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Identifying needs for learning analytics adoption in Latin American universities: A mixed-methods approach

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Identifying Needs for Learning Analytics Adoption in Latin American Universities: A Mixed-Methods Approach

Learning Analytics (LA) is perceived to be a promising strategy to tackle persisting educational challenges in Latin America, such as quality disparities and high dropout rates. However, Latin American universities have fallen behind in LA adoption compared to institutions in other regions. To understand stakeholders' needs for LA services, this study used mixed methods to collect data in four Latin American Universities. Qualitative data was obtained from 37 interviews with managers and 16 focus groups with 51 teaching staff and 45 students, whereas quantitative data was obtained from surveys answered by 1,884 students and 368 teaching staff. According to the triangulation of both types of evidence, we found that (1) students need quality feedback and timely support; (2) teaching staff need timely alerts and meaningful performance evaluations, and (3) managers need quality information to implement support interventions. Thus, LA offers an opportunity to integrate data-driven decision-making in existing tasks.

Keywords: Learning Analytics; Latin America; Higher Education; Stakeholder Perspectives; Institutional Adoption; Mixed Methods

1. Introduction

Latin American universities and colleges have an urgent need to foster student persistence and improve quality assurance (Cobo & Aguerrebere, 2018; Ferreyra, Avitabile, Botero Álvarez, Haimovich Paz, & Urzúa, 2017; Knobel & Bernasconi, 2017). To address these challenges, some researchers have suggested building capacities for Learning Analytics (LA)[1] in the region, so higher education systems can use educational data to improve learning outcomes (Cobo & Aguerrebere, 2018; Lemos dos Santos, Cechinel, Carvalho Nunes, & Ochoa, 2017; Maldonado-Mahauad et al., 2018). From current practice in the UK and other developed countries, researchers have argued that LA could become a valuable strategy for boosting retention rates, reducing quality disparities, optimizing resources, monitoring skill development, and increasing the number of graduates (Gasevic, 2018; Sclater, Peasgood, & Mullan, 2016). Thus, it is anticipated that LA could provide potential solutions to address similar educational challenges in Latin America and other developing countries (Gasevic, 2018; Sclater et al., 2016).

However, the early LA promise of optimizing learning and its environments has not been completely fulfilled. So far, there is limited evidence that demonstrates the impact of LA services on learning results, teaching and learning processes, and institutional decision-making (Ferguson et al., 2016; Gasevic, Jovanović, Pardo, & Dawson, 2017; Macfadyen, Dawson, Pardo, & Gasevic, 2014), even in regions where researchers have made more progress in the development of LA services (i.e. North America, Europe and Australia) According to Gasevic (2018), the availability and deployment of LA tools and methods does not guarantee institutional benefits if LA adoption is not closely integrated with learning design at a classroom level, and with decision-making processes at an institutional level (Gasevic, 2018). To benefit from LA adoption, some universities have started to strategically

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[1] LA: Learning Analytics

plan for leveraging educational data on a large scale, but these institutions are only a handful (Colvin, Dawson, & Fisher, 2015; Colvin, Dawson, Wade, & Gasevic, 2017).

To overcome challenges for LA adoption, researchers have proposed several frameworks and instruments to guide the deployment of LA tools and methods in Europe, North America and Australia (Colvin et al., 2017; Dawson et al., 2018). Although this work has allowed researchers to identify key dimensions that generally affect the adoption of LA services (Dawson et al., 2018), there are still complex siloes, conflicting leadership agendas, and a wide variety of issues that are specific to each institution (Zilvinskis, Willis, & Borden, 2017). In the light of the complexity of higher education contexts, the SHEILA (Supporting Higher Education to Integrate Learning Analytics) project produced a number of materials for engaging key stakeholders and formulating policies for LA adoption in European universities (Tsai et al., 2018). These materials include protocols for conducting surveys, interviews and focus groups to explore stakeholder needs for LA services, along with other aspects such as culture and existing capabilities for LA adoption. As the interest in LA grows in Latin America, these materials could be helpful if they are adapted to explore needs for LA services from the perspective of various stakeholders.

While the SHEILA protocols analysed various themes related to LA adoption (Tsai et al., 2018), this paper focuses on identifying *needs of students, teaching staff, and managers from Latin American universities in terms of LA services*. Considering that the maturity levels of LA adoption in Latin America fall far behind Europe, we adapted the SHEILA protocols to the local context of four Latin American universities affiliated to a large-scale project to build capacity for the design and implementation of LA tools in the region (LALA project: https://www.lalaproject.org/). As a result of adapting these protocols, we collected qualitative data by means of semi-structured interviews with 37 senior managers, and 16 focus groups with 51 teaching staff and 45 students respectively. We also collected quantitative data by conducting a student survey and a staff survey, which attracted responses from 1,884 students and 368 teaching staff. While qualitative data was used to identify needs, quantitative data provided complementary information about expectations of LA adoption from a larger population. Thus, we triangulated both types of data to determine stakeholders' needs for LA services.

