown in the following table.

Table 1. Pretest record tracking.

Groups	Assignment	Log sequence		
		Pretest	Experiment	Posttest
TO	Control	01	- -	02
B	Experiment	03	X	04

Source: Own elaboration

The instrument selected for data collection was the Likert scale, which was used as a pretest and posttest. The Likert scale was composed of 17 items. The instrument grouped five levels: Never (N); Almost never (CN); Regularly (R); Almost always (CS); Always (S).

The items were structured according to the indicators considered to be the most representative for the purposes of this research, and therefore the perspectives of managers and teaching staff, educational purposes, as well as the technological resources and computer skills of the participants were taken into account. The instrument comprises four factors, which group the indicators of what is intended to be measured:

Table 2. Instrument indicators.

Indicator	Item
Management	1,2,3,4
Monitoring teaching practice	5,6,7,8,9,
Assessment	10,11,12,13,14,
Use of ICT in management	15,16,17

Source: Own elaboration.

The main purpose of the instrument is to obtain information on the reality experienced by directors in schools belonging to preschool zone 08 in the state of Querétaro, taking into account their basic functions and the professional profiles, criteria and indicators for personnel with management functions that were created from the last reform dedicated to the New Mexican School, and was released in December 2020 in the document called *Framework for excellence in teaching and school management in Basic Education. Professional profiles, criteria and indicators for teachers, teaching technicians and personnel with school management and supervision functions* (Unit of

the System for the Career of Teachers and Masters [USICAMM], 2022).

The aim is to identify how managers feel about their role and the need they have for an instrument that facilitates their observation in the classroom and improves the time it takes to do so. The second need refers to operational visual perception and what support is provided to the teachers in charge, based on feedback after being observed.

The instrument was validated by expert judgment after its design. A pair of experts from the Autonomous University of Querétaro were asked to review it, and they made observations on items 2, 3, 6 and 8, which were redundant and unclear. After that, the instrument was returned for review. When they gave their approval, a pilot test was carried out with a group of managers and teachers who did not participate in the application of the experiment. There were no anomalies in the pilot test, so the instrument was considered validated.

Additionally, to get an idea of the internal consistency of the scale, a pilot test was carried out, in which ten directors who were not part of the study participated. The results showed a Cronbach's alpha coefficient of 0.72, to determine the reliability of the test. Therefore, it is considered that there is a correlation between the items of the instrument and a good internal consistency.

Results

The information obtained from the application of the instrument, both from the control group and from the experiment, was analyzed and contrasted in the first moment in a statistical manner, in addition to the evaluation and interpretation of the results obtained. Subsequently, the experiment was applied to the control group, which consisted of socializing the use of the *app* to support management support tasks for teachers in preschool centers.

To this end, a workshop on use was held, where a brochure was handed out, and then the *app was installed* on their respective telephone devices; the participants carried out various practices of the application. Additionally, they were informed that they would have advice and technical support for correct use, as well as to address areas of opportunity.

The results reflect a notable change in relation to the management work on teacher support, not only in terms of greater communication, but also in the systematization of the data generated, from its registration to generating better feedback, which was very significant.

Design of management *software*

The application for managing teacher monitoring was developed to facilitate the tasks of preschool managers, with a user interface that is identified by name and password. Also, a combination of three languages was used, which are:

- HTML5 stands for *Hyper Text Markup Language* (Taniar and Rahayu, 2018). The name corresponds to the code with which it is programmed, with the purpose of capturing the structure of the content that must be included in the web page, in other words, it organizes and hierarchizes the elements that are captured, such is the case of videos, images, games, text, multimedia with animation, among others; It has the particularity that geolocation can be added optionally, likewise, it adapts to various types of *tablets* , devices, *laptops* , desktop computers, and the screens you have *Smart TV* .

  It is controlled by various attributes depending on the task, the types of input, and a progress bar. It is relevant to mention that this type of language is free.
- CSS3 (Smith, 2023). This language is for graphic design. It was used to create the presentation of a document that is structured with the purpose of being established as a visual design, with the purpose of giving a better presentation to web documents and all those interfaces that are coded in HTML.

  It has 100 different properties, which are pairs of properties and these are developed by modules. It can be applied in both Opera and Safari browsers.
- JavaScript (Torkington, 2018) is a programming language, regularly interpreted as just-in-time, with first-class functions. Better known as the *ECMAScript standard dialect* .

