JOURNAL OF LEARNING ANALYTICS

Volume 11(1), 49–66. https://doi.org/10.18608/jla.2024.8125

Perspectives and Opportunities for Learning Analytics Integration: A Qualitative Study in Mexican Universities

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Abstract

The adoption of learning analytics (LA) in higher education institutions (HEIs) in Mexico is still at an early stage despite increasing global interest and advances in the field. The use of educational data remains a challenging puzzle for many universities, which strive to provide students, teachers, and institutional administrators with information and insights to better understand their performance. The objective of this study was to identify the perspectives of teachers, students, and administrators about the use of educational data to explore opportunities for the adoption and integration of LA in three different Mexican universities. A qualitative approach was used, adopting instruments and guidelines previously developed in the framework of Learning Analytics for Latin America (LALA) project, adapting them to the Mexican context. Methods included 1) structured interviews with high-level institutional administrators and 2) focus groups with students, teachers, and other educational administrators. Results showed that perceptions are oriented toward improving school performance through data-based feedback, with ethical responsibility. Emergent categories were physical and mental health, development of healthy relationships and well-being, feedback style, and governance in a bureaucratic setting. The specific modern construct of LA still needs to be internalized and disseminated to Mexican universities' educational stakeholders to increase the likelihood of successful adoption.

Notes for Practice

- Adoption of learning analytics (LA) in Latin America (LATAM) has been slow and heterogeneous. In Mexico, experiences with and research about LA are scarce; there is a need to identify stakeholders' perspectives about educational data.
- This qualitative study used focus groups and structured interviews to explore the perspectives about the educational data of students, teachers, and administrators from three Mexican universities.
- Educational data use is oriented to performance improvement and has ethical, administrative, pedagogical, and technical implications. Student wellness, feedback, and data governance are relevant.
- Mixed-methods studies and stakeholder involvement are needed to develop effective strategies for LA adoption and implementation in Mexican universities.

Keywords

Learning analytics, Mexico, higher education, qualitative research, Latin America

Submitted: 30/06/2023 — **Accepted:** 05/02/2024 — **Published:** 13/03/2024

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1. Introduction

Learning analytics (LA) is a complex field of study defined as "the measurement, collection, analysis and visualization of data about students and their context, with the aim of understanding and optimizing learning in the environments in which it occurs" (Siemens & Gašević, 2012). Its integration in higher education institutions (HEIs) has been increasing globally over the last decade (Lee et al., 2020). The development of LA and its growing adoption in higher education are related to its benefits in learning and teaching processes, mainly in Anglo-Saxon countries (Cechinel et al., 2020). In comparison, these achievements contrast with the relatively slower integration of LA techniques and tools in educational institutions in the Latin American and Caribbean region (Hilliger et al., 2020a). Particularly in Mexico, progress in LA is still scarce and scattered, evidenced by its limited scientific output (Cobo & Aguerrebere, 2018; Cechinel et al., 2020), which positions Mexico as fifth in LA academic publications in the field in Latin America (Espinoza-Guanuche et al., 2020). As described in EDUCAUSE's Horizon Report 2022, LA has a large potential to address the complex educational issues of the Mexican context (Sánchez-Mendiola, 2022).

Mexico's HEI system is large and diverse, integrated by more than 200 educational institutions (ANUIES, 2023). Common challenges include many students with educational lag, as well as dropouts, which impede their higher education completion (Hilliger et al., 2020a; Sánchez-Mendiola, 2022). The Organisation for Economic Co-operation and Development (OECD, 2019) shows that Mexico has one of the lowest shares of adults (25–64 years old) with a higher education degree across OECD countries (17%), well below the OECD average of 37%, and lower than other countries in the region, such as Chile (23%), Colombia (23%), Costa Rica (23%), or Argentina (21%). Given this situation, we believe that LA adoption is significant and relevant. It can help in understanding complex educational phenomena in Mexico and assist via data-informed decisions.

In the processes of technology acceptance, routinization, and infusion into systems, an initial step involves recognizing beliefs about usefulness and accessibility, as well as attitudes and intentions toward use (Saga & Zmud, 1993). Our initial study focuses on identifying the perspectives and perceptions of participants who have an influence in educational decision-making and of those who directly experience the teaching and learning process. Their insights will be the foundation for developing strategies and actions that systematically promote the integration of LA. In the Mexican context, this study is an early endeavour carried out through the collaboration of three different higher education institutions.

2. Background

This study used the "Learning Analytics for Latin America (LALA)" framework project and its instruments (Maldonado-Mahauad et al., 2018) as an initial foundation to focus on LA perspectives and opportunities in Mexico. The LALA project originated from the "Supporting Higher Education to Integrate Learning Analytics" (SHEILA) project that aimed to improve the quality, efficiency, and relevance of higher education in the Latin American (LATAM) context (Maldonado-Mahauad et al., 2018). The LALA project proposed initiatives to adopt, create, and implement LA tools and methodologies in Latin American universities, and to improve decision-making in diverse educational processes (Maldonado-Mahauad et al., 2018).

Since the origin of that project, universities in Brazil, Colombia, Chile, Argentina, Ecuador, Cuba, Uruguay, and Peru have carried out actions to promote institutional policies to integrate LA tools and techniques in educational spaces (Cechinel et al., 2020) and studied the perceptions of students and teachers regarding the adoption of LA (Hilliger et al., 2019; Salas-Pilco & Yang, 2020; Hilliger et al., 2020a, 2020b; Garcia et al., 2021). Researchers have pointed out that different experiences with LA have occurred at the institutional, classroom, and student levels in LATAM and that LA has the potential to improve the

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quality of education while reducing inequality (Salas-Pilco & Yang, 2020), as has happened in Oceania and in some Anglo-Saxon countries (Cechinel et al., 2020).

2.1. Opportunities and Challenges of LA Adoption in LATAM

Recent institutional efforts in LA in LATAM have been mostly focused on the recognition of LA perceptions and expectations of different groups of stakeholders involved in educational experiences. There has been a gradual increase in the research output of LA in Latin America since 2017 when systematic literature reviews started reporting that the systematization of data has been a key factor for decision-making, and reports of educational interventions in countries such as Brazil, Ecuador, Chile, and Mexico were published. Nonetheless, these efforts are part of a broader, more complex picture (Espinoza-Guanuche et al., 2020) related to the identified institutional challenges of adopting LA (Tsai & Gašević, 2017). The first challenge is related to the required resources (technological infrastructure, financial and human resources), the second is associated with ethics and data privacy, and the third is the engagement and acceptance of stakeholders.