To the best of our knowledge, this paper is the first effort to provide empirical evidence about educational challenges and needs for LA adoption from the perspectives of higher education stakeholders in Latin America. First, this paper presents a literature review on current challenges in higher education systems in the region, followed by an analysis of the needs for LA tools and methods to address these challenges. Then, the paper illustrates how mixed methods were used to identify needs of each stakeholder. Based on these findings, we discussed considerations and recommendations for LA adoption in the Latin American region.

2. Literature review

Latin American universities have started to measure and optimize teaching and learning processes through LA, but these attempts are still on a small scale (Lemos dos Santos et al., 2017). Additionally, the region lacks a community to exchange ideas, methods, and tools because of the limited availability of experienced researchers in this field (Cobo & Aguerrebere, 2018; Lemos dos Santos et al., 2017). To make a timely contribution for scaling LA adoption in Latin America, we first present an overview of current challenges of higher education in the region, followed by an analysis of the needs for LA tools reported in the

literature.

2.1. Current challenges of Higher Education in Latin America

The first universities in Latin America were founded in the early 1500s and its role was to educate a tiny elite of the Spanish colonies (Reisberg & Altbach, 2018). However, this role started to shift at the beginning of the twentieth century, when the first democratic government in Argentina implemented the Córdoba University Reform in 1918 (Knobel & Bernasconi, 2017). Further reforms started in Chile at the onset of the 1980s, which were later adopted in Argentina, Mexico, Peru and other countries (Bernasconi & Celis, 2017). These reforms expanded enrollment, along with creating new higher education institutions and programs (Bernasconi & Celis, 2017; Ferreyra et al., 2017). As a consequence, college access grew dramatically in the early 2000s, and particularly for those students from middle and low-income segments (Ferreyra et al., 2017). Most of these 'new students' enrolled in new private programs, relying on the recent growth of middle-class family income, student loans and scholarships (Ferreira et al., 2013).

Although the coverage expansion of higher education systems was crucial for knowledge production and social mobility, it generated major challenges regarding quality and equity. In order to address these challenges, Latin American governments have implemented quality assurance policies to reinforce minimum input requirements — such as faculty qualifications, curricula criteria, and infrastructure regulations (Bernasconi & Celis, 2017; Ferreyra et al., 2017). One of the most widely studied policies has been quality assurance system implemented in Chile in 2006 (Cancino & Schmal, 2014; OECD, 2012). As a consequence of this policy, most Chilean universities had voluntarily undergone an accreditation process by 2010. However, the number of years and accredited programs for each institution confirmed the existence of broad quality disparities, rather than reducing them (Cancino & Schmal, 2014; OECD, 2012). That same year, Ecuador implemented a new higher education law to define quality regulations for existing and emerging institutions (Edenfield, 2016; Johnson, 2017), besides making public universities tuition-free. Although more research is needed to understand how Ecuadorian universities are coping with this new law (Johnson, 2017), studies already reveal that quality and equity problems have not been fully resolved in this or other countries in the region (Edenfield, 2016; Ferreyra et al., 2017).

Therefore, the deployment of governmental reforms has not solved the challenges generated by expansion of higher education enrolment in Latin America (Bernasconi & Celis, 2017; Knobel & Bernasconi, 2017). Youth from the top income quintile are more likely to gain access to high quality education, while youth from the bottom quintile are less likely to graduate (Ferreyra et al., 2017). These disparities between students from different socioeconomic backgrounds have raised public concern to this day, considering that low-income students are still the ones at higher risk of dropping out and being disfavoured by disparities in lifetime earnings (González-Velosa, Rucci, Sarzosa, & Urzúa, 2015). Furthermore, the need for stronger regulations led to student movements in Chile, Colombia and Mexico in 2011 (Bernasconi & Celis, 2017), and recent budget cuts and austerity measures led to student protests in Ecuador, Argentina, and Colombia (Telesur, 2018).

In order to prevent future political conflicts, higher education in Latin America has the urgent need to solve disparities in program quality, reduce dropout rates, and bridge the gaps in existing regulatory policies (Cobo & Aguerrebere, 2018; Ferreyra et al., 2017). In this context, LA services are seen as an opportunity to tackle persisting problems in the region from an innovative perspective (Cobo & Aguerrebere, 2018). However, empirical studies on

needs for LA services are required to understand what tools and methods are useful for different stakeholders, particularly students, teaching staff, and manager. Thus, this study aims to identify needs of stakeholders in Latin American universities that are at a starting point for LA adoption.

