UNIVERSIDADE FEDERAL RURAL DE PERNAMBUCO

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Aligning Expectations About the Adoption of Learning Analytics in a Brazilian Higher Education Institution

Recife

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“Não tenha pena dos mortos, Harry. Tenha pena dos vivos, e, acima de tudo, daqueles que vivem sem amor.”

(Alvo Dumbledore)

Resumo

Learning Analytics (LA) consists of using educational data to inform teaching strategies and management decisions, aiming to improve students' learning. The successful implementation of LA in Higher Education Institutions (HEI) involves technical aspects and infrastructure and, but also, and very importantly, stakeholders' acceptance. The SHEILA framework proposes instruments for diagnosis of HEI for LA adoption, including stakeholders' views. In this paper, we present the results of the application of SHEILA's surveys adapted to the Brazilian context, to identify the most and least important aspects in the views of students and instructors, and compare their ideal and realistic expectations about the adoption of LA. Results confirm the high interest in using LA for improving the learning experience, but with ideal expectations higher than realistic expectations, and point out key challenges and opportunities for Latin American researchers to join efforts towards building solid evidence that can inform educational policy-makers and managers, and support the development of strategies for LA services in the region.

Palavras-chave: Learning Analytics, higher education, student expectations, instructors expectations.

Abstract

Learning Analytics (LA) consists of using educational data to inform teaching strategies and management decisions, aiming to improve students' learning. The successful implementation of LA in Higher Education Institutions (HEI) involves technical aspects and infrastructure and, but also, and very importantly, stakeholders' acceptance. The SHEILA framework proposes instruments for diagnosis of HEI for LA adoption, including stakeholders' views. In this paper, we present the results of the application of SHEILA's surveys adapted to the Brazilian context, to identify the most and least important aspects in the views of students and instructors, and compare their ideal and realistic expectations about the adoption of LA. Results confirm the high interest in using LA for improving the learning experience, but with ideal expectations higher than realistic expectations, and point out key challenges and opportunities for Latin American researchers to join efforts towards building solid evidence that can inform educational policy-makers and managers, and support the development of strategies for LA services in the region.

Keywords: Learning Analytics, higher education, student expectations, instructors expectations

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Lista de abreviaturas e siglas

LA	Learning Analytics
HEI	Higher Education Institution
LATAM	Latim America
LMS	Learning Management Systems
IT	Information Technology

Sumário

1 Introduction

Data analysis is a big step for business-growth and decision-making of any organization. The concept of Big Data, a term popularized in the 2000s, relates to large volumes of data, and was first presented in the report ”Data, data, everywhere: a special report on managing information”(CUKIER, 2010) in 2010. Over the last decade, the term has been widely used in data warehouses and business intelligence, but it has a much larger potential and is continually growing in various fields of human knowledge (TAURION, 2013). Hence Big Data, which would be an extensive set of information collected in a digital way and that needs a system capable of interpreting it, ended up bringing to the spotlight an area that could benefit from it: Education.

Learning Analytics (LA) has been increasingly used over the last few years, especially as the analysis of large masses of data became more accessible and popular (JOKSIMOVIĆ; KOVANOVIĆ; DAWSON, 2019). The Society for Learning Analytics Research defines the term as the ”measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs”(LONG et al., 2011). The implementation of these educational analysis in higher education institutions (HEI) can be seen as a service to optimize learning and its environments (WHITELOCK-WAINWRIGHT; GAŠEVIĆ; TEJEIRO, 2017). The amount of data available about students in HEI is growing fast: exam grades, duration and frequency of interactions with virtual learning environments, and discussions in forums, are some examples of very useful data sources used in educational analysis. LA has great potential to face important educational challenges, such as student drop-out, failure, and personalized feedback at scale (FERGUSON, 2012; PARDO et al., 2019).

