

## **Towards learning analytics adoption: A mixed methods study of data-related practices and policies in Latin American universities**

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## Abstract

In Latin American universities, Learning Analytics (LA) has been perceived as a promising opportunity to leverage data to meet the needs of a diverse student cohort. Although universities have been collecting educational data for years, the adoption of LA in this region is still limited due to the lack of expertise and policies for processing and using educational data. In order to get a better picture of how existing data-related practices and policies might affect the incorporation of LA in Latin American institutions, we conducted a mixed-methods study in four Latin American universities (two Chilean and two Ecuadorian). In this paper, the qualitative data is based on 37 interviews with managers and 16 focus groups with 51 teaching staff and 45 students; the quantitative data was collected through two surveys answered by 1,884 students and 368 teachers respectively. The findings reveal opportunities to incorporate LA services into existing data practices in the four case studies. However, the lack of reliable information systems and policies to regulate the use of data imposes challenges that need to be overcome for future LA adoption.

Keywords: Learning Analytics; Latin America; Higher Education; Data Management Practices; Data Protection Policies; Mixed Methods

## Structured practitioner notes

What is already known about this topic

- Learning analytics services have the potential to provide quality and actionable information for supporting diverse learners.
- The adoption of learning analytics services is still incipient in Latin American universities.
- The lack of expertise and policies to regulate the use of educational data imposes several challenges for adopting learning analytics services.

What this paper adds

- Describes opportunities to integrate learning analytics services into existing data practices in four Latin American universities.
- Reveals the need to invest in reliable information systems to collect and integrate educational data commonly used in learning analytics.
- Reveals the need to develop policies to guide the adoption of learning analytics in Latin American contexts.

Implications for practice and/or policy

- Researchers should design or adapt existing learning analytics services to support existing data-based actions in Latin American universities.
- Latin American universities should design and implement policies to regulate the use of educational data.

## 1. Introduction

In Latin America (LATAM), access to higher education has grown dramatically in the last three decades, so universities currently serve a wider and heterogenous student

population (Ferreyra, Avitabile, Botero Álvarez, Haimovich Paz, & Urzúa, 2017; Fischman & Ott, 2018). This rapid growth has increased the diversity of students' socioeconomic backgrounds without reducing gaps in academic performance and university readiness, so students from low socioeconomic backgrounds are more likely to drop out than other students (Ferreyra et al., 2017; Székely, 2017). In this context, LA has been perceived as a promising strategy for dealing with this new landscape by leveraging existing data to monitor student progress at scale and implementing learner-oriented services for students at risk (Cobo & Aguerrebere, 2018).

However, LATAM institutions interested in adopting LA services have to deal with several challenges related to the use of educational data (Alexander et al., 2019). First, there is a limited number of LA researchers and LA initiatives in the region (Cobo & Aguerrebere, 2018; Lemos dos Santos, Cechinel, Carvalho Nunes, & Ochoa, 2017), so institutions do not usually have data experts who know how to use LA or managers and teaching staff with data analysis and interpretation skills (Fischman & Ott, 2018; Lemaitre, 2017). Second, LATAM lacks regional policies such as the European General Data Protection Regulation (GDPR) to ensure procedures of data protection in institutions (Cobo & Aguerrebere, 2018). Given the importance of data-related practices and policies for sustaining the success of LA initiatives (Alexander et al., 2019; Arnold et al., 2014; Greller & Drachsler, 2012), more studies are needed to understand how LATAM universities could incorporate LA services.

Prior work highlights the importance of having input from key stakeholders when addressing LA adoption (Avella, Kebritchi, Nunn, & Kanai, 2016; Scheffel, Tsai, Gašević, & Drachsler, 2019), since they are the end-users that have the most direct impact by LA services. In light of this, the study presented in this paper focuses on understanding how key stakeholders — students, teaching staff, and managers — perceive practices and policies for collecting, analysing, and protecting data related to teaching and learning (T&L). For this purpose, we used mixed methods to collect data from four LATAM universities, all affiliated to a large-scale project to build capacity for LA adoption in the region (<https://www.lalaproject.org/>). Qualitative data was collected through semi-structured interviews with 37 senior managers, and 16 focus groups with 51 teaching staff and 45 students. Meanwhile, quantitative data was collected through a student survey (1,884 respondents) and a staff survey (368 respondents). Both types of data were triangulated to understand stakeholders' perceptions regarding existing data-related practices and policies across universities. Findings obtained from these stakeholders give an overview of the current use of educational data, besides revealing opportunities and challenges towards future LA adoption.