In the Latin American and Caribbean contexts, these challenges share similarities with those previously documented in the processes of integrating LA in HEIs. Some examples are bureaucracy and its implications in the use of data (Garcia et al., 2021); lack of capacity and resources to integrate LA; regulatory frameworks on transparency, ethics, and data privacy; data governance (Cechinel et al., 2020); and the scarce development of data literacy in teachers and students (Tsai & Gašević 2017; Cobo & Aguerrebere, 2018).

Early alerts, timely feedback, and quality evaluations are examples of desired services that LA could facilitate in Latin America (Hilliger et al., 2020b); these could help to reduce school dropout and educational lag in the region (Ferreyra et al., 2017), challenges that have accentuated learning gaps due to the COVID-19 pandemic (Sánchez-Mendiola et al., 2023). Recognition of these phenomena can be attributed to the framework developed by the LALA Project (Tsai & Gašević, 2017).

2.2. Adoption of Learning Analytics in Mexico

Different efforts to promote LA have been made at Mexican institutions, with the development of applications like predictive models (Talamás-Carvajal & Ceballos Cancino, 2023), prevention of student dropout (Alvarado-Uribe et al., 2022), as well as other initiatives regarding prediction of student performance (Acosta-Gonzaga & Ramirez-Arellano, 2020; Monteverde-Suárez et al., 2021; Rincon-Flores et al., 2022). Similarly, there are studies of diagnostic assessment with large-scale standardized exams (Sánchez-Mendiola et al., 2023). Experiences related to these publications are a foundation for the continuous development of LA. However, several studies have been more focused on the quantitative aspects of LA and have not explored the perceptions of the end users who are expected to be empowered by this field (i.e., students, teachers, administrators).

The objective of this paper is to identify the perspectives of teachers, students, and administrators about the use of educational data in universities in order to explore opportunities for LA adoption in three HEIs in Mexico. To achieve this objective, the following research question was used:

RQ1: What are the perceptions of university stakeholders about educational data and its use in their setting?

As far as we know, this research is the first of its kind in Mexico that attempts to integrate the perspectives of teachers, students, and administrators (educational authorities and administrative staff) from three universities in a collaborative effort to incorporate LA in the region. This information is important for the creation and establishment of institutional policies to trigger and accelerate LA integration processes.

3. Methods

This section is structured as follows: 1) participants and sampling method, 2) instruments, 3) procedures, and 4) data analysis. We used the Consolidated criteria for Reporting Qualitative research (COREQ) checklist, a guideline for reporting qualitative research that includes three areas: 1) research team, 2) research design, and 3) analysis and results. These items provide key information for the researcher and the reader, to improve the reporting process (Tong et al., 2007).[1] The methods used were focus groups and semi-structured interviews.

3.1. Participants and Samples

The three Mexican HEIs participating in this study differ in size, organizational structure, curricula, and educational model. The National Autonomous University of Mexico (UNAM; U1), the Tecnologico de Monterrey (Tec; U2), and the University of Guadalajara (UdeG; U3) have unique characteristics.[2] Each university used purposive and convenience sampling by open

[1] More detail about the research design is available in Appendix 1.
[2] More detail about the three universities is available in Appendix 2.

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invitation to participants. As presented in Table 1, focus groups and interviews had different group sizes and participant composition. U1 obtained more than the expected number of participants in its focus groups, which were conducted during the COVID-19 pandemic in the first half of 2022. U2 and U3 invited participants to their focus groups in the second half of 2022, with fewer COVID-19 concerns; this provided opportunities to conduct more focus group sessions with a lower number of participants.

Three types of stakeholders were considered for the study: 1) students, 2) teachers, and 3) administrators. For students, our selection criteria required them to be enrolled at the university at the time of the focus group, with similar conditions for teachers. In the case of administrators, we considered institutional decision makers (such as faculty deans, directors, administrative staff, or similar), and their participation could be in focus groups or interviews. For administrators, the questions used in focus groups and interviews were the same. As a general condition for all participants, students, teachers, and administrators were identified and not allowed to participate in more than one intervention type (interview or focus group). The distribution of the number of participants, their roles, and their institutions is presented in Table 1.

Table 1. Summary of Research Participants[3]

	Institutions		
Participant type	U1	U2	U3
Administrators (A)	4 (interviews)	3 (interviews)	n/a
	35 (1 focus group)	9 (1 focus group)	7 (1 focus group)
Students (S)	32 (1 focus group)	13 (3 focus groups)	9 (1 focus group)
Teachers (T)	32 (1 focus group)	10 (2 focus groups)	22 (4 focus groups)

3.2. Instruments

The study employed a protocol for interviews and focus groups previously used in the LALA project (Hilliger et al., 2020b). The five categories considered were these:

1) **General Use of Data** — two questions on relevant data and how effective is its use on feedback
2) **Transparency, Ethics and Data Privacy** — five questions on data categories, informed and explicit consent, and policies for data collection and analysis
3) **Academic Use of Data** — two questions on how data is currently used and how it should be used
4) **Feedback Through Data** — three questions on feedback format and frequency, and comparisons with peers
5) **Results-Based Intervention** — one question on which actions should be taken

The guide for interviews and focus groups was adapted for the Mexican context and language use. Following the recommendations provided by the LALA project, the term "learning analytics" was substituted with the Spanish equivalent of "educational data analysis" (Hilliger et al., 2020a) since the term LA is scarcely known by the HEI community in Mexico and there are few LA projects in these institutions. Similarly, the guide was slightly modified with words and expressions more commonly used in Mexico to ensure better understanding of the questions. Nonetheless, the general structure of the instrument was preserved to facilitate comparisons between institutions and other studies performed in LATAM.[4]

3.3. Procedures

In all institutions, participants received a declaration of ethics procedure through different channels (i.e., email, online forms). As reinforcement, at the beginning of each focus group and interview recording session, participants were informed that 1) the study purpose was to explore and identify the perspectives for LA integration in higher education, 2) information would be managed confidentially, and 3) a reminder that their participation was voluntary, with the possibility of leaving the session any time, without consequences. In all the cases, both session types occurred online, using videoconferencing tools (e.g., Microsoft Teams, Zoom) due to COVID-19 concerns, with the exception of focus groups with teachers in U1, which were carried out in person.