In Latin America (LATAM), LA adoption is still timid compared to North America and Europe (CECHINEL et al., 2020; HILLIGER et al., 2020b). Still, the amount of data collected over the last years indicates that LATAM countries can implement LA strategies to target challenges in the educational system (COBO; AGUERREBERE, 2017), addressing known problems in the region like student dropout and program quality (FERREYRA et al., 2017; HILLIGER et al., 2020a). In Brazil, interest in LA is growing, particularly as online and blended learning expand, through the extensive use of Learning Management Systems (LMS) (CECHINEL et al., 2020). A large amount of data is produced daily by HEI students in Brazil, and the collection and analysis of this educational data can be crucial for the development of new strategies for improving teaching-learning processes.

However, LA implementation is not straightforward, and is highly dependent on context (TSAI et al., 2020; KOLLOM et al., 2021). Although interest in LA has grown considerably around the world (SIEMENS; DAWSON; LYNCH, 2013; COLVIN et al., 2015; VIBERG et al., 2018; TSAI et al., 2020), few studies specifically address the key role of contextual factors in implementing LA successfully at the institutional level (HILLIGER et al., 2020a). The SHEILA framework (Supporting Higher Education to Integrate Learning Analytics) (TSAI et al., 2018b) is the main such initiative, providing instruments to build a diagnosis of HEI in terms of several aspects that impact on the successful adoption of LA. As SHEILA is grounded in empirical research undertaken in the European context (TSAI et al., 2018b), the LALA project (Learning Analytics in Latin America) (MALDONADO-MAHAUAD et al., 2018) encourages local adaptations of its methods and instruments, aiming at generating a corpus of knowledge and contextual evidence for the region.

The SHEILA framework comprises dimensions that include political context, internal capacity, engagement strategy and learning frameworks (TSAI et al., 2018b). Perhaps most importantly, it recommends the identification of key stakeholders and the changes they desire. Stakeholder engagement and buy-in is one of the four main challenges for LA adoption, along with pedagogical grounding, resources, and ethics and privacy (TSAI et al., 2020).

As stakeholders diagnosis is very particular to regional specificities, including for example culture, bureaucracy, and social inequality, existing research based on SHEILA (TSAI et al., 2018b; TSAI et al., 2018a; TSAI et al., 2020) may not account for LATAM HEI. So far little is known about how stakeholders' opinions and behaviors impact LA adoption in the LATAM context.

We seek to address this gap by performing empirical research in a Brazilian HEI, generating evidence about stakeholders' opinions and perceptions that can guide LA implementation with maximized buy-in. Such collective effort in gathering empirical evidence has been pointed out by other LATAM researchers (HILLIGER et al., 2020a).

Qualitative findings from previous research indicate high interest of students and instructors in using LA for improving the learning experience, by providing personalized feedback, adapting teaching practices to students' needs, and making evidence-based pedagogical decisions (FALCAO et al., 2019; FALCÃO et al., 2020). In this paper, we complement qualitative evidence with quantitative data collected through SHEILA's survey instrument, which allows to investigate stakeholders' ideal and predicted expectations (WHITELOCK-WAINWRIGHT et al., 2019; KOLLOM et al., 2021). More specifically, we aimed to answer the following research questions: *What are the most and least important aspects regarding the adoption of LA, in the views of students and instructors? What are the differences and similarities between students' and instructors' ideal and*

predicted expectations about the adoption of LA?

In other words, our goal was to gain a wider understanding of the desires of students and instructors with regard to the use of LA, as compared to their perceptions considering the institutional context and the actual feasibility of LA successful implementation.

2 Method

2.1 Instrument

The instrument used for data collection was based on SHEILA's survey (WHITELOCK-WAINWRIGHT et al., 2019; KOLLOM et al., 2021), empirically tested and aiming for a diagnosis of HEI at scale, by providing a comparison between ideal and predicted (or realistic) expectations from the main stakeholders groups (students and instructors). We consider ideal expectations as desired outcomes based on the individual's hope, while predicted expectations are realistic beliefs about what is perceived as feasible. Together, they provide deeper understanding of stakeholders' perspectives, and allow identifying main areas to focus, with realistically expected topics being considered priority in service planning (WHITELOCK-WAINWRIGHT et al., 2019).