## **2. Current challenges of LATAM universities**

Despite the differences between LATAM countries in terms of culture and resources, one common feature is the diversity of the higher education systems and students therein (Cobo & Aguerrebere, 2018; Fischman & Ott, 2018). Along with the diversification of the types of institutions and programs offered, accessibility grew for all students, but particularly those from the low- and middle-income segments (Ferreyra et al., 2017). These students, who were previously underrepresented, constitute a critical piece for greater quality and equity of higher education systems. To ensure high-quality programs to all students, governmental agencies have implemented or improved quality assurance mechanisms throughout the region (Lemaitre, 2017). For example, Perú and Ecuador have recently proposed new higher education laws, while Chile and Colombia have reformed their quality assurance systems

(Ferreya et al., 2017).

This strong emphasis on quality assurance in past years has recently become an opportunity for LA adoption in LATAM universities. First, quality assurance mechanisms have highlighted the importance of universities' teaching role, giving greater relevance to quality criteria associated with the improvement of T&L (Lemaitre, 2017). Second, universities have invested significant efforts in assessing learning outcomes to comply with accountability demands, besides collecting information to monitor graduate performance (Fischman & Ott, 2018). As a consequence, most universities have strengthened their institutional capacity for collecting and analysing educational data for responding to the quality demands (Ferreya et al., 2017). This new capacity has not only increased the availability of information about students' progress, but has also raised awareness about the importance of improving curricular and teaching practices based on educational evidence (Lemaitre, 2017).

Considering the amount of educational data accumulated in the last two decades, Cobo and Aguerrebere (2018) indicate that LATAM universities would be able to implement LA services to address challenges that all higher education systems in the region have in common, such as improving quality and reducing student dropout rates (Ferreya et al., 2017). However, LATAM universities still need to scale up their capacity before adopting LA at an institutional level. First, they need to install valid and reliable information systems to integrate data that is currently stored and managed separately (Lemaitre, 2017). Second, they need to understand stakeholders' perspectives regarding data protection and privacy, besides implementing institutional policies in accordance with constitutional rights or regulations that are currently being revised in light of the GDPR (Cobo & Aguerrebere, 2018; Villan, 2019). Third, they need to create communities of practice for acquiring and generating LA knowledge (Cobo & Aguerrebere, 2018), taking advantage of existing initiatives to promote collaboration and capacity building towards LA adoption (Maldonado-Mahauad et al., 2018).

Due to these capacity issues, there is a long way to move from LA research to institutional adoption of LA services in LATAM universities (Cobo & Aguerrebere, 2018; Pérez-Sanagustín et al., 2018). However, the ability of institutions to collect and analyse educational data to comply with quality assurance systems could set a basis for LA adoption (Cobo & Aguerrebere, 2018; Lemaitre, 2017). According researchers in LA, quality data is an essential component of the success of LA initiatives (Arnold et al., 2014; Greller & Drachsler, 2012; Tsai et al., 2018), and its availability creates a starting point for designing and implementing LA services (Cobo & Aguerrebere, 2018). Therefore, the data accumulated in LATAM institutions creates the opportunity to start using data to improve T&L.

To the best of our knowledge, there are no studies that analyse the perspectives of different stakeholders regarding the current use of educational data in LATAM universities. By different stakeholders, we mean managers, teaching staff, and students who could potentially benefit from LA services as end users (Avella et al., 2016; Reyes, 2015; Scheffel et al., 2019; Tsai et al., 2018). On the one hand, managers and teaching staff could monitor changes in the formulation of expected learning outcomes, curricular design, and study plans (Lemaitre, 2017; Pistilli & Heileman, 2017), besides analysing the impact of students' socio-economic context on their learning results (Cobo & Aguerrebere, 2018; Gašević, 2018). On the other hand, students could benefit from on-time support, besides adjusting learning strategies based on educational data (Cobo & Aguerrebere, 2018; Gašević, 2018). According

to a prior study on students' perspectives, students desire to use LA to obtain early, iterative, and personalized feedback, in order to know the reasons for poor learning outcomes (Pontual Falcão, Ferreira, Lins Rodrigues, Diniz, & Gašević, 2019).