[3] Additional detail about participant characteristics is available in Appendix 3.

[4] The adapted version of the questions in Spanish for the Mexican context for the three types of participants is available in Appendix 4.

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3.4. Data Analysis

Analysis of the information recorded during interviews and focus groups was converted into transcripts for content analysis. This process involved the participation of one researcher from each university with documented experience in qualitative research methods. For U1, Excel spreadsheets were used to organize the data for each type of participant, assigning codes to identify content themes and anonymize participant identities. The process was carried out in two stages: the first included a review of the ideas from each participant (in each focus group), while the second involved the identification of key concepts, common themes, and ideas based on what was expressed by all the participants in the focus group. The analysis of administrators' interviews followed the same process by the same researcher as the focus groups. The outcomes of U1's coding and classifications of comments in categories were used as reference and common ground for analysis by U2 and U3, which included these categories on their coding stage.

For U2 and U3, focus groups were fully transcribed and analyzed using Atlas.ti software. The experiences of participants were coded using the five LALA project categories. By integrating the categories identified by U1, U2, and U3, we classified their comments using this as a common reference and added new themes that emerged from their experiences in their institutions. In a final round, researchers from the three universities verified the pertinence of the new themes by comparing and contrasting different cases for each category and merging them when they were equivalent. When the coding phase was finished, U2 researchers compared results between the same stakeholder groups (e.g., students with students, teachers with teachers) and then made a cross-group comparison to identify common themes between different actors. Finally, a comparative analysis was carried out comparing the results found for each institution and for the same themes in the five instrument categories, as shown in the Results section.

4. Results

The collection of student, teacher, and administrator experiences created an opportunity to recognize different perspectives while identifying opportunities for the integration of LA. To analyze results in an orderly manner, findings for each university are presented in each of the five main categories (Hilliger et al., 2020a). From our joint analysis, 25 themes emerged in total, arranged as follows:

- General Use of Data — 7 themes
- Transparency, Ethics and Privacy — 7 themes
- Data Feedback — 5 themes
- Academic Use of Data — 2 themes
- Results-Based Intervention — 4 themes

To understand the results better, each section includes a table that summarizes the themes and repetitive characteristics of the focus groups and interviews for each of the stakeholders across the three universities, and in some cases, testimonies and remarks are also included.[5]

4.1. General Use of Data

In this section, stakeholders discussed which data are relevant to evaluating student and teacher performance and how to obtain feedback from the analysis of these data. They also explored other potential uses of data to improve education. Table 2 shows the details that emerged in this initial stage, including student profiles, group profile, physical and mental well-being, accessibility, personalized learning, qualitative feedback, and digital competencies.

[5] Testimony codes: U=university; Participants: S=student, T=teacher, A=administrator. More detail for all testimonies is available in Appendix 5.

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Table 2. Themes Identified in the General Use of Data

Themes Identified	Students			Teachers			Administrators		
	U1	U2	U3	U1	U2	U3	U1	U2	U3
1. To learn more about their individual **student profiles** (academic performance, learning/teaching styles, socioeconomic conditions and information about their scholarships) *— To understand the best learning styles according to every student (U1S2), like predictors of their own performance (U1S3, U2S2)* *— Teacher performance is perceived through student grades, results and survey feedback (U1T1, U1T2, U1T3)* *— To understand who our students and teachers are beyond their grades (U1A1, U3T6, U3T8, U3T11, U3T12, U3T18, U2A1)*	x	x		x		x	x	x	
2. To learn more about **group profiles** *— Reviewing characteristics of groups according to difficulty to pass, difficulties to learn (U1T4)* *— Comparison with larger groups of other universities, employability purposes (U2S1)*		x		x					
3. Understand about their **physical and mental well-being** as a main influence of their academic performance *— Emotional well-being (U1S4)* *— Physical well-being (U3T17)*	x					x			
4. The use of data for **accessibility**, identifying the variety of conditions for every student *— Differences between the "normal" student profiles (e.g., students who work, who live far from university, family conditions; U1S5, U1A1, U1A2, U3A7)*	x						x		x
5. **Personalized learning** opportunities *— Recognizing self-purpose (goals; U1A3, U2A1)*							x	x	
6. Obtain more **qualitative feedback** about their performance from their own data *— More appropriate performance feedback, receiving more feedback than just a grade, a number (U1S6, U3S12). Grades by themselves do not reflect the true degree of learning (U1A4, U3S2, U2A1, U2T1)* *— Feedback through rubric and checklist approaches (U1T5)* *— Qualitative feedback of students´ participation and interventions in the teaching–learning process (U3S9)*	x		x	x	x		x	x	
7. Availability of technological resources and **digital competencies** *— Possibilities to take advantage of technology (U1T6)*				x					

All three types of stakeholders at U1 agreed that student profiles (theme 1) were important for making educational decisions, which included academic performance, learning styles, and social and economic conditions. Students and administrators at U2 also agreed on this theme. At U3, teachers expressed support for the idea of having student profiles. A point of agreement among the different actors regarding the construction of student profiles was the convergence of qualitative and quantitative data. Administrator U2A1, for example, declared that scores should have a lower value when compared to assessment of student skills. In consequence, they noted that the focus should be to understand where the students stood today in their achievement of competencies and focus on measuring the ideal development, while assisting them along the developmental track.

U2A1: "What is the level that the student has in face of this new challenge? [...] I believe that it would be better to know about their attitudes instead of their scores, […] scores don't always reflect the progress of knowledge and skills [...] to

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understand better how they are performing in each of their courses, for example, or what skills we would wish them to have, how they have developed, at what depth level we may observe this would be greatly beneficial."

According to one student:

U1S1: "I think it also has a lot to do with modality, time, how many courses are taken, because sometimes the hours that a student invests are not the same in face-to-face, open, or distance activities, not the same days."