We translated the questionnaire to Brazilian Portuguese, making small semantic adaptations to fit the context of Brazilian HEI. We added a question to the student questionnaire about study profile (e.g. if they consider themselves hardworking, if they give up easily or are easily distracted), with the intention to bring insights and new data about the students involved in this study and whether this could provide any correlation with other findings. On the other hand, we removed a question about sharing the students data for a third party company as in Brazil it is not possible for public universities to share data with private companies. Questions from the adapted questionnaire for the instructors were maintained.

The questionnaire included a brief introduction to LA and the purpose of the study, asking for informed consent for participation. We also collected demographic information, such as age and gender, and educational data (course, study field, degree, among other information). The themes addressed by the survey were:

- **Data Privacy** (4 items for students): Whether the university is allowed to collect, use and analyze the data obtained from the students and for what purpose the institution may use these data.
- **Academic Progress** (6 items for instructors, 2 for students): What kind of information could benefit students and instructors helping to check on students' progress in the courses.
- **Feedback** (4 items for instructors, 3 for students): How students would like to receive feedback / what are the ways of giving feedback that instructors find the most appropriate.

- **Decision-making** (2 items for instructors, 1 for students): How educational data can help students and instructors take action upon problematic situations identified.
- **Intervention** (1 item for instructors, 1 for students): Whether the instructors or the institution should intervene when being notified by the system of a student at risk, and how this should be approached.
- **Training** (3 items for instructors): What kind of training for instructors will be provided for them to be capable of analyzing data effectively.

The items were formulated as statements with which the participant could agree or disagree through two 7-point Likert scales from total disagreement to total agreement, for ideal and realistic expectations separately.

2.2 Context and Participants

This study was undertaken in a HEI that offers face-to-face and online courses, with access to the same LMS (Moodle). While online courses occur fully through this platform, in the face-to-face courses the LMS is used as support to share materials, submit assignments and interact in online discussions.

The questionnaires were created using Google Forms, and sent through the university official communication channels, including social networks and emails lists from departments and direct contact with course coordinators. The survey had 241 participants from the HEI (192 students and 49 instructors), from various areas of knowledge and courses (online and face-to-face) (Tables 1 and 2). The higher number of participants from Information Technology (IT) courses is justified as the authors of this paper are from the IT field and had better reach in this area.

Tabela 1 – Overview of instructors

Major	Quantity
IT Related	26
Education	11
Mathematics and Statistics	5
Agrarian sciences	4
Others	3

Tabela 2 – Overview of students

Major	Quantity
IT Related	132
Education	45
Mathematics and Statistics	4
Agrarian sciences	2
Others	9

2.3 Data Analysis

In order to identify the most and least important aspects regarding the adoption of LA from the perspective of students and instructors (RQ1), we present the box plot graph, median rating score of each item, for ideal and realistic expectations.

In order to address RQ2, we compared ideal and realistic expectations from students and instructors. For this analysis, only participants inclined to agreement were considered, i.e. those who answered 5 to 7 in the Likert scale. We performed statistical analysis over this sample and we assessed the percentage of agreement in instructors' and students' responses (separately) and the comparison between ideal and realistic expectation. More specifically, we applied the McNemar test (LACHENBRUCH, 2014) that performs a statistical comparison of two related samples. In this analysis, we aimed to reach 95% of reliability.

3 Results

3.1 Important aspects regarding the adoption of LA

Instructors' responses are shown in the box plot in Figure 1. In the boxplot, the vertical lines mark the lowest, median and highest values; the outer limit of the boxes show the first and third quartiles; and the dots correspond to outliers. Overall, the responses from instructors show high ideal expectations about the adoption of LA in their institution, with less optimistic views about the viability in their current context (median rating scores between 5 and 6). Items regarding access to students' progress (Q4-I and Q5-I), university support on data analysis (Q7-I), understanding of data (Q11-I), learning profile (Q12-I) and visualization of learning performance (Q16-I) showed almost unanimously high ideal expectations. Some of these items also had the highest median ratings of perceived feasibility in the present context (Q4-I, Q5-I, Q11-I, Q12-I and Q16-I). The university support on data analysis (Q7-I) showed the biggest interval, with answers between 3 and 7, oscillating between agreement and neutrality.