In order to scale the use of LA services, it is crucial to understand the perspectives of key stakeholders regarding how educational data is gathered and used as evidence for curricular and instructional change (Avella et al., 2016; Reyes, 2015; Scheffel et al., 2019). This paper addresses the following research question: *How do students, teaching staff and managers perceive existing educational data-related practices and policies in LATAM universities?* Perceptions of these stakeholders were analysed to identify opportunities to incorporate LA services into existing academic processes, besides revealing data-related challenges that need to be addressed towards future LA adoption in the region.

### **3. Methods**

#### *3.1. Research objective and design*

This paper aims to understand how key stakeholders perceive educational data-related practices and policies in four LATAM universities. To meet this objective, we adapted the instruments produced by the SHEILA project (Supporting Higher Education to Integrate Learning Analytics—<https://sheilaproject.eu/sheila-framework>) to explore stakeholder perceptions in the LATAM context. These instruments include surveys, interviews and focus groups, which have already been adopted in a Brazilian higher education context to explore stakeholder needs for LA services, along with other aspects such as culture and existing capabilities for LA adoption (Pontual Falcão et al., 2019). Likewise, we adapted these instruments to conduct a mixed methods study to understand the data-related challenges and opportunities that emerge from stakeholders' perspectives in LATAM universities. This type of studies involves triangulating qualitative information (obtained from a relatively small sample) with quantitative results (obtained from a relatively large number of individuals), which means contrasting evidence obtained from different study participants and from different sources of data (Creswell, 2012). Further details about the adaptation of SHEILA protocols are described in the sub-sections 3.3. and 3.4.

#### *3.2. Participants and sample*

Four universities participated in this study: two traditional private institutions in Chile (U1 and U2), and two public institutions in Ecuador (U3 and U4) (<http://bit.ly/2OpB2va>). Not only do these universities differ in size, type of administration, and year of foundation, but they also represent contrasting higher education systems. The Chilean system has been carefully observed and mirrored by other LATAM governments (Torres & Schugurensky, 2002), whereas, the Ecuadorian system has received little attention from researchers and governmental agents from other LATAM countries (Jameson, 1997; Johnson, 2017). Considering the contrasts among these universities, the sample represents a wide range of universities in the region.

We obtained qualitative data from 45 students, 51 teachers, and 37 managers (see Table 1). A stratified sampling method was followed to identify students and teaching staff from different academic units, while a snowball sampling method was followed to identify suitable managers to contact until obtaining redundant information (Creswell, 2012).

Table 1. Samples of participants in focus groups and semi-structured interviews.

	U1	U2	U3	U4
Focus groups (FG) with students	13 students (1 FG of 6 and 1 FG of 7)	5 students (1 FG)	3 students (1 FG)	24 students (1 FG of 8, 1 FG of 10, and 1 FG of 6)
Focus groups (FG) with teaching staff	5 teachers (1 FG)	15 teachers (1 FG of 7 and 1 FG of 8)	8 teachers (1 FG of 4 and 1 FG of 4)	23 teachers (1 FG of 7, 1 FG of 10, and 1 FG of 6)
Interviews with managers	7 managers	11 managers	8 managers	11 managers

Additionally, we collected quantitative data from 1,884 students and 368 teaching staff by using online surveys (see Table 2). In student survey responses, the representation of undergraduates ranged between 85% and 95%, which is consistent with the universities' current enrolment. In staff survey responses, assistant professors were overrepresented compared to universities' faculty statistics. Still, the percentage of respondents who had eight or more than eight years of teaching experience ranged between 34% and 67%.

Table 2. Samples of participants in student and teaching staff surveys.

	U1	U2	U3	U4
Number of students enrolled	32,445	16,670	11,922	17,495
Number of respondents of the student survey	878	228	205	573
Number of teaching staff members	1,265	753	960	1,158
Number of respondents of staff survey	124	79	25	140

Note: The number of students enrolled and staff members per university was retrieved in August 2019, while student and staff surveys were distributed between January and May 2018.