For theme 2 (group profiles), students at U2 and teachers at U1 thought of data as a means to help students with two purposes: 1) identify courses or subjects that are the best fit for the student, and 2) the possibility of comparing themselves to other students with similar profiles. Personalized learning was discussed as a recognition of student profiles, with the objective of optimizing their trajectories while implementing preventive measures. The expectation is that these actions would be presented visually.

About theme 3 (physical and mental well-being), students and teachers at U3 recognized that mental and physical health was crucial for school performance; acknowledgement made similarly by teachers, who also discussed the importance of being aware of student medical data to support the academic community.

*U1S4: "it also has to do with the **emotional issues** in this case, the mental aspect, **because I believe that if a student is not feeling well mentally, emotionally, they cannot have a good performance at school**."*

In theme 4 (accessibility), students of U1 and administrators of U1 and U3 suggested that student accessibility data should consider factors such as their employment situation, distance, and travel time from home to the university. It is similarly important to recognize the types and degree of family support, socioeconomic information, and scholarships. In other words, access to the data facilitates recognition of the diversity of student contexts, both inside and outside of the institution, as mentioned by one administrator:

*U1A1: "obviously their living conditions, technology equipment, are important. We have not seen **all teachers have the space and devices in these virtual conditions**."*

In theme 5 (personalized learning), administrators at U1 and U2 pointed out that it was important to have a broader vision of the congruence between a student's life objectives and the career they were studying, as well as the feeling of teacher comfort in relation to the role they represent. The other stakeholders did not mention this issue.

Teachers and administrators at U1 and U2 and students at U1 and U3, said that qualitative feedback (theme 6) was relevant to improve the performance of students and teachers. Students made observations related to feedback style: *"Obtain more qualitative feedback about their performance from their own data"* (*U1S6*). Students pointed out the relative lack of assertive and constructive feedback from their teachers, emphasizing that they received very polarized comments that did not help to improve their learning. Administrators recognized that grades did not reflect the true degree of student learning or their real abilities. On the other hand, some students noted that grades were important because many decisions were made based on these, such as the priority given to students with better grades to schedule courses, to obtain scholarships and honour distinctions, among others.

U1S6: "There are teachers who kind of feel sorry or feel bad, and they don't want to tell you that you're not performing well, that doesn't help you, and you continue with your strategies, and there are teachers who are very harsh and make you feel bad, they make you feel stupid and that does not help you improve; and, on the other hand, there are teachers who simply do not say anything, they just give you a grade and that's it, you don't know what you did wrong, what you did well, what you have to improve. So, it is very rare to find a teacher who is assertive in giving an evaluation and feedback where they do not focus on the errors, but on what you can improve."

In theme 7 (digital competencies), only teachers from U1 recognized that it was important to collect data about students' available technological resources and their level of technology management since they had an important impact on their learning.

For the three groups of stakeholders, we identified a consensus for supporting decisions according to academic data. Administrators and students stated that data collected by the university should serve students in a better way, giving them a broader vision of their opportunities in their careers, study strategies, and life goals.

4.2. Transparency, Ethics, and Privacy

Transparency, ethics, and data privacy aim to recognize the concerns of stakeholders about data management and governance. Questions like "What data is obtained from us? When do we give permission to obtain it? What policies dictate how data

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should be cared for? Who is in charge of its life cycle?" are discussed during this section. Table 3 shows the different themes for each group of stakeholders from the three universities.

Table 3. Themes Identified in Transparency, Ethics, and Privacy

Themes Identified	Students			Teachers			Administrators		
	U1	U2	U3	U1	U2	U3	U1	U2	U3
1. Systematic **data collection** from students and teachers during their careers *— Personal (U1S7, U2S3, U2A2), socioeconomic, academic (U1S7, U2A3, U2S3), consumption trends and employability (U2S3), extracurricular (U2S3), lack of awareness of data related to students and teachers (U3S15)*	x	x	x					x	
2. **Sensitive data** collection *— Health (U1S7, U2A5), sexual (U1S7, U3S23), income (U2S3), family (U2S3), feelings (U1T7)*	x	x	x	x				x	
3. Data collection on **institutional indicators** regarding teachers and students *— Student data: dropout, failure, retention, graduation (U1A3)* *— Teacher data: reports, qualitative and quantitative surveys (U1A5)* *— Use of library, interests, cafeterias (U2S3)* *— Institutional surveys (U1S7, U2S3), other surveys (U3T22)*	x	x				x	x		
4. Interest on **data access** *— Lack of knowledge of who has access to the data (U3S15)* *— Responsibility involved in accessing the data (U3A22)* *— By teachers (U3S22) for possible usefulness (U3S19)* *— Denial of access to data (U3A10-18)* *— By collegiate bodies to assess professor performance (U1A6), faculty directors (U2A4)*			x				x	x	x
5. **Data Governance and Cybersecurity** *— Implementation of cybersecurity systems and establishment of privileges for employees (U2A4, U2S4)* *— Lack of knowledge of consent forms (U1S8, U2S5), request for more transparency (U1T8), coupled with the belief that students and teachers tacitly grant the institutions the authorization to access their data, from the moment they are part of it (U1A7)*	x	x		x			x	x	
6. Knowledge of the signing of **informed consent** forms by teachers and students *— Available in privacy notices (U2A6), acceptance of data access and data protection regulations (U1A8)*							x	x	
7. **Policies** for collecting and data analysis *— Beliefs of statistical purposes (U1S9), improper handling (U1T9), culture of data protection (U1A8, U1T8)* *— Unaware of documents for data protection (U2S6)*	x	x		x			x		

Students from U1, U2, and U3 and administrators from U2 recognized that universities systematically collected a lot of data, namely a variety of personal, socioeconomic, academic, and school record data, as well as sensitive data such as health

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or sexuality, from admission to graduation. Students believe that these data shaped their educational path and could help them make better decisions.