  Its function is to create interactive web pages; it also updates social networks, animations and interactive maps. It is used when the user is called, and is then executed by the browser, where the process is carried out with the code, as well as by the server. It works through different features, such as functions, variables, statements, objects, arrays, DOM *event listeners* , *such as getElementById*, *getElementByClass* and *addEventListener* .

The *back end* is the implementation of a website, where the logic design is carried out with its solutions, in order for them to be executed correctly, and to carry it out the following were used:

- Node. is an open source, multi-platform application that is used to build and develop scalable real-time applications. It is important to note that it is based on the *Java* and *Google Chrome execution engines*, due to the high performance with which it runs.

- Framework Express. It is part of the construction of the working environment of web pages, it can be multi-page or hybrid; it is regularly used to create APIs, which are the Mobile Application Programming Interface; it is responsible for error management and routing.

  It also helps to speed up the execution of activities and to have a more consistent code because it is effective.

MySQL database was used (Vandervoort, 2019), as it is an open source *software code* , which has been developed by Oracle; it is based on relational algebra and is regularly used to store data from different web services. The server that was worked with has the *netlify user interface* , which is a *hosting* that hosts static websites, this is used to perform continuous *deploys* according to the *commits* that are made. The server that has the *back end is cyclic* . The database is in *db4free.*

The *software* was developed to be applied on a PC or laptop (*Windows*) and in the same way a version was obtained for mobile (Android) and for the web (*HTML5*), therefore, they can be used on the three platforms *Android, HTML5 and Windows* .

Software Screens

The screens in the main section are New assessment, Teachers, Assessments, and Charts. All of them contain specific tasks, according to the activities being carried out. The user with whom you are working is shown on the top right side; in the central right part, the option to add teachers is displayed.

The next section determines what type of material and displays the following options:

- Permanent working material
  - Such as the board and the elements to write on it, video projectors, notebooks, rulers, compasses, personal computers.
- Information material
  - Maps, books, stories, dictionaries, encyclopedias, magazines, newspapers, etc.
- Audiovisual literary material
  - Posters, videos, records, etc.
- Experimental material
  - Various devices and materials that are suitable for carrying out tests or experiments that lead to learning.
- Technological material

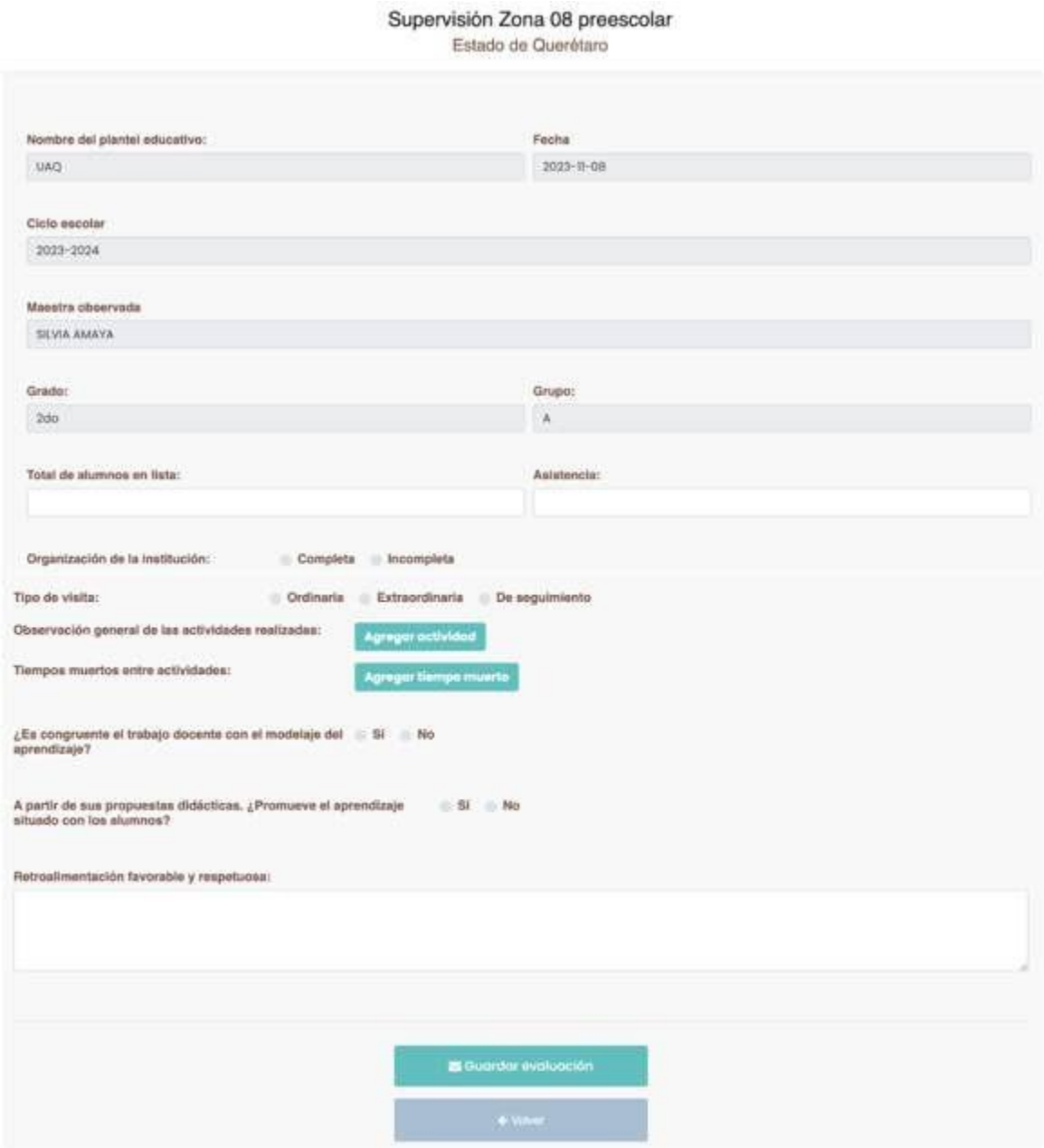
- All electronic media for the creation of teaching materials. Tools or materials, digital dictionaries, interactive biographies, digital libraries