### 3.3. Qualitative data collection and analysis

To collect qualitative information, we adapted the SHEILA protocols by revising their Spanish version (see English version of the adapted protocol in <http://bit.ly/2OjnwJo>). We had to change the term 'Learning Analytics' for 'educational data analysis' because the LA concept is not widely known in LATAM universities. Due to the limited availability of LA services and research experiences at each university, we also had to include expressions such as 'data-based feedback' and 'data-based actions', add questions about 'academic uses of data', and remove all questions about existing LA projects and strategies. Finally, we included some words and expressions that are commonly used in Chile and Ecuador to make sure that interviewees understood all protocol questions.

One researcher per university was responsible for conducting the semi-structured interviews and focus groups with informed consent received from the participants. The audio files obtained from interviews and focus groups were transcribed verbatim. Their analysis was conducted by four researchers, one per university, who conducted four rounds of coding practices using NVivo Pro 12. With the results of the final coding practice, a matrix query was obtained to compare the percentage of coding references obtained from key stakeholders in different categorical nodes. Additionally, quotes were extracted and translated to complement the analysis. See the coding scheme and further details of the qualitative data analysis in Appendix 1.

### 3.4. Quantitative data collection and analysis

To collect quantitative data, we kept all questions included in the SHEILA student and staff survey instruments that have already been used in other universities. Still, we did minor language editing to include words and expressions that are commonly used in Chile and Ecuador. We also had to change the expression ‘LA services’ for ‘services based on the analysis of educational data’, while making sure that the meaning of each survey item stayed the same.

Both student and staff survey instruments consisted of a 7-point Likert scale to measure both ideal and predictive expectations (see adapted student survey instrument in <http://bit.ly/2YGFmsd>, and adapted staff survey instrument in <http://bit.ly/2CRywXx>). These two scales were designed to explore the discrepancies between what users ideally would like to see and what they expect to see based on their existing experiences at the institutions (Wainwright, Tsai, Tejeiro, & Bennett, 2019). Thus, survey respondents were asked to report two scores for each item; one for ideal expectations and another one for the predicted expectations. Considering that we were interested in understanding how stakeholders perceive existing data-related practices and policies, we only used the scores reported for the predictive expectation scale as a proxy of student and staff expectations regarding the collection and analysis of educational data. In each survey, the quantitative analysis consisted of estimating the percentage of respondents who rated a high level of agreement with the statements of the predictive expectations scale. By high-level agreement, we considered respondent scores that were equal to or higher than 6, considering that the scale ranged from 1 (strongly disagree) to 7 (strongly agree). See further details of the quantitative data analysis in Appendix 2.

## 4. Findings

The following sub-sections are organized to describe existing data practices and policies in four LATAM universities. These findings are supported by qualitative and quantitative data, and they represent the perspective of key stakeholders. See additional quotes extracted to support findings in Appendix 1.

### 4.1. Data practices in LATAM universities

Table 4 reports the main findings regarding the existence of data practices in LATAM. These findings indicate that all stakeholders acknowledge the existence of data-based actions, either to support T&L or to inform managerial practices.

Table 4. Main findings regarding the existence of data practices in LATAM universities (see supporting data in <http://bit.ly/2R5CLqo>)

Findings	Qualitative and quantitative results	Supporting data
Finding 1. Students and teaching staff report the existence of data-based actions to support T&L, besides having high expectations on the benefits that these actions might have to better understand T&L practices.	<ul style="list-style-type: none"><li>- 52% of coding references obtained from focus groups with students regarding existing policies alluded to data-based actions (32 out of 61), and 81% of those references alluded to emerging uses of data to support T&amp;L (26 out of 32).</li><li>- 57% of students survey respondents agreed with the affirmation ‘In reality, the teaching team will be able to provide me with information and support based on the results obtained through the analysis of my educational data’.</li><li>- 64% of coding references obtained from focus groups with teaching staff regarding existing policies alluded to data-based actions (41 out of 64), and 76% of those references alluded to emerging uses of data to support T&amp;L (31 out of 41).</li></ul>	<ul style="list-style-type: none"><li>Student focus groups (see coding references in Appendix 1)</li><li>Student survey results presented in Appendix 2 (‘teacher feedback’ item)</li><li>Staff focus groups (see coding references in Appendix 1)</li></ul>