> *U1S7: "when we are admitted they ask many things, if we are married, if we have children. They ask for all our information; they know us even better than we do sometimes."*

The point of view of students from U1, U2, U3, teachers at U1, and administrators at U2 was that universities could have a clear vision regarding the sensitive representation of data (theme 2). They also referred to the lack of awareness regarding data generated from the student–teacher relationship:

> *U3S15: "I also feel that it is relevant to know what kind of data the teachers have because right now we are talking, and I really don't know what data the university has in its possession."*

Students from U1 and U2, teachers at U3, and administrators at U1 expressed the importance of knowing the performance indicators of the institution (theme 3), with the observation of reducing indicators to facilitate decision-making:

> *U1A5: "externally, we are immersed in the process of evaluating the quality management systems. We also take these indicators as relevant because they evaluate the impact on some issues that perhaps we did not consider a priority."*

Administrators from the three universities stated that they did not clearly recognize who had access to their data (theme 4), while students at U3 said that the access to the data of students was useful when used to improve learning outcomes.

Administrators and students at U2 recognized particularly that the academic governance structures (theme 5), such as technical advisory boards, had access to data, and said that the board of directors had access to the data. The informed consent signature (theme 6) for these documents varied between those who had forgotten and were unaware of its existence or those with a lack of consciousness about this act due to the context (nervousness or excitement) associated with being admitted to the university:

> *U1S8: "And when I am going to sign a document, I believe that no, I believe that many times we just sign documents without knowing what they are."*

In contrast, administrators of U2 referred to the importance of implementing data governance, where performance indicators were implemented. The common instruments for data collection were institutional surveys, and only in one university did teachers use surveys they had developed to understand their students' different situations.

The collective perspective of students, teachers, and administrators in U1, as well as students in U2, regarding the policies for data collection and analysis was rooted in the idea that data (theme 7) was often treated merely as a "statistical endpoint" (U1S9). This approach lacked explicit protocols detailing data access, storage, and the processes involved. Nevertheless, concerns persisted about the inadequate utilization of data:

> *U1S9: "for which purpose will (data) be used? I imagine that for some good, and obtaining statistics about specific groups or where we are as students located in the university, I would believe that it is with good intentions."*

4.3. Data Feedback

Feedback is one of the main strategies whereby LA can help teachers and students. This is consistent with what participants said in the general use of data stage. Table 4 summarizes the issues addressed, namely purpose, comparison, temporality, channels and methods, and data literacy.

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Table 4. Themes Identified in Data Feedback

Themes Identified	Students			Teachers			Administrators		
	U1	U2	U3	U1	U2	U3	U1	U2	U3
1. **Purpose** of data feedback *— Qualitative data analysis of academic performance by the identification of patterns (U1T10, U2A7)* *— Grades as a starting point for feedback (U3T44)*				x		x		x	
2. **Comparison** among subjects (self, peers, others) *— For competition among peers; unfavourable perspectives (U1T11, U2S7) and favourable* *— To replicate the best practices (U2S8)* *— The act of comparison (U1A9)* *— Among teachers (U2T2)*		x		x	x		x		
3. **Temporality** for feedback (latency) *— Avoid lag in feedback (e.g., each week, month, end of the course; U1S10, U2S9, U2S12, U2T3)*	x	x			x				
4. Feedback **channels and methods** *— Personal feedback (U2S10, U3S35)* *— Training (U2S11)* *— Anonymized referenced data (U2A)* *— Visualizations (U2S9)*		x	x					x	
5. **Data literacy** *— For students and teachers (U2A)*								x	

Qualitative feedback was substantive, as a complement to numerical grades. In relation to its purpose (theme 1), teachers at U1 and U3 and administrators at U2 pointed out that identifying patterns in the student experience might promote their own understanding through qualitative appreciation and not only by numbers, a similar point to that found in section one (U1T10). Teachers at U3 also suggested that these experiences should be a starting point for feedback:

> *U1T10: "the way of presenting it, I believe that would be something that could be different for big and small groups, the identification of students' patterns that allows them to separate their own individuality [...] These identification of patterns would reflect the experience of students in the process: not the numbers, not the grades, but just the experiences of the students — if I did learn or not, if I acquired new skills, if I learned something but had a bad time, or I had a great time but did not learn."*

Comparison (theme 2) may emerge from feedback and may be healthy or unhealthy. Student and teacher testimonies from U1 and U2, as well as administrators from U1, revealed that comparisons between students could promote an unfavourable environment, something that they believe could have an impact on their mental health:

> *U2S7: "I should return to the question '(comparisons) for what?' I mean, what would be the objective of that? If you are aiming to generate a competitive environment between students or if you are really interested in their own growth."*

Temporality (theme 3) was also a distinctive quality of feedback for students from U1 and U2, and teachers at U2. The moment in which this was performed also influenced learning outcomes. According to student testimonies, in the context of LA, temporality was a concept associated with latency, corresponding with the time that passes between the collection of the data and the time it takes to gain meaning to execute an action.

> *U2S13: "Could be weekly reports because daily reports would be too much."*

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Students pointed toward empathetic and assertive feedback (theme 4), taking care of their privacy, an act that must be done personally and with the support of data viewers. For this to occur, it is necessary to train teachers to develop these capacities and develop data literacy to be able to interpret them properly.

4.4. Academic Use of Data

The academic use of data strives to create conditions for learning and well-being in universities (Table 5). Our results show that what is imagined or expected to be done with data across institutions differs among stakeholders.

Table 5. Themes Identified in the Academic Use of Data

Themes Identified	Students			Teachers			Administrators		
	U1	U2	U3	U1	U2	U3	U1	U2	U3
1. **Desired applications** for academic use of data *— Early warnings for online and open education students (U1S11) and students in general (U2A7, U2A8)* *— Design of remedial courses to prevent dropout and failure (U1T12), review student outcomes in other classes (U2T4)* *— Data driven institutional policy decisions for administrators (U1A10), systems for recommendation of social services and internships (U2S14, U2S15)*	x	x		x	x		x	x	
2. **Academic well-being** *— Overview of the student's academic past (U3T37, U2T4)* *— Pleasant learning experience for students and teachers (U2S8, U2T5)* *— Advocacy for teachers' well-being (U2S16)* *— Advocacy for students' well-being (U2T5)*		x			x	x			

The first theme in this dimension refers to the expectations of students, teachers, and administrators (U1 and U2) and how educational data was used and should be used. Most conversations in the focus groups were related to their desired uses of data. Early warnings were an attractive solution for students enrolled in open and online courses since they perceived themselves as physically isolated from other members of the educational community, so receiving continuous feedback when at risk was valuable. Early warnings were a valuable topic in U2 for their students in general:

> *U2S15: "everyone wants more personalized recommendations. [...] We see proposals to know about projects, but most of the time, you get to know about them when it is already happening; you don't know before that or until it happened [...] it would be good if we could have a filter on an institutional portal where they ask you about your interests, and suggestions would appear about events, projects, even for the social service."*

For teachers in U1 and U2, learning from past experiences of students at risk and designing targeted courses was a strategy that, in their opinion, would contribute to preventing failure by providing remedial courses. Administrators stated that institutional policy decisions could be data driven, providing an opportunity to better understand how students possessed the skills and technological equipment required to succeed in their courses.