Then, add the recommendations, the closing time and click on "Add this evaluation" and close. After saving the evaluation, the following options are displayed:

- Add if there were any downtimes, where this should be established using the schedule form.
- Is the work consistent with learning modeling? Yes/No
- Based on your teaching proposals, do you promote situated learning with students? Yes/No
- Favorable and respectful feedback.
- Save evaluation.

Likewise, the main idea or objective of this section is to capture the activities that are carried out during the evaluation, which serves to detect the evaluation of teaching activities, as well as what type of materials they use and the development of these considering active teaching times and their dead times, as shown in the following figure.

Figure 1. Screen, new evaluation



Source: Own elaboration.

In the add teacher section, the following fields must be included to feed the platform:

- Name of the teacher
- Degree
- Cluster

Once the information is entered, click on "Add teacher". In the teacher list section, the search engine is activated; to enter the name, display the name and the option is presented:

- See information
    - General data of the teacher is integrated

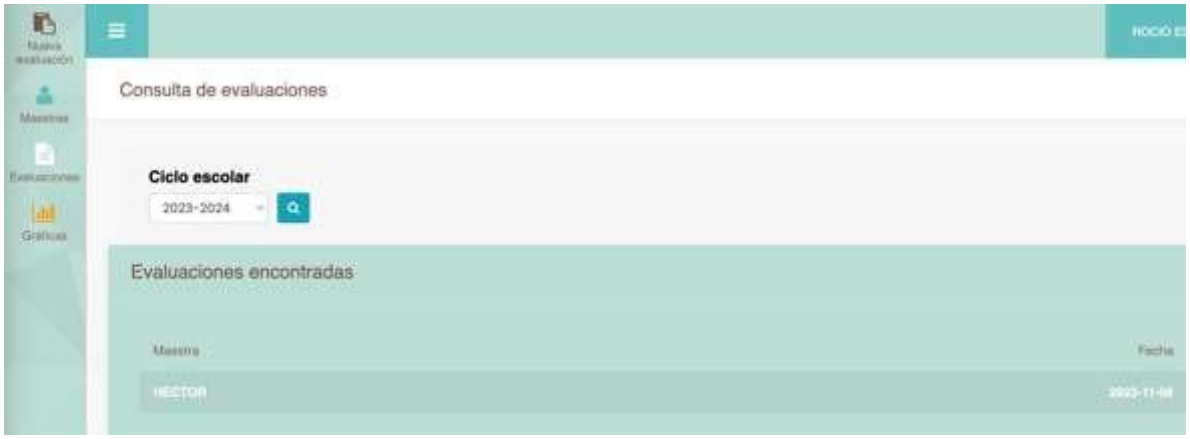
- Edit information
    - It works to modify the teacher's information
- Evaluations
    - Displays the evaluations carried out