Findings	Qualitative and quantitative results	Supporting data
	- 51% of staff survey respondents agreed with the affirmation 'In reality, the analysis of educational data will allow me to better understand the learning process of my students and their academic results.'	Staff survey results presented in Appendix 2 ('understanding learning' item)
Finding 2. Managers report the existence of procedures to collect educational data to inform managerial practices.	- 65% of coding references obtained from interviews with managers about existing policies alluded to data collection and data access (108 out of 165).  - 55% of coding references obtained from interviews with managers about existing data-based actions to inform managerial practices (90 out of 165), and 45% of them alluded to emerging uses of data to support T&L (75 out of 165).	Interviews with managers (see coding references in Appendix 1)  Interviews with managers (see coding references in Appendix 1)

Finding 1 shows that both students and teaching staff report the existence of emerging data-based actions to support T&L. These actions use educational data to: (1) provide students with the adequate feedback to help them succeed; and (2) implement peer-evaluation strategies for providing students with cross-feedback. Moreover, both stakeholder groups have high expectations regarding the use that their universities can give to educational data to better understand learning results. During focus groups, students referred to examples of how teaching staff have used educational data to inform them about their learning process:

I have noticed that there has been a couple of teachers who... if someone consistently underperforms, or even — if someone has performed well but underperforms in one lesson — they approach students and talk to them. (Student, U3)

During staff focus groups, teachers also referred to examples of how they have used educational data to monitor student learning:

We implemented a peer-evaluation strategy (...) that we called cross-feedback; the teaching team evaluates a student report. In addition, this report is evaluated by another student (...) It is fantastic for feedback for two reasons: students compare two assessment processes, and the teaching team validate their feedback with the one delivered by a student. (Teaching staff member, U1)

Unlike students and teachers, managers mentioned another opportunity to leverage educational data: informing managerial practices related to academic counselling and course planning (Finding 2). During interviews, managers explained how they use educational data in existing academic processes within their institution:

Every semester we distribute the student satisfaction survey to all the students who work in an area. We ask what service they used and how they would evaluate that service. For example, if a student came to academic counselling, we asked the student whether the counselling fulfilled its purpose or not. (Manager, U2)

#### 4.2. Data policies in LATAM universities

Table 5 reports the main findings regarding the existence of data-related policies in LATAM universities. These findings indicate that all stakeholders have experienced data-related challenges to access critical information for decision-making, besides perceiving policy-related challenges to ensure informed consent and data privacy.

Table 5. Main findings regarding the existence of data policies in LATAM universities (see supporting data in <http://bit.ly/2R5CLqo>)



Findings	Partial results	Support data
Finding 3. Students, teaching staff, and managers have experienced data-related challenges to access critical information for decision-making.	- 48% of coding references obtained from student focus groups alluded to data-related challenges in relation to accessibility (15 out of 31).	Student focus groups (see coding references in Appendix 1)
	- 36% of students survey respondents agreed with the affirmation 'In reality, the services associated with the use of educational data will be used to promote decision making by students.'	Student survey results presented in Appendix 2 (student decision-making item)
	- 66% of coding references obtained from staff focus groups alluded to data-related challenges in relation to accessibility (21 out of 32).	Staff focus groups (see coding references in Appendix 1)
	- 37 % of staff survey respondents agreed with the affirmation 'In reality, I will be able to access the data of any student who is in a program.'	Staff survey results presented in Appendix 2 (data access item)
	- 30% of coding references obtained from interviews with managers alluded to data-related challenges in relation to accessibility (34 out of 113), and 33% of them alluded to challenges regarding data integration (37 out of 113).	Interviews with managers (see coding references in Appendix 1)
Finding 4. Students, teaching staff and managers perceived that there are policy-related challenges to ensure informed consent and data privacy.	- 59% of coding references obtained from student focus groups alluded to issues on consent and privacy (29 out of 49).	Student focus groups (see coding references in Appendix 1)
	- 38% of student survey respondents agreed with the affirmation 'In reality, the university will request my consent to collect, use and analyse any of my educational data.'	Student survey results presented in Appendix 2 (collection and analysis item)
	- 57% of coding references obtained from staff focus groups alluded to issues on consent and privacy (26 out of 46).	Staff focus groups (see coding references in Appendix 1)
	- 34% of staff survey respondents agreed with the affirmation 'In reality, the teaching team will have the obligation to support the students if the analysis of the students' educational data shows that they have low performance, are at risk of being suspended, or that they can improve their learning.'	Staff survey results presented in Appendix 2 (obligation to act item)
	- 52% of coding references obtained from interviews with managers alluded to issues on consent and privacy (43 out of 82).	Interviews with managers (see coding references in Appendix 1)