2.2. Needs for LA adoption

Latin American universities could implement LA services to tackle persisting educational challenges, such as disparities in learning outcomes between students from different socio-economic contexts (Cobo & Aguerrebere, 2018; Gasevic, 2018). However, current evidence of the impacts of LA in terms of transforming how higher education institutions support learning processes is yet to be observed (Gasevic et al., 2017; Viberg, Hatakka, Bälter, & Mavroudi, 2018). Most studies have concentrated on the design and implementation of LA tools and methods to monitor learning outcomes (Ferguson et al., 2016; Ifenthaler, 2017), while few of them have analysed how stakeholders may benefit from adopting those tools and methods in their everyday practice (Ferguson et al., 2016)

In recent years, several studies have documented the development of dashboards about student learning characteristics and patterns (Bodily & Verbert, 2017; Jivet, Scheffel, Specht, & Drachsler, 2018), in order to make learning experiences more personal and engaging (Ifenthaler, 2017; Wong, 2017). Researchers argue that these dashboards provide students with insightful data to reflect on their learning results, besides allowing teaching staff to identify students that might be at risk (Bodily & Verbert, 2017; Sclater et al., 2016; Wong, 2017). Thus, timely support interventions are expected from the implementation of these type of tools, in order to improve course completion and retention rates (Avella, Kebritchi, Nunn, & Kanai, 2016; Sclater et al., 2016). Still, most studies have focused on evaluating a dashboards' usefulness and ease of use as perceived by its users, rather than on whether the dashboard brings any benefit to the teaching and learning process (Avella et al., 2016; Jivet et al., 2018).

Other LA solutions have been proposed to support academic planning and curriculum decision-making from the perspective of different higher education stakeholders (Ochoa, 2016). Concerning students, LA tools provide individual visualizations of competency attainment to promote help-seeking behaviours (Pistilli & Heileman, 2017). Concerning teaching staff, LA tools provide curriculum mapping visualizations to improve scaffolding of instructional resources and assessment methods (Ifenthaler, 2017; Pistilli & Heileman, 2017). Concerning managers, LA services help them to identify crucial courses in a curriculum, in order to optimize resource allocation to support students' needs, besides facilitating the collection of evidence for accreditation agencies and policy makers (Ifenthaler, 2017).

Regardless the fact that LA is still an evolving field of research and practice, limited evidence has been provided to understand how the potential benefit of LA services has been transferred to higher education practices (Ferguson et al., 2016; Viberg, Hatakka, Bälter, & Mavroudi, 2018). Moreover, a smaller number of studies have addressed the ethical implications of using these services at an institutional context (Viberg et al., 2018), despite the fact that early efforts in this field acknowledge the importance of ethical integrity in the deployment of analytical tools and methods (Buckingham & Ferguson, 2012). Consequently, more empirical evidence is required to understand the needs, barriers and challenges of using LA tools to support teaching and learning processes from the perspective of students, teaching staff and managers (Ferguson et al., 2016; Viberg et al., 2018). Along these lines,

this paper presents empirical evidence of the perspectives of these stakeholders on potential uses for LA services in Latin American universities.

3. Methods

3.1. Research design and objectives

This paper is part of the first phase of a large-scale project that aims to build capacity to design and implement LA tools in Latin America (LALA project-https://www.lalaproject.org/). The research question addressed in this paper is: *What are the educational needs for LA adoption in Latin American universities from the perspective of students, teaching staff and managers therein?* To answer this research question, we adopted a mixed convergent-parallel approach to complement qualitative information obtained from a small sample with quantitative results obtained from a larger number of individuals (Creswell, 2012). In order to build upon existing work for collecting stakeholders perceptions related to LA adoption, we decided to adapt the materials produced by the SHEILA project to the Latin American context (accessible at https://sheilaproject.eu/sheila-framework/). Specifically, we adapted the focus groups and interview protocols to collect qualitative data, and the student and staff survey protocols to collect quantitative data. Then, we triangulated the results of the qualitative and quantitative data analysis to deepen our understanding of the needs for LA services in this context. This process consisted of contrasting evidence obtained from the different stakeholders that participated in this study (students, teaching staff and managers), and from the different sources of data (focus groups, interviews, and surveys) (Creswell, 2012). Further details about the adaptation of SHEILA protocols is detailed 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) (see further details about the four institutions via the link: http://bit.ly/2OpB2va). Not only this universities differ in size, type of administration, and year of foundation, but also represent contrasting higher education systems. On the one hand, the Chilean system has been carefully observed and mirrored by other Latin American governments (Torres & Schugurensky, 2002), on the other hand, the Ecuadorian system has received little attention from researchers and governmental agents from other Latin American countries (Jameson, 1997; Johnson, 2017).