In the Evaluations menu, the evaluations carried out by the teacher are shown, and in general terms; it is important to note that this section provides information showing which teacher has had the most evaluations. To obtain the information, the following fields must be integrated:

- School year
- Name of the teacher

Once the information is entered, you must click on the search engine and it will display the generated information, as can be seen in figure 2.

Figure 2. Evaluations screen.



Source: Own elaboration.

In the case of the Statistics menu, statistics are generated for the evaluations carried out, both by teacher and by school year; the purpose is to highlight the behavior of the supervision.

To generate such statistics, it is necessary to add the following fields:

- School year
- Name of the teacher

Once the information is entered, you must click *on* the search engine and the options of teachers with timeouts, students involved, type of material, and link to the school year will be displayed.

As can be seen, the application of management for the evaluation of preschool teachers is essential for several reasons; among them, it facilitates the systematization of the information collected during the evaluations, which allows for a more precise monitoring of the teachers' performance over time.

Not only does this help identify areas for improvement, it also allows each teacher's strengths to be recognized and highlighted. Additionally, by automating administrative processes, such as scheduling visits and generating reports, the *software* frees up time for managers to focus on more strategic activities, such as designing and implementing educational improvement plans.

Finally, by providing a centralized platform for storing and sharing relevant information on teacher performance, the *software* promotes transparency and collaboration between different educational actors, contributing to the construction of a school culture based on continuous improvement and collaborative learning.

Analysis of results

This research shows a significant impact on the educational practices of teachers, where the most benefited are the students, in their cognitive and socio-emotional development. On the other hand, it is intended that this is reflected in the general evaluations, having better results and making a profound change in the current educational policies, where until now, innovative and creative educational experiences are not valued or allowed, due to compliance with a strict and closed curriculum.

Pretest data

Analysis of the completed questionnaires reveals significant data in several key categories. Firstly, in terms of Management, there is a need to strengthen certain areas, given that some managers obtained minimum scores in certain items. Although most of the responses indicate a high frequency of making written observations during classroom visits, the low value of the Cronbach alpha coefficient suggests poor internal consistency in the responses. In addition, the high variance indicates a large dispersion in the data, which could be attributed to the time previously spent on administrative tasks.

Regarding the Monitoring of Teaching Practice, a trend towards lower scores is observed, with a low internal consistency again according to the Cronbach alpha coefficient. Although some monitoring by the principals is reflected, some teachers indicate that this monitoring is not efficient due to time constraints. The variability between participants in the use of recording instruments to observe teaching practice is also notable.

In the Teacher Evaluation, there is a tendency towards low scores, with most principals indicating that advisory sessions on classroom work are infrequent. The Cronbach alpha coefficient and the low variance indicate low internal consistency and

data dispersion, reflecting a uniform perception among participants about the lack of need for a classroom observation instrument.

Finally, regarding the Use of ICT in Management, it is observed that, although managers integrate technology into their observation practices, the internal consistency and variability of responses remain low. The lack of a specific tool that meets the needs and difficulties of some teachers in using technology reinforces the need for time management strategies or additional resources to maximize the efficiency of classroom visits.

It is important to note that, prior to the implementation of the *software* , low values in the Cronbach alpha coefficient and high variance were identified, suggesting low internal consistency and a large dispersion of data. It was recommended to carry out feedback and review of the pretest to improve the internal consistency of the instrument and to consider calculating the Cronbach alpha coefficient for each group of questions that make up a dimension in multidimensional tests.

Post-test data

Analysis of the results following the implementation of the *software* shows significant improvements in several key categories. First, regarding Management, a substantial increase in the internal consistency of the instrument is observed, indicated by a Cronbach's alpha coefficient of 0.80. This increase suggests that the questions in the questionnaire are more closely related to each other after the intervention, leading to more consistent results. Furthermore, although the variance of the data remains high, a trend towards a reduction in the frequency of dedication to administrative tasks by directors is observed, suggesting greater efficiency in time management.