Data-related challenges vary depending on the stakeholder (Finding 3). First, students who participated in focus groups pointed out the need for more information about grading and course approval:

I believe that something that is also missing is data and statistics. For example, if you have a class and many people are failing it, it would be good to know why, what the most difficult thing about that course is. (Student, U1)

Second, teaching staff members who participated in staff focus groups raised the need for more data about student characteristics and behaviour throughout the semester to provide students with timely support:

Like the special needs a student has or when students have problems. We may not be experts, but it would be good to know that a student has a problem to treat him or her in a special way, but not at the end of the semester (Teaching staff member, U2).

Third, managers who participated in the interviews mentioned the need for improving reporting systems:

Our reporting system is very rigid, yes, the report does not offer greater features to select certain information that could be relevant, or to choose certain selection criteria. I think that this is a topic we should still work on a lot in terms of systems. I think that's why ... we should give the user, that has the right credentials, the ease to generate reports that are somehow flexible, or that allow me to select a greater number of criteria. (Manager, U3)

Besides data-related challenges, stakeholders indicated policy-related challenges that hinder the responsible use of educational data (Finding 4). During focus groups, students argued that existing processes for data protection do not account for consolidated policies to ensure informed consent and transparency:

Personally, I would like to know what kind of data is shared and with whom. Because when you sign an informed consent, it is very general, and they also tell you that if you do not sign that paper you cannot enrol in the program. (Student, U2)

During staff focus groups, teachers claimed the need to ensure both data transparency and protection:

I think there is information that should be public, and another should require consent. We must define what... For example, my education and work experience, that is fine to be public. But, health issues, sexual orientation, religion... that kind of information should be confidential (Teaching staff member, U4)

In this regard, managers who were interviewed confirmed the lack of policies to ensure informed consent, and the need to improve data protection procedures:

There is no consent in that regard. We deliver the information depending on the requirement of the university and for higher level organizations (...) which little by little are requesting more information, that we would not necessarily have considered initially. (Manager, U3)

## **5. Discussion, implications, and conclusions**

This study contributes to LA research by presenting the perspectives of different stakeholders regarding the use of educational data in four LATAM universities. Existing data-based actions and policy gaps emerged from the analysis of the quantitative and qualitative evidence collected from students, teaching staff, and managers. These findings are relevant for future adoption of LA services, since they help to identify opportunities and challenges that LATAM universities face when collecting, analysing, and reporting data about learners and their contexts.

Regarding existing data-based actions, two main findings were obtained from triangulating quantitative and qualitative data. First, managers report the existence of procedures to collect educational data to inform program-level processes, such as providing students with academic counselling (Finding 2). Second, students and teaching staff report the existence of course-level actions informed by educational data, such as providing students with peer reviewed feedback or monitoring academic performance (Finding 1). According to Pistilli & Heileman (2017), existing data-based actions generate the opportunity to integrate LA services—both at a program- and course-level. Moreover, these actions help LA researchers to identify actual institutional needs that could be met with the design or adaptation of existing LA services. Considering data-based actions mentioned by stakeholders in this study, LA researchers should develop LA services for: (1) visualizing the correlation between students' grades and class-attendance; (2) integrating student demographics with performance to identify students at risk; and (3) facilitating peer-evaluation and cross-feedback. All these services require an integration of student-level data (e.g. socio-economic context), course-level data (e.g. grades), and program-level data (e.g. study plans) (Cobo & Aguerrebere, 2018).