In these two contrasting contexts, 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). In this study, redundant information was reached when repetitive ideas were collected about potential needs for LA services from an administrative perspective.

************************************Table 1**********************************

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, the percentage of respondents who had eight or

more years of teaching experience ranged between 34% and 67%, despite the fact that assistant professors were overrepresented compared to universities' faculty statistics.

**********************************Table 2**********************************

3.3.   Qualitative data collection and analysis

To collect qualitative information, we adapted the SHEILA protocols by revising its Spanish version (see English version of the adapted protocol in http://bit.ly/2OjnwJo). First, we had to change the term 'Learning Analytics' for 'educational data analysis' because the LA concept is not widely known in Latin American universities. Second, we had to rephrase all questions about feedback and interventions based on LA services. We had to include expressions such as 'data-based feedback' and 'data-based actions', besides adding questions about 'academic uses of data'. Third, we had to remove all questions about existing LA projects and strategies due to the limited availability of LA services and research experiences at each university. This implied modifying most of the protocol questions for managers, and removing the questions about educational support in the staff survey protocol. Finally, we had to include some words and expressions that are commonly used in Chile and Ecuador, in order to make sure that interviewees understood all protocol questions.

One researcher per university was responsible for conducting the semi-structured interviews and focus groups under the informed consent of the participants. Managers were interviewed individually in 30-minute sessions, whereas teaching staff and students were interviewed in separate focus groups, each one lasting for an hour (see participation and sample in Table 1). The audio files obtained from interviews and focus groups were transcribed verbatim. Its analysis was conducted by four researchers, one per university, who summarized interview and focus groups responses into a spreadsheet to develop the first version of a coding scheme. Then, they conducted four rounds of coding practices in NVivo Pro 12, until they obtained moderate to satisfactory Kappa's coefficients for all categorical nodes, ranging between 0.55 and 0.99 (McHugh, 2012). In each round, all researchers worked on the same transcript. Throughout the four rounds, they worked with transcripts from the four universities and from the different stakeholders who participated in this study. The final coding was also conducted in NVivo Pro 12, using the coding scheme presented in Table 3. After the final coding practice, a matrix query was obtained to compare the percentage of coding references obtained from students, teaching staff, and managers in different categorical nodes. Additionally, quotes were extracted and translated to complement the analysis.

**********************************Table 3**********************************

3.4. Quantitative data collection and analysis

To collect quantitative data, we kept all questions included in the SHEILA student and staff survey protocols to avoid changing scales that have been already 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', making sure that the meaning of each survey item stayed the same (see adapted student survey protocol in http://bit.ly/2YGFmsd, and adapted staff survey protocol in http://bit.ly/2CRywXx).

Both student and staff survey protocols consisted of a 7-point Likert scale to measure both ideal and predictive expectations. These two scales were designed to explore expectations and experiences of stakeholders with LA services, in order to solve discrepancies between expectations and actual services (Whitelock-Wainwright, Gasevic, & Tejeiro, 2017). Thus, survey respondents had to report two scores for each item; one for ideal expectations and another one for the predicted expectations. Considering that this paper presents the first part of a large-scale project, we only used the scores reported for the ideal expectation scale as a proxy of student and staff preferences regarding LA adoption. Then, the quantitative analysis consisted in estimating the percentage of respondents who rated a high level of agreement with the statements of the ideal expectations scale in each survey (student scale items: http://bit.ly/2GpZ4RC, staff scale items: http://bit.ly/2K6OdNn). By high-level agreement, we considered respondent scores that were equal or higher than 6, taking into account that the scale ranged from 1 (strongly disagree) to 7 (strongly agree). We ranked ideal expectation items from the highest to the lowest percentage of respondents who agreed with the corresponding statement, in order to determine the predominant expectations of students and staff concerning LA adoption at their institutions.

4. Findings

Table 4 reports the five main educational needs for LA adoption in Latin American universities. The following sub-sections were organized to describe the needs of each stakeholder separately, despite the fact that all findings were based on the analysis of the information collected from the three of them.

************************************Table 4************************************

4.1. Needs of students

Regarding students' needs, we identified two main findings supported by qualitative and quantitative results. Firstly, students from all institutions pointed out the need for quality feedback and data-driven support from teaching staff to improve their learning results (Finding 1 in Table 4). On the one hand, qualitative results show that most of the coding references alluded to the need for quality feedback, over enhancing study skills and the learning environment (see Figure 1). By quality, students referred to timely and individualized feedback beyond the grading as a form of formative evaluation:

> Sometimes it is frustrating to have a good grade, without receiving feedback. You might have the maximum score, but I feel that there is always something to improve, as well as a feedback beyond the grade (Student, U2).