As regards the Monitoring of Teaching Practice, a general improvement in this indicator is recorded after the intervention. The increase in the internal consistency of the instrument (Cronbach's alpha coefficient of 0.80) and the greater frequency of oral feedback by the principals indicate a positive impact of the *software* in this area; carried out regularly and systematically, which is essential for professional development and the improvement of teaching practice.

In the Teacher Evaluation, there is a greater consistency in the established practice of graphing the results of classroom observations, indicated by a Cronbach alpha coefficient of 0.80. The implementation of the *software* allowed a significant improvement in the frequency and uniformity in the use of technological tools, which are used for classroom observation, which reflects greater effectiveness in management.

Finally, regarding the Use of ICT in Management, there is evidence of a trend towards a more uniform and effective integration in management practices. Although values that define the internal consistency of the instrument (Cronbach's alpha coefficient of 0.81) and the reduction in variability between items are still observed, therefore, teachers indicate a general improvement in the use of ICT.

Based on the interpretation of the data, the implementation of the *software* has had a positive impact on several key areas of school management and teaching practice, improving data consistency, feedback frequency, and the integration of technology into educational practices. These findings underscore the importance of using technological tools to optimize school management and lead to educational quality.

Impact of the application on management

The pretest results show responses mostly between 4 and 5, but the low internal consistency of the instrument (Cronbach's alpha of 0.28) indicates measurement problems. The variance of 0.88 indicates a large dispersion in the data, affected by outliers. This suggests that before the intervention, the directors spent a lot of time on administrative tasks, reflecting an inconsistency in the frequency of their visits. Figure 3 shows the posttest results with which a comparison was made and the impact of the management application was analyzed.

Figure 3. Teachers' management scores.

Source: Own elaboration

The use and application of the *software* not only supports management, values and fluctuations in scores, but may be interesting areas for future research or specific interventions.

Based on the detailed analysis of each management and the comparisons between the pre-test and post-test, it can be concluded that the intervention program has had a generally positive impact on management and teaching practices in the areas evaluated.

In the management area, improvements were observed in the post-test scores, suggesting that the directors are using the *software tools* effectively, after the intervention, despite some variability that exists and is common in any educational context, due to individual differences, the general trend of the results shows an improvement.

For teacher practice monitoring, post-test results indicate an increase in average scores, signalling an improvement in educational practices. Although there are fluctuations in teachers' scores, this could reflect the diversity in how interventions affect different individuals, underlining the importance of personalised approaches.

In the evaluation, the results show a trend towards higher and more consistent scores in the post-test, suggesting a possible strengthening of teachers' evaluation skills, as a result of the educational policies applied, with significant implications for the improvement of educational quality.

Finally, in the use of ICT in management, a remarkable improvement in scores and a decrease in variability between teachers in the post-test are observed, suggesting a broader and more effective adoption of ICT, crucial for effective school management in the digital age.

Taken together, these findings indicate that the development of the *software* and associated educational interventions could be having the desired impact in preschools. However, statistical analysis is essential to confirm the significance of these observations and to accurately identify the areas that require further attention and resources. Furthermore, the identified outliers may offer opportunities for further research and more targeted adaptations of the intervention, ensuring that all the needs of principals and teachers are effectively addressed.

Discussion

Post-test results in management performance show a marked improvement, indicating that preschool principals are using the software tools more effectively following the intervention. Despite the persistence of some variability, the overall trend is positive, reflecting increased effectiveness in management practices.

Flores (2021) emphasizes that both public and private education should focus on providing quality education to improve social and economic conditions. The improvement in management observed in the post-test results demonstrates how adequate

intervention can increase effectiveness in educational administration, thus contributing to a higher quality education that promotes equal opportunities and competitiveness.

Franco (2017) and the National Institute for the Evaluation of Education (2019) highlight the importance of ensuring quality education as a fundamental human right. The improvement in management practices, reflected in the post-test scores, supports the idea that efficient management is essential to guarantee this right. Educational interventions that improve management can have a significant impact on educational quality and, therefore, on social equity.

Escribano Hervis (2018) highlights the need for teacher management to be aligned with the needs of students, while Martínez Rizo (2018) emphasizes curricular structuring to achieve quality education. Post-test results indicating an improvement in management suggest that good administration, as well as adequate curricular planning, are crucial to improve educational practices and better respond to student needs.