However, data integration is one of the most challenging aspects for LA adoption (Greller & Drachsler, 2012), and the four LATAM universities involved in this study are no exception. Regarding data-related challenges and policy gaps, two main findings emerged

from this study. First, all stakeholders who participated in this study have experienced challenges to access relevant information for their decision-making (Finding 3). All key stakeholders mentioned data that appeared to exist, but not readily available to them. Students referred to problems of accessing course grades as early feedback, teaching staff referred to problems of accessing student demographics to determine whether a student needs extra help, and managers referred to problems with reporting systems. According to prior work, Learning Management Systems are not often used to provide students with grades and detailed feedback given the difficulties that staff face when using the functionalities and integrating data (Pontual Falcão et al., 2019). This confirms the need for reliable information system to integrate educational data in LATAM universities claimed by Lemaitre (2017).

Another challenge that was identified in this study is the lack of policies to ensure informed consent and privacy (Finding 4). Moreover, key stakeholders claimed the need for informed consent policies and data transparency, in order to know how their data is going to be used, and for what purposes. These policy gaps are partly explained by the fact that institutions have not necessarily implemented their own data protection policies due to the lack of, or need to renew, the constitutional rights and data protection laws in LATAM (Cobo & Aguerrebere, 2018; Villan, 2019). However, this is not the case for every LATAM university, so the design of these type of policies should consider contextual differences that influence individuals' attitudes towards privacy and protection of personal data (Pontual Falcão et al., 2019). Still, practitioners and researchers could follow existing guidelines for LA adoption in LATAM, adopting technical and ethical considerations that are relevant for their context (Pérez-Sanagustín et al., 2018).

In regards to this study, different stakeholders confirmed the availability of educational data to support evidence-based interventions in four LATAM universities (Ferreira et al., 2017; Lemaitre, 2017). These findings serve to identify existing data-based actions and policy gaps that create opportunities and challenges for LA adoption. Regarding data-based actions, this study describes different ways that key stakeholders use educational data in real-life scenarios. By scenarios, we mean student support interventions and peer evaluations. In this context, LA researchers should design or adapt existing LA services that could support interventions in those scenarios, such as visualizations that display different course-level variables (e.g. attendance, grading, peer evaluation scores), or reporting systems that display student demographics along with program-level variables (e.g. study plan, number of courses passed).

Regarding policy gaps, this study presents stakeholders' perspectives concerning the difficulties to access and protect educational data. On the one hand, stakeholders indicated that universities lack reliable information systems to integrate the type of educational data that is commonly used in LA services, such as student grades or student demographics. On the other hand, they indicated that there is a lack of policies to ensure informed consent and data transparency, regardless of their interest to know who accesses their data and for what purpose. In order to overcome these challenges, we recommend that LATAM universities:

- Install valid and reliable information systems to integrate data that is currently stored and managed separately (e.g. classroom attendance, course grading, and student demographics),
- Consult existing regulations and codes of practice to design and implement data protection policies, having in consideration the Brazilian General Data Protection Law enacted in 2018, the amendment of the Chilean Data Protection Law

(adopted also in 2018), and the European GDPR (Villan, 2019). Further ethical guidelines are also presented in the LALA Framework developed by Pérez-Sanagustín et al. (2018).

Considering that all higher education systems in LATAM share common needs, such as improving program quality and reducing dropout rates, the findings of this study could inform regional actions for institutional adoption of LA services. The first step implies implementing data protection policies and procedures in LATAM universities to ensure informed consent and transparency in the collection, analysis and reporting of educational data. The second step implies exploring existing LA services to support data-based actions described in this study, including the delivery of timely feedback to students. Future work may build on these two steps, taking advantage of existing initiatives to build capacity for LA adoption in the region.

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## 7. Statements on open data, ethics and conflict of interest

Data used for supporting study findings can be accessed in the following link <http://bit.ly/2R5CLqo>.

This study was conducted under a protocol approved by the ethical commission of the Pontificia Universidad Católica de Chile (protocol identifier number 180325003), in accordance with the ethical standards of the other institutions participating in this study. Identifiable data was removed by research assistants who signed confidentiality agreements, and the analysis of the data was performed after identifiable data had been removed.

The authors have no conflicts of interest to declare in relation to this work.

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