From students' perspective, the ideal expectations are also high on the use of LA, but slightly lower compared to the instructors' expectations (Figure 2). For what students' expected as realistically applicable in their context, the median rating scores are between 5 and 7, i.e., higher values than those expressed through the instructors' views. Higher expectations from students were in items regarding consent for use of their educational data (Q2-S) and use of data for other purposes (Q5-S); accessing their educational progress (Q3-S) and educational goals (Q7-S). Q10-S, regarding intervention when analytics show that a student is at-risk of failing, shows the biggest gap between median ratings (3-7) and most likely oscillates from agreement to neutrality.

3.2 Ideal versus realistic expectations

Table 3 shows the results of the analysis of instructors' answers, where "n"refers to the number of participants inclined to agree with the item (having answered 5-7 in the Likert scale) and "%"is the percentage of the total number of participant instructors. For almost all items, there were significant differences between instructors' ideal and

Figura 1 – Box plot of instructors' responses

Figura 2 – Box plot of students' responses

realistic expectations, being the former higher. Only Q4-I and Q5-I showed similarity between expectation and reality, with high levels of agreement. These items were about being able to access students' data on courses instructors are teaching or have taught, indicating that instructors find this is viable in their present context.

Tabela 3 – Instructors' ideal and realistic expectations

	Ideal expectations		**Realistic expectations**		
Item	**n**	**%**	**n**	**%**	**p-value**
Q1-I	45	91.8	35	71.4	=0.006
Q2-I	44	89.8	29	59.2	< 0.001
Q3-I	44	89.8	35	71.4	=0.004
Q4-I	48	98.0	43	87.8	=0.063
Q5-I	47	95.9	42	85.7	=0.063
Q6-I	47	95.9	35	71.4	< 0.001
Q7-I	45	91.8	29	59.2	< 0.001
Q8-I	46	93.9	33	67.3	< 0.001
Q9-I	44	89.8	34	69.4	=0.002
Q10-I	43	87.8	31	63.3	< 0.001
Q11-I	47	95.9	37	75.5	=0.002
Q12-I	44	89.8	37	75.5	=0.016
Q13-I	46	93.9	33	67.3	< 0.001
Q14-I	42	85.7	27	55.1	< 0.001
Q15-I	43	87.8	31	63.3	< 0.001
Q16-I	46	93.9	37	75.5	< 0.001

Table 4 shows the results of the analysis of students' answers. Similarly, for almost all items, students' ideal expectations were higher than realistic expectations. The only item for which no significant differences were found was Q1-S (about the university asking for consent to use identifiable data like ethnicity, age and gender), indicating similarity between ideal and realistic expectation. Items Q2-S and Q10-S showed significant distance between ideal and realistic expectations, the ideal expectation having a ceiling effect bigger than other items, specially for Q10-S. Item Q2-S, about the university ensuring that educational data will be kept safe, had the highest ideal expectation. Item Q10-S, about instructors having the obligation to act if the analytics show students underperforming or at-risk of failing, had the lowest rating about realistic expectations.

Tabela 4 – Students' ideal and realistic expectations

	Ideal expectations		**Realistic expectations**		
Item	**n**	**%**	**n**	**%**	**p-value**
Q1-S	145	75.5	148	77.1	=0.678
Q2-S	162	84.4	149	77.6	< 0.001
Q3-S	158	82.3	135	70.3	< 0.001
Q4-S	138	71.9	127	66.1	=0.035
Q5-S	156	81.3	139	72.4	< 0.001
Q6-S	152	79.2	128	66.7	< 0.001
Q7-S	154	80.2	133	69.3	< 0.001
Q8-S	146	76.0	133	69.3	=0.011
Q9-S	145	75.5	126	65.6	=0.001
Q10-S	146	76.0	110	57.3	< 0.001
Q11-S	151	78.6	136	70.8	=0.001

4 Discussion

In this section, we discuss the survey results considering other research using the same instrument performed in other countries (HILLIGER et al., 2020a; KOLLOM et al., 2021; WHITELOCK-WAINWRIGHT et al., 2019), as well as considering our previous qualitative results from the same HEI using the SHEILA instruments for focus groups to investigate similar themes as the survey, but through deep discussions with a smaller amount of people (Pontual Falcão et al., 2019; FALCÃO et al., 2020).