Vega (2020) and Romero (2018) discuss how efficiency in educational management can strengthen economic development and improve educational quality. Post-test results showing improvements in management suggest that more effective school administration can significantly contribute to these objectives, improving the efficiency and quality of the educational system.

Sánchez (2018) and the study by Martínez (2012) highlight the importance of innovative educational management, focused on attention to ensure better school coverage. The decrease in the variability of post-test scores and the more effective adoption of ICTs suggest that well-structured educational management adapted to current needs can improve both coverage and educational quality.

Post-test results in management reflect a significant improvement after the intervention, highlighting the importance of efficient and well-designed educational management. These results support the authors' claims about the need for effective administrative approaches to improve the quality of education, promote equal opportunities and contribute to social and economic development.

software application to improve management in preschools, based on post-test results, has been remarkably positive. School principals showed greater effectiveness in using the *software tools* after the intervention, which resulted in several key improvements:

- Administrative efficiency. Principals were able to manage their tasks more efficiently, which reduced the time spent on their management practices and allowed for a better allocation of time and resources. This improvement in

efficiency is reflected in the post-test scores, which were higher compared to the pre-test scores.

- Consistency in management practices. Despite some variability inherent in any educational context, the general trend showed greater consistency in management practices. This indicates that principals were able to more uniformly apply the tools and strategies learned during the intervention.
- ICT Adoption. There was a marked improvement in the adoption and effective use of Information and Communication Technologies (ICT) in management. This not only improved administrative efficiency but also facilitated communication and data-driven decision making.
- Reduction in variability. The intervention helped to reduce variability in scores across managers, suggesting a more consistent and effective adoption of the new management practices introduced by the *software* .
- Impact on educational quality. Indirectly, improvements in management contributed to improved educational quality. By freeing up time and resources for more strategic and instruction-focused activities, principals were able to focus more on supporting teachers and improving instructional practices, which is crucial for the development of quality education.

The implementation of *software* to improve management had a significant and positive impact, increasing administrative efficiency, consistency in management practices and the adoption of ICT, thus contributing to an overall improvement in the educational quality of pre-schools.

Conclusions

The implementation of the *software* proved to be highly beneficial in improving administrative efficiency in school management. Principals were able to improve their work more effectively, which was reflected in a significant increase in post-test scores compared to pre-test scores. In addition, greater consistency in school management practices was observed after the intervention, suggesting that the *software* helped to standardize these practices in preschools, despite the persistence of some variability.

The intervention also facilitated a broader and more effective adoption of Information and Communication Technologies (ICT) in school management, so future research would be advisable to explore how the *software application* can be adapted and effective in different educational contexts, considering geographic, socioeconomic, and cultural variations, which will be essential. In addition, customizing the interventions and

software to meet the specific needs of each school and principal could address the observed fluctuations and variability in scores.

Another interesting aspect is the possibility of extending the functionality of the application to include the management and monitoring of communication between teachers and parents. This could include the development of modules that facilitate continuous and personalized feedback, improving transparency and collaboration in preschool education. This integration would allow for greater cohesion in educational management and would offer a more complete view of the preschool educational environment. Each of these areas presents opportunities to extend the reach and effectiveness of the application, and could be the subject of complementary studies and developments in the future.

Future lines of research

Studying the integration of *software* with other educational policies and professional development programs can maximize its impact on the quality of management and teaching. It is also important to analyze how improvements in management directly influence academic performance and the comprehensive development of students.

Finally, investigating methods to identify and handle outliers in assessment data will ensure that they do not distort conclusions, providing a more accurate understanding of intervention impacts. These future lines of research may provide a deeper and more nuanced understanding of the impact of technology on educational management, optimizing strategies to improve the quality of education in different contexts.

References

Carro, A., y Lima, J. A. (2022). Gestión educativa y colectivos escolares durante la pandemia de la Covid-19. *Revista Latinoamericana de Estudios Educativos (México), LII*(3), 393-424. DOI: 10.48102/rlee.2022.52.3.518

Escribano, E. (2018). El desempeño del docente como factor asociado a la calidad educativa en América Latina. *Revista Educación, 42*(2), 738–752. DOI: 10.15517/revedu.v42i2.27033

Flores, J., y Pimentel, G. (2023). Cambio organizacional en educación básica: impacto de las tecnologías durante la pandemia. *Sinéctica, Revista Electrónica de Educación*, (60), 1-23. https://doi.org/10.31391/S2007-7033(2023)0060-006

Flores, H. (2021). La gestión educativa, disciplina con características propias. *Revista Dilemas Contemporáneos: Educación, Política y Valores.*, 1-27.