In theme 2, "Academic well-being," students and teachers at U1 and U2 discussed the need to create a pleasant environment and learning experience, both for students and teachers, remarking that self-confidence and well-being were important elements to improve the learning experience. Aligned to the following phrase "*empower the teachers, and improve everything"* (U2S16), some students advocated for solutions aimed at teachers as one way that could help satisfy their needs. Similarly, teachers needed to understand if there was something important they should know about the students (i.e., health, mental health, life hardships); some kind of "flag system" so they could be aware of the student's context would be useful:

> *U2T5: "Maybe it would be achievable to have some kind of marker or something that would determine [show] if a student is living some type of situation, health, mental health, so teachers could relate to them [in other ways]."*

4.5. Results-Based Intervention

Results-based interventions were scarcely mentioned in the focus groups and interviews. Categories that emerged during the analysis were intentions for data use, data isolation, data-driven decision-making, and custom use of data (Table 6).

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Table 6. Themes Identified in Results-Based Intervention

Themes Identified	Students			Teachers			Administrators		
	U1	U2	U3	U1	U2	U3	U1	U2	U3
1. **Intentions** for the use of data *— Early identification of causes of school lag and dropout phenomena (U1S12, U2S11, U3S40)* *The desire for teacher collaboration within the framework of learning analytics (U2T6)*	x	x	x		x				
2. **Data isolation** *— Fragmented (silos) (U1T13, U3A22)*				x					x
3. Data driven **decision-making** *— Lack of capabilities, low resources and availability for data management (U1A11, U2S17)* *— From the teachers (U2S18, U3T45)* *— Option for accepting support or not (U2S19)*		x				x	x		
4. **Custom use of data** *— Statistical interpretation (U1S9) instead of an understanding of human development based on concrete actions (U2S11, U3S39, U3A23)*	x	x	x						x

Students from U1, U2, U3 and teachers at U2 engaged in discussions regarding the desirability of using data as a means to enhance understanding of strategies to support students:

> *U1S12: "Why is there so much dropout? Is it because of something related to us, something related to our teachers? Is it something related to our programs?"*

One concern of U1 teachers and U3 administrators related to the creation of silos that store a significant amount of data in a fragmented manner generated by university bureaucratic structures:

> *U1T13: "what criteria or communication patterns do we have to establish among the actors because certain information is held by teachers, other by coordinations, and other by the university."*

Students from U2 and U3, teachers at U3, and administrators at U1 identified the lack of data driven decision (theme 3) and suggested an integrated approach to analyzing data fragmented throughout different areas of the university, which should be done for the sake of learning:

> *U2S21: "This definitely should happen because what usefulness could information have if you don't know what it is?"*

In relation to custom use of data (theme 4), students from the three universities and the administrators of U3 agreed on the need to move from a statistical interpretation to the development of concrete actions to improve learning:

> *U2S11: "Behind those averages, there is a whole phenomenon where many aspects are involved in the development of a student, and I believe too that there is a lack of this integral comprehension of both the student and the professor, of training them, and being interested about their well-being, I mean, of taking care of their well-being, so they could have the competencies to detect (these issues that affect their own well-being and that of their students)."*

5. Discussion

In this study, we identified the perceptions of teachers, students, and administrators about the use of educational data in the context of three Mexican higher education institutions, providing evidence of the need to improve the state of adoption and integration of learning analytics in Latin America. The five categories analyzed in the study will serve as an organizing thread for the discussion.

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5.1. General Use of Data

A widespread aspiration of educational stakeholders is related to the development of concrete actions that emerge from the use of educational data. The perceptions of study participants indicate a belief that information is mostly used to build institutional performance indicators for accountability, while there is a desire for a better comprehension of each participant as an individual (Table 2, theme 1). This characteristic is a feature previously recognized in institutional analytics (Siemens & Gašević, 2012), which, while desired, is still far from the expectations of an integrated learning analytics system. Other examples, like curricular analytics (Hilliger et al., 2019), recognition of school trajectories (Canales Sánchez et al., 2022), or opportunities to recognize the magnitude of the effects of the COVID-19 pandemic on first-year students (Sánchez-Mendiola et al., 2023), can provide other purposes and inputs for institutional decision-making. Nonetheless, many of these efforts are still in the research stage, especially in the case of Latin America and the Caribbean (Cechinel et al., 2020).

It is interesting that the notion of learning styles continues to appear as an important concept for students in our research (Table 2, theme 1) despite the large body of evidence in the academic literature that labels it as a neuromyth and recommends using our time and effort in more evidence-based activities (Newton et al., 2021). As reported in several studies, it is not easy to transition from educational assumptions based on tradition and common sense to more empirically and theoretically grounded practices (Yan & Fralick, 2022).

Feedback was an aspect frequently addressed by participants from the three institutions (Table 2, theme 6). Previous research has focused on learning analytics–based feedback from a motivational perspective (Lim et al., 2021) and the quality of feedback demanded in Latin American scenarios (Hilliger et al., 2020a, 2020b). The findings in these studies report a close relationship between well-being in schools and a feedback style based on empathy and assertiveness, which is congruent with the perceptions collected in themes 1 and 3, Table 2.

As other studies from Latin America have found, students, teachers, and in some cases administrators, perceive an absence of capacities to manage and interpret data generated during teacher–student interactions (Hilliger et al., 2020b), which corresponds to the perspective of U2 teachers, likely due to limited data literacy (Tsai & Gašević, 2017). Students, teachers, and administrators in the three educational institutions agree that quantitative assessment is just a starting point to assess the integral performance of students.