> I think (feedback) is not effective. In my faculty, every time someone fails, there are few teachers who care if we (students) are all going at the same pace or if someone is stuck. Besides grades, they do not give anything else. (Student, U4)

Moreover, data from students' surveys suggest that most students expect their educational data to be used to inform support interventions. The quantitative analysis shows that 88% of student survey respondents agreed with the statement, 'Ideally, 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' ('teacher feedback' item of the ideal expectations scale shown in Figure 2).

Secondly, students need timely support interventions from teachers and managers when they are facing difficulties that affect their academic performance (see Finding 2 in Table 4). On the one hand, qualitative results indicate that students perceived that they need more support when they are experiencing social-emotional problems that affect their class attendance. For example, two students from different universities highlight:

> If you notice that a student is acting weirdly in classes and it's something serious, the professor should notify the department where the psychologists work, so they could call the student - something like that. (…) Likewise, when a student is missing too many classes, they should act on that matter. (Student, U4)

> When students are at the risk of an academic dismissal, they give student representatives the information, who are the only person who communicates with these students. If students are officially at the risk of being dismissed, why does the university not communicate with the students? (Student U1)

On the other hand, data from the surveys suggested that students expect their educational data to inform support interventions. Over 80% of students survey respondents agreed with the statement, 'Ideally, the teaching staff will have the obligation to support me if the results obtained from the analysis of educational data show that my performance is below the average, that I am at risk of being suspended (…).' ('obligation to act' item of the ideal expectations scale shown in Figure 2).

4.2. Needs of teaching staff

Regarding teachers' needs, we identified two different findings. The first finding indicates that teaching staff need timely alerts from managers to provide better support to students who are experiencing difficulties (see Finding 3 in Table 4). On the one hand, qualitative data suggests that teaching staff have the willingness to support students throughout their academic studies, but to do so, they would expect some type of LA alert systems or information from managers when students are facing difficulties:

> I generally teach first-year engineering students, and there were plenty of things that caught my attention. For example, the school of engineering tracks students' performance, they asked me about the grades... and they intervene, they act, they talk to the student, they get support them. In my faculty, I was in the curriculum committee for many years and it happened that, suddenly, a student was at risk. I used to think, 'this student was very good when she was with me, what happened? I missed … a more institutional follow-up process. (Teaching staff member, U1)

> We have been working with the learning support unit to improve tutoring (…) We have evaluated the students' experience with the psychological services, because the students' self-esteem is one of the things most affected by failing a subject. Then, it is vital to give students psychological support as a positive reinforcement. This has more to do with the emotional wellbeing, rather than tutoring- and it ends up being more support in the academic area (Teaching staff member, U2)

On the other hand, most of the teaching staff feel that they have the obligation to use educational data to support their students if they are not performing as expected. This is supported by data from the staff surveys, in which 86% of respondents agreed with the statement, 'The university will provide support to the student as soon as possible if the analysis of the student's educational data suggests that he may be having some difficulty or problem.' ('early intervention' item of the ideal expectations scale shown in Figure 3).

********************************Figure 3********************************

The second finding about teaching staff indicates that they need meaningful performance evaluation of the quality of their teaching (see Finding 4 in Table 4). Qualitative results show that most of the coding references obtained from teaching staff alluded to their need for performance evaluations (Figure 4). During focus groups, teaching staff claimed they need meaningful information about their teaching practice, beyond surveys as student evaluations of teaching:

> I think the teacher survey could inform teaching, but the collective image is like… it does not influence teachers, it does not change your teaching, it does not change the promotion, it does not change anything, so why do you bother? It does not matter, teaching stays the same, the question is: For what? Does it make any sense? (Teaching staff member, U1)

> I believe student performance is also an indicator (of the quality of teaching). If no one participates in class, it would be very strange that it is because of the students' rather than the teachers. Personally, I think that you care when a group of students does not excel according to their grade or course performance (…) Maybe that shows us where we are failing, then that could be an indicator. (Teaching staff member, U4)

********************************Figure 4********************************

Besides, quantitative results in Figure 3 show that most teaching staff perceived that the quality of information obtained from the analysis of educational data relies on how easy it is to use for taking actions. Similarly, 87% of staff survey respondents agreed with the statement, 'Ideally, the information provided by the services associated with the use of educational data will be displayed in a comprehensible and easy to read format' ('format feedback' item of the ideal expectations scale shown in Figure 3). In other words, teachers demand actionable information in the form of "easy-to-use" feedback.