Hernández, R., Fernández, C., y Baptista, P. (2020). *Metodología de la investigación. Las rutas cuantitativa, cualitativa y mixta.* (7th ed.). McGraw-Hill Education.

Martínez, F. (2016). *La evaluación de docentes de educación básica. Una revisión de la experiencia internacional*. México: INEE.

Martínez, H., y Benitez, L. (2016). *Metodología de investigación social*. Cengage Learning.

Martínez, P., Ballester, J. e Ibarra, N. (2018). Estudio cuasiexperimental para el análisis del pensamiento crítico en secundaria. *Revista Electrónica de Investigación Educativa, 20*(4), 123-132. DOI: 10.24320/redie.2018.20.4.1705

Rincón-Gallardo, S. (2024). ¿Educar para qué? Los propósitos de la educación en y más allá del colapso. *Revista Latinoamericana de Estudios Educativos, LIV(1),* 71-92. DOI: 10.48102/rlee.2024.54.1.608

Ríos, A. D., y Hernández, L. F. (2023). Habilidades directivas: diseño instrumental y modelo para educación primaria en Durango, México. *Sinéctica, Revista Electrónica de Educación*, (61), 1-22. DOI: 10.31391/S2007-7033(2023)0061-011

Smith, J. (2023). Understanding CSS3: A Comprehensive Guide. *Journal of Web Design and Development, 10*(2), 45-58. DOI: 10.1002/jwd.20230045

Taniar, D., and Rahayu, J. W. (2018). A Comprehensive Introduction to HTML. *International Journal of Web Engineering and Technology, 13*(3), 190-204. DOI: 10.1504/IJWET.2018.10017011

Torkington, N. (2018). JavaScript: Understanding the Weird Parts. *JavaScript Journal, 5*(2), 30-45.

Unidad del Sistema para la Carrera de las Maestras y los Maestros [USICAMM].

(Noviembre 2022). *Marco para la excelencia en la enseñanza y la gestión escolar en la Educación Básica. Perfiles profesionales, criterios e indicadores para el personal docente, técnico docente, de asesoría técnica pedagógica, directivo y de supervisión escolar*. Secretaría de Educación Pública [SEP]. Recuperado de http://public-file-system.usicamm.gob.mx/2023-2024/compilacion/EB/Marco_EB.pdf

Vandervoort, A. (2019). *MySQL Explained: Your Step-by-Step Guide*. Addison-Wesley.

Contribution Role	Authors
Conceptualization	Camacho-Herrera, Cialett Itzel.
Methodology	Lopez-Martinez, Rocio-Edith
Software	Camacho-Herrera, Cialett Itzel
Validation	Lopez-Martinez, Rocio-Edith(main) Camacho-Herrera, Cialett Itzel (supports)
Formal Analysis	Lopez-Martinez, Rocio-Edith Camacho-Herrera, Cialett Itzel (equal)
Investigation	Lopez-Martinez, Rocio-Edith Camacho-Herrera, Cialett Itzel (equal)
Resources	Camacho-Herrera, Cialett Itzel (main) Lopez-Martinez, Rocio-Edith (supports)
Data curation	Lopez-Martinez, Rocio-Edith (main) Camacho-Herrera, Cialett Itzel (supports)
Writing - Preparing the original draft	Lopez-Martinez, Rocio-Edith
Writing - Review and editing	Lopez-Martinez, Rocio-Edith (main) Camacho-Herrera, Cialett Itzel (supports)
Display	Camacho-Herrera, Cialett Itzel (main) Lopez-Martinez, Rocio-Edith (supports)
Supervision	Lopez-Martinez, Rocio-Edith (main) Camacho-Herrera, Cialett Itzel (supports)
Project Management	Lopez-Martinez, Rocio-Edith (main) Camacho-Herrera, Cialett Itzel (supports)
Acquisition of funds	Lopez-Martinez, Rocio-Edith Camacho-Herrera, Cialett Itzel (equal)