5.2. Transparency, Ethics, and Privacy

Privacy about the use of educational data to improve teaching and learning processes prevails among the different groups of participants. Participants recognize the possibility of data misuse in various forms, such as an absence of data governance or the lack of awareness of data policies (Table 3, theme 5). Our study found that students and teachers often seem to be unaware of how they agreed to grant access to the collection, storage, and use of their data. While it was commonly found that this procedure occurred by signing a Privacy Notice to provide their consent, most participants (teachers and students) could not recall how it occurred, how much information was requested, for which time periods, and where to obtain further information about its implications. In contrast, administrators were comfortable answering these questions, recognizing appropriate levels of security, and even identifying opportunities for developing strengthened data governance. The four ethical and privacy principles suggested by Pardo and Siemens (2014) could function as fundamentals for protecting user data: 1) transparency, 2) student control over the data, 3) security, and 4) accountability and assessment.

Students and teachers at U1 and U2 agreed that their institutions systematically obtain large amounts of data, ranging from personal information and school records to professional performance information (Table 3, themes 1 and 2). In this issue, ethical principles for the collection and use of educational data should be proposed and applied with the objective of protecting student privacy, considering student performance as a dynamic variable (Slade & Prinsloo, 2013). At U2, students stated that they believe the university could have sensitive data related to their families — such as personal characteristics and financial assets — data concerning their work preferences and even their data consumption patterns (Table 3, theme 2). This situation generates concern in some students, reflected in a sort of irony: they are unaware of the situation, but at the same time, they would not be surprised if the case were true. This was the case for U2SG1 (question 4, *Transparency, Ethics and Privacy* in Appendix 4), where one student recalled that the institution had data obtained many years ago, even decades in the past. In a different context, U3 students commented that they are unaware of which data are available to the institution and their teachers. Teachers at this university remarked on enacting individual actions to better understand the situations in which their students live and learn.

Many students at U1 and U2 perceive data collection not as a means but as an end in itself. Although U3 students do not express this perception explicitly, they suggest that their teachers could collect their data directly to provide them with the attention they require, as was discussed in the previous paragraph. In other words, they position themselves beyond a mere statistical purpose, which is a desire shared by U1 and U2 students who feel unaware of the analysis carried out on their data by their institutions. On this topic, administrators agree that when using data, it is relevant to continuously promote a culture of data protection throughout the educational community by developing new data literacies among decision-makers,

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academics, and educators to address emerging challenges in this field such as privacy, informed consent, transparency, interpretation of data, data ownership, and the obligation to act on knowledge (Steiner et al., 2015). Actions promoted by each institution in terms of privacy and transparency differ, with some shared concerns at different levels about potential failures to comply with federal data protection laws, actions to promote more transparency in their processes, or data governance systems to strengthen regulations at their institution.

From the student's point of view, signing the privacy notices oscillates between forgetfulness and doubt. The carelessness or emotions experienced by the student's disposition is one possible reason for giving consent to privacy notices without being fully aware of the implications (U1, U2). U1 students pointed out that their daily school practice and routine have made them insensitive and careless when signing the consent form. Therefore, in legal situations, as pointed out by Cobo and Aguerrebere (2018), this could guarantee a first level of acknowledgement and regulation for the fundamental rights in ethical and privacy matters that will continue emerging in the adoption of learning analytics. In conclusion, not only is more empirical evidence required to understand the needs and challenges of using LA tools to support teaching and learning processes from the perspective of students, teaching staff, and managers (Vuorikari & Castaño Muñoz et al., 2016; Viberg et al., 2018), but new procedures are needed to empower students and teachers to recognize which data has been obtained from them, and to recover some control about its use.

5.3. Academic Use of Data

There is consensus that prevention, feedback, and remedial action are key dimensions that help build an environment for academic and personal well-being (U1 and U2, Table 5). By protecting the well-being of the student community, we can help avoid critical events such as student dropout, absenteeism, or similar problems. In LA, data stored in digital platforms like learning management systems can provide deeper insights on student learning. From the results of this study, we believe this can help with comprehensive educational data integration and strategic planning to direct students toward a state of wellness while pursuing the institutional goals established by the community and university administrators.

Using pedagogical elements like self-reflection and appropriate comparisons to increase student motivation, LA could benefit academic data use. Furthermore, a state of well-being involves the ethics of self-care (Foucault, 2010), where all members of the educational community embrace this joint responsibility. In LA, this may provide opportunities for teachers to offer help to students in distress and for students to obtain support (from predictive algorithms) or voluntarily request it from teachers or peers. The ongoing practices of critical thinking and teacher support continue to evolve, not only for knowledge acquisition but for providing guidance for student decision-making. This can transform the act of teaching into a more compassionate endeavour to increase student resiliency and academic perseverance. Moreover, this desire to increase the well-being of others was found to be bidirectional — not only from teachers to students but from students to teachers (Table 5, theme 2). This awareness could have increased due to the isolation of the recent pandemic quarantine. The promotion of learning analytics from this ethical perspective opens the possibility of empowering users, improving institutional policies, and boosting emotional well-being. The empirical evidence of quality related to efficiency is scarce; several LA research studies have focused on prediction, with relatively few studies looking at the effectiveness of interventions (Larrabee Sønderlund et al., 2019).

5.4. Feedback

Feedback between teachers and students is still provided in traditional paradigms. Faced with feelings of embarrassment, students wish for more personal, assertive, constructive, and empathetic feedback when required (Table 4, themes 3 and 4). Regarding comparisons between peers, both students and teachers identify that a common practice in our universities is to promote rivalry and competition, either by students themselves or generated by teachers (Table 4, theme 2). This practice does not promote well-being. Students suggest that adequate feedback using anonymized data and behaviours, accompanied by strategies that encourage student collaboration and role-differentiation, may improve the learning and assessment process by incorporating the principles of assessment-for-learning (Sánchez-Mendiola et al., 2023).