4.3. Needs of managers

Regarding managers' needs, the analysis indicates that they need quality and actionable information from staff to evaluate if support interventions are needed and how effective they are when implemented (finding 5 in Table 4). Figure 5 shows that, unlike both students and teaching staff, who mostly reported references on student support, managers alluded to their need for better information to evaluate support interventions. Some quotations reflect this need, claiming for more information about the teaching staff experience and workload to balance student support and teaching staff workload:

> It would be interesting to know what proportion of the teaching staff are also counsellors or tutors in each faculty. This would allow me to determine a common

standard, or to know why there is more in one faculty compared to others. For example, I ask myself, why in this more? Why he has more projects, fewer projects? Questions about the load of ... Then, I could manage how many students per teacher. I would like that kind of data. (Manager, U3)

I think there has to be a joint work to identify what is the information that can be practical, useful, and relevant; and how it could be delivered by the Offices for Institutional Analysis or the Academic Registry in a fluid way to the academic units, so they can make decisions or undertake actions, or interventions. (Manager, U1)

**********************************Figure 5**********************************

5. Discussion and considerations for LA services in Latin America

By triangulating the data collected from four different Latin American universities, we identified needs for LA services that have been previously documented in literature, regardless of the fact that this literature has been generated primarily outside of this region. First, students need quality feedback and timely support to improve their learning results (Findings 1 and 2 in Table 7), which could allow them to reflect on their learning results (Bodily & Verbert, 2017). Second, teaching staff need timely alerts to assist students enrolled in their classes, besides meaningful evaluations of the quality of their teaching (Findings 3 and 4 in Table 7) (Pistilli & Heileman, 2017). And third, managers need high-quality information to evaluate if support interventions are required and well-implemented (Finding 5 in Table 7), so they can allocate resources to support student needs (Ifenthaler, 2017). The fact that stakeholder's needs are associated to existing literature, opens a window of opportunity to integrate existing LA tools in current educational practices (Viberg et al., 2018).

Furthermore, the needs identified in this study could be addressed by adapting existing LA services to Latin American contexts. Concerning students' needs, current research shows that LA solutions have already been developed to provide students with feedback on their learning results (Bodily & Verbert, 2017). Concerning teaching staff needs, LA solutions have also been developed to help teachers to evaluate the effectiveness of their teaching practices. Existing LA solutions integrate different sources of educational data, such as student demographics and their interactions with Learning Management Systems, so teaching staff can reflect about their teaching based on students' characteristics and behaviours (Wong, 2017). And concerning managers' needs, there are LA solutions to evaluate when a support intervention is needed in a specific course when course-level results are impacting outcome attainment at a program level (Pistilli & Heileman, 2017). Along these lines, our findings not only suggests that LA solutions could be actually used to tackle persisting challenges in Latin America (Cobo & Aguerrebere, 2018; Gasevic, 2018), but also describe improvements needed in tasks that exist in most institutions, such as grading, tutoring, and resource allocation for student support services.

As a consequence, this study contributes to shifting LA research from tool development towards understanding stakeholder experiences with LA services. So far, most studies in Europe have focused on the supply side, documenting the design and development of analytical tools and predictive models that could potentially improve learning results (Ferguson et al., 2016). However, the potential benefit of these tools and models has not

necessarily been perceived by higher education stakeholders (Viberg et al., 2018), so recent efforts had to be invested in understanding LA adoption from a stakeholder perspective (Tsai et al., 2018). Considering that some lessons learned from existing research in Europe are transferrable to the Latin American context (Gasevic, 2018), researchers and practitioners from Latin American countries have to acknowledge this shift instead of reinventing the wheel. In light of our findings, we recommend other Latin American universities to engage stakeholders in a dialogical approach to increase their awareness about the existence of LA services, while the ability to design or adapt LA tools for improving student learning experiences grows in the region (Viberg et al., 2018).

This study was an intervention itself to generate expectations for LA services in students, teaching staff, and managers who participated in each research site. By collecting data from these stakeholders, we increased their awareness of how analytical methods and tools could be used to improve learning outcomes, particularly for students who are facing difficulties (Ferreyra et al., 2017). Now, it is a matter of time to start implementing LA services that meet stakeholder expectations, and evaluate if its implementation reduced quality disparities and dropout rates (Cobo & Aguerrebere, 2018). Considering that Latin American universities are characterized by resisting change (Knobel & Bernasconi, 2017), slow and incremental adoption of existing LA services might be preferable to integrate them into higher educational practice over the years (Viberg et al., 2018). Along these lines, our findings already describe existing tasks that could be benefited by the use of LA services, such as feedback provision, evaluations of teaching, and resource allocation for student support services. To trigger incremental change, institutional leaders and LA researchers should start by socializing our findings with students, teaching staff, and managers within their universities.

6. Limitations and future work

This study presents findings obtained from four flagship universities in Chile and Ecuador. These universities are relevant to the system as a whole by serving as benchmarks for student training, faculty evaluation, and research generation (Knobel & Bernasconi, 2017) However, we expect other institutions to analyse if our findings resonate with their contextual needs, in order to motivate data-driven strategies across the region. This is why similar studies and analysis should be done in other type of institutions and from different countries; not only to evaluate the extension of the findings of this study, but also to explore further themes related to LA adoption from the perspective of varied stakeholders – including ethical and privacy considerations (Buckingham & Ferguson, 2012; Viberg et al., 2018).

Future work has to be focused on needs findings and stakeholder involvement, to then adopt and evaluate the implementation of LA solutions to meet these needs at an institutional level (Gasevic & Dawson, 2015; Sedrakyan, Järvelä, & Kirschner, 2016). Research work has already invested efforts in tool development that does not necessarily meet user requirements (Ferguson et al., 2016). In Latin America, LA experts have already been working on a framework to involve stakeholders in iterative processes to adopt LA services, but a larger community of researchers is needed to test existing tools and exchange results (Cobo & Aguerrebere, 2018; Lemos dos Santos et al., 2017). By sharing tool deployment experiences, institutional leaders might be able to see the whole picture regarding what integrating LA into higher education practices.

7. Conclusions

This study expands current research about LA adoption in Latin America by contributing empirical evidence about the needs of different stakeholders for LA services. These needs are associated to existing processes in many universities and colleges, such as feedback provision and evaluations of teaching, which provide a convenient starting point to integrate data-driven strategies at an institutional level. It is important that institutions take into account the views of different stakeholders to contextualize our findings, so as to ensure that LA is implemented effectively and responsibly (Knobel & Bernasconi, 2017). Besides, the involvement of teaching staff and students is crucial to explore needs for LA services, and to evaluate if its adoption support their everyday practices.

Considering that the stagnant culture that has existed in higher education systems in Latin America has not solved persisting quality and equity issues, we believe that LA adoption is a promising opportunity to start a slow and incremental process with long lasting beneficial effects in terms of learning outcomes. From the perspective of students, teaching staff, and managers of Latin American Universities, LA is already perceived as promising tool to improve quality feedback and to inform timely support interventions. If these key stakeholders are already aware of the potential benefits of adopting LA services, we just need to convince more institutional leaders and researchers that they could address educational challenges in the region by leveraging existing educational data and LA services.

Declarations of interest: none

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

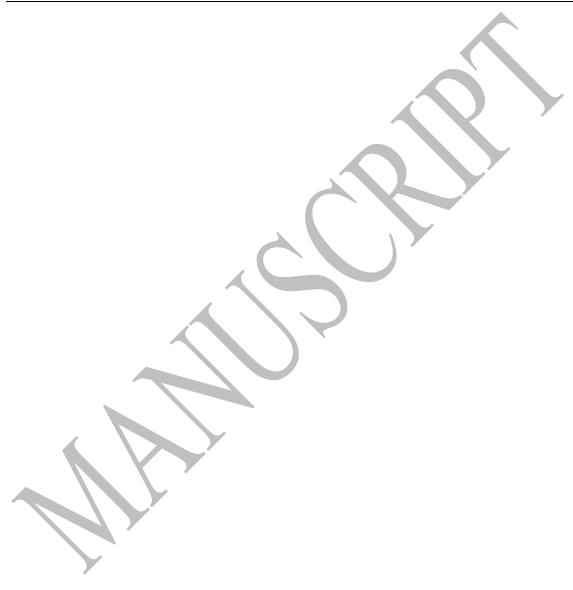|	U1	U2	U3	U4
Focus groups (FG) with students	2 FG (13 students)	1 FG (5 students)	2 FG (3 students)	3 FG (24 students)
Focus groups (FG) with teaching staff	1 FG (5 teachers)	2 FG (15 teachers)	2 FG (8 teachers)	3 FG (23 teachers)
Interviews with managers	7 managers	11 managers	8 managers	11 managers

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 students surveyed	878	228	205	573
Number of teaching staff members	1,265	753	960	1,158
Number of teaching staff surveyed	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 applied between January and May, 2018. The data obtained from each university was combined into one data set per stakeholder, having a total number of 1,883 and 368 responses for the student and staff survey respectively.

Table 3. Coding scheme to identify needs for LA adoption in focus groups and interview transcripts.