Other characteristics of feedback expected by students are improved teacher assertiveness with data, personalized feedback, and support with visualization (Lim et al., 2021). U1 and U3 students and teachers highlighted the importance of knowing information related to job opportunities, industry demands, and students' physical and mental health during their academic trajectories since these have a direct influence on their performance. Teachers of U2, for example, declare that their institution lacks the capabilities to share valuable data among departments and teachers about their students' physical and mental health conditions (i.e., recent events that could affect the student, emotional hardships, disease, accidents), leaving them responsible for observing and managing difficult situations. Administrators from U1 and U3 said that it is important to recognize if students have adequate physical spaces to study at home and in the university and to know the results of admission exams (such as diagnostic or psychometric results), which could provide valuable information about areas that students need to reinforce.

Regarding data that helps provide feedback on the academic performance of teachers, participants from the three universities mentioned that the main vehicle to obtain student perceptions is teaching evaluation questionnaires. U3 teachers

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highlighted that this is an operational challenge since responses are anonymous, which sometimes promotes harsh comments from students toward their teachers. While the same situation occurs in U2, it is recognized by administrators that this information could be further analyzed. Recent advances in Natural Language Processing (NLP) and Large Language Models (LLL) may help to extract insights from narrative evaluations (Ifenthaler & Gibson, 2020). U1 administrators also specified that to evaluate the performance of teachers, it is necessary to follow and analyze the academic profiles of their students (i.e., courses taken, pass/fail rates, etc.), as well as their participation in extracurricular activities (institutional projects, publications). All this information provides an opportunity to better grasp the interests and preferences of students, so teachers can apply this information to motivate them better, aligned with their individual interests.

5.5. Results-Based Intervention

Students from the three universities and teachers at U2 intend to make LA-based decisions, aiming to proactively address the causes of the dropout phenomenon (Hilliger et al., 2020b). However, they frequently encounter the data isolation phenomenon (Table 6). Teachers from U1 and administrators from U3, both public institutions, perceive that bureaucratic elements prevail as major barriers to the appropriate use of data, a pattern commonly observed not just in Latin America (Hilliger et al., 2020a) but in other countries as well. The systematic centralization of data for institutional purposes, such as statistical treatment and interpretation, with discretionary access or denial, was identified in our study, as reported by others (Salas-Pilco & Yang, 2020). In Mexico, the lack of formal guidelines for the use of data in higher education institutions could affect the efforts toward adequate management of data processes aligned with the core functions of universities. Faced with these challenges, U2 administrators mentioned actions carried out in their institution for the implementation of data governance (Table 3), which is usually absent in the Latin American context (Salas-Pilco & Yang, 2020).

One important ethical and implementation challenge is the transition from the isolated generation of statistical reports (descriptive, explanatory, or prescriptive) that exist in silos in institutional systems toward a more holistic, integrated approach with concrete actions to optimize organizational resources and educational improvement. Replicating and scaling this behavioural change in other institutions could address the persistent phenomenon of school dropout in Mexico. We are still far from having systems that automatically act when estimating the causal effect of interventions (Kitto & Buckingham Shum, 2023).

6. Limitations

Some limitations of this study are heterogeneous institutional sample sizes, sample composition, differences in each university's procedures, and the need for more in-depth content analysis. Sample size was different among the three institutions, with a larger number of focus group participants in U1. Key aspects of qualitative research, such as saturation, may not have been optimally achieved, not only across institutions but for the same university. Moreover, due to COVID-19 policies in place during the research study, the availability and disposition to participate in focus groups by different participants were varied. Each institution considered different types of participants (i.e., students and teachers from different schools and areas of knowledge, administrative staff or educational authorities), with availability a key concern to obtain the desired focus group composition. U2 and U3 performed their focus groups with video conferencing tools (Zoom, Microsoft Teams) while U1 held theirs in person. In-depth content analysis from the transcriptions could have provided further insights, classifying and analyzing data by sociodemographic categories, such as career, age, and sex, and linking these with themes of interest, number of interventions, length of participation, and other data. However, due to the nature of the study and each university's limitations to link personal data to each participant, we were not able to perform a deeper analysis.

It is important to emphasize that results from this study are evidence of the experiences from different stakeholders in Mexico, but these may not be representative of other national public and private institutions, so inferences made in this regard should be done with caution. On the other hand, the three universities that participated in the study are large and prestigious national institutions — two public, one private — that serve as role models for other higher education institutions in the country and throughout Latin America. Future studies could continue this line of research, finding commonalities and differences in institutions, inside of and beyond our borders.

7. Conclusions

The focus of this study was to identify the perceptions of students, teachers, and administrators about the use of educational data in three different universities in Mexico. Stakeholders described not only concerns about the actions and beliefs around data but intersected with other important themes for each participant type, such as well-being (mental, physical, and the well-being of others), purposes of data collection, and the self-fulfillment of students as individuals. Students are open to sharing their data if these analyses can help them achieve their educational goals and be better prepared for their professional roles in society. Students also identified that not all efforts should be focused on them since teachers also require better tools to provide

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adequate and constructive feedback, diagnose and follow-up on student learning activities, and obtain deeper insights about their teaching activities.

Teacher initiatives to help students were identified in the three universities, since everyone performed different activities and strategies to acquire, analyze, and use data. Teacher experiences, goals, and concerns varied considerably. Some believed that LA systems should help them to recognize the "story" of their students, pointing out that they do not have enough time to really get to know them, and are not provided with information from previous courses or other teachers' experiences.

For administrators, consensus and progress made on data governance were varied. Like students and teachers, they recognized that data collection should have a purpose, and data silos should be avoided. Decision makers recognize value in data as a vehicle for the achievement of institutional goals, and to facilitate the tasks of all personnel across the organization. Concerns associated with data management remain and need to be addressed (i.e., data regulations, procedures, documentation). Students and teachers are unable to identify the processes and nuances of their data collection, the responsible actors for its processing, or institutional guidelines that could help them to learn more about data management and use procedures.

The results of this study suggest several educational and organizational opportunities to improve management and use of educational data and identify positive interest from all stakeholders to advance in the integration of learning analytics in their institutions. Ideas, preferences, aspirations, and concerns of the major education stakeholders should be accounted for when developing institutional strategies. Quoting a testimony from our study, we should remember that *"data itself should not be an end, but a means to an end."*

Declaration of Conflicting Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors declared no financial support for the research, authorship, and/or publication of this article.

Acknowledgements

We acknowledge the enthusiastic participation of the students, teachers, and administrators from the three universities in the study.

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