Category/Code	Description
Concerning students	
Learning environment	Students' needs for the adequate physical locations, contexts and cultural elements to learn.
Quality feedback	Students' needs for timely and individualized feedback to understand their learning process.
Study skills	Students' needs of study skills to address their learning process successfully (for example, time management).
Concerning teaching staff	
Course planning	Teachers' needs for information to revise course objectives, select and arrange course content, choose teaching or assessment methods, etc.
Performance evaluation	Challenges related to evaluations of teaching performance at an institutional level.
Student diversity	Teachers' needs to understand different subgroups of students (for example, first year students, students with special needs, students with different learning styles, etc.)
Teaching skills	Teachers' needs of pedagogical abilities, such as the ability to manage a class, to communicate effectively with the students, to create a proper learning environment, etc.
Concerning managers	
Curriculum management	Challenges faced by managers related to curriculum design, management and planning (e.g. course planning, assigning teachers to courses, mapping outcome development at a course level, etc.)
Information	Managers' needs to have further information to evaluate if particular remedial or improvement actions were successful, or the need to improve data collection and analysis for management decision-making and reporting.
Resources	Managers' needs for information to optimize existing resources such as time, budget, infrastructure, etc.
Student support	Managers' responsibilities to implement remedial actions to support students (for example, counselling)
Teacher support	Managers' responsibilities to implement remedial actions and timing to support teachers (mentoring, notifications, evaluation)

Table 4. Main educational needs for LA adoption according to data triangulation (see supporting data in http://bit.ly/2I6723N)

Findings	Qualitative and quantitative results	Supporting data
1. Students need quality feedback and data-driven support from teaching staff to improve their learning results.	- 72% of students' references about their needs for LA services alluded to quality feedback.	Student focus groups (see coding references presented in Figure 1)
	- 88% of students survey respondents agreed with the following statement of the ideal expectations scale 'Ideally, 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'	Student survey results presented in Figure 2 ('teacher feedback' item)
2. Students need timely support interventions from staff and managers when they are facing difficulties that affect their academic performance.	- 69% of the coding references obtained from students about managerial needs for LA services alluded to student support.	Student focus groups (see coding references presented in Figure 5)
	- 84% of students survey respondents agreed with the following statement of the ideal expectations scale 'Ideally, the teaching staff will have the obligation to support me if the results obtained from the analysis of my educational data show that my performance is below the average, that I am at risk of being suspended (…).'	Student survey results presented in Figure 2 ('obligation to act' item)
3. Teaching staff need timely alerts from managers to provide better support to students who are facing difficulties that affect their academic performance.	- 70% of the coding references obtained from teaching staff about managerial needs for LA services alluded to student and teacher support (38% and 32% percent respectively).	Staff focus groups (see coding references presented in Figure 5)
	- 86% of staff survey respondents agreed with the following statement of the ideal expectations scale 'The university will provide support to the student as soon as possible if the analysis of the student's educational data suggests that he may be having some difficulty or problem.'	Staff survey results presented in Figure 3 ('early intervention' item)
4. Teaching staff need meaningful and "easy-to-use" feedback about their performance and the quality of their teaching to inform their practice.	- 43% of staff references obtained about their needs for LA services alluded to performance evaluation, followed by managing student diversity (21%), addressing course planning (20%), and developing teaching skills (16%).	Staff focus groups (see coding references presented in Figure 4)
	- 87% of staff survey respondents agreed with the statement 'Ideally, the information provided by the services associated with the use of educational data will be displayed in a comprehensible and easy to read format'	Staff survey results presented in Figure 3 ('feedback format' item)
5. Managers need quality information from staff to evaluate support interventions targeted to students.	- 37% of managers' references about their needs for LA services alluded to information to evaluate support interventions, followed by information to optimize resources (22%).	Interviews with managers (see coding references presented in Figure 5)

Note: Qualitative results were obtained by counting coding references to estimate percentage of coding references in each category, followed by reading the coded content. Quantitative results were obtained by estimating the percentage of survey respondents that agree with the ideal expectations item by dividing the number of respondents who reported scores equal or higher than 6 by the total number of respondents, taking into account that the scale ranged from 1 (strongly disagree) to 7 (strongly agree). See further details in section 3.2.2.

Figure 1. Percentage of coding references alluding to students' needs for LA adoption.

Figure 2. Percentage of student survey respondents who agreed with statements that describe ideal expectations for LA adoption (revise student scale items in the following link: http://bit.ly/2YGFmsd).

Figure 3. Percentage of staff survey respondents who agreed with items that describe ideal expectations for LA adoption (revise staff scale items in the following link: http://bit.ly/2K6OdNn).

Figure 4. Percentage of coding references alluding to teaching staff needs for LA adoption.

Figure 5. Percentage of coding references alluding to managers' needs for LA adoption.