Data analysis showed that instructors and students, overall, had positive views about the adoption of LA in their institution, which confirms results from other contexts (KOLLOM et al., 2021; WHITELOCK-WAINWRIGHT et al., 2019), and our previous findings (Pontual Falcão et al., 2019; FALCÃO et al., 2020). The survey results add that these stakeholders groups have ideal expectations higher than realistic expectations, i.e. they wish for LA to be implemented, but are unsure about its viability in a foreseeable future, considering the context of their institution. Previous research using the same survey instrument in other HEI (KOLLOM et al., 2021; WHITELOCK-WAINWRIGHT et al., 2019) also showed ideal expectations scale with a ceiling effect, with ideal expectations higher than the realistic, reinforcing the tendency of stakeholders' uncertainty about what can be achieved in their present context.

According to the survey, instructors are particularly interested in visualizing students' progress, learning profiles and performance, consonant with findings from the focus groups (Pontual Falcão et al., 2019; FALCÃO et al., 2020) previously performed, which indicated instructors' particular interest in: decreasing students' dropout; improving students' learning and their own teaching; and viewing students' progress. Although in the focus groups, instructors were somewhat reluctant about the access to and use of students' data (in line with other research findings (KOLLOM et al., 2021)), fearing that this could become intrusive, the survey shows that they consider access to student data viable, even at present (items related to this topic – Q4-I and Q5-I – showed similarity between ideal and realistic expectations). Meanwhile, they were less optimistic about the support they can get from the HEI to help them analyze and understand this data, and act upon it (Q7-I) (also previously identified in the literature as an important challenge (KOLLOM et al., 2021)).

According to the survey, students were also especially interested in visualizing their progress and keeping track of their learning goals. This is in line with qualitative findings, which indicate that students particularly support the adoption of LA with the purpose of improving their learning experience. The use of such educational data was of lit-

tle concern for students in the focus groups (Pontual Falcão et al., 2019; FALCÃO et al., 2020), but the survey indicates very high ideal expectations that the HEI will keep this data safe (Q2-S) (reinforced by previous similar results (WHITELOCK-WAINWRIGHT et al., 2019)). As for the use of personal data, students were more cautious, which was confirmed by the survey results, where asking for consent to use their data (Q1-S) appeared as an important aspect, and one that they considered rather feasible in their present context.

In the focus groups, students were interested in better feedback through the identification of weaknesses in their learning and suggestions to improve it (confirming findings in (HILLIGER et al., 2020a)), which is aligned with previous evidence that students need meaningful information about their progress to motivate them to improve and remain engaged (WHITELOCK-WAINWRIGHT et al., 2019). Students were in favor of the system alerting instructors early if they were at-risk of failing a course or could improve, but there were also reflections on their own responsibility for their learning. For their part, instructors in the focus groups mostly agreed with the obligation for teaching staff and/or HEI to take action when difficulties in students' learning are identified by LA methods, consonant with (HILLIGER et al., 2020a). However, in the survey, this same topic (Q14-I) presented a large difference between instructors' ideal and realistic expectations, and had the lowest ratings of agreement, indicating that instructors were in fact unsure about this obligation, as also identified in (KOLLOM et al., 2021). Students were also uncertain about the viability of instructors being obliged to take action when they are identified as underperformers or at-risk (Q10-S, lowest percentage of agreement and larger difference between ideal and realistic expectations).These somewhat contradictory findings reflect the hot topic still open to discussion, about the moral obligation instructors would have to act, versus students' need to be autonomous and responsible for their learning (KOLLOM et al., 2021; PRINSLOO; SLADE, 2017; WHITELOCK-WAINWRIGHT et al., 2019).

5 Conclusions, limitations and research directions

This study presented the findings of a survey aimed at investigating stakeholders' expectations on the adoption of LA in a Brazilian HEI, thus adding empirical evidence to the research efforts towards guiding the development of LA services in Latin America (HILLIGER et al., 2020a). Following qualitative research undertaken previously through focus groups, the present study aimed to complement evidence with a quantitative analysis that included a larger number of participants and a comparison between ideal and realistic expectations of key stakeholders.

The main limitation of the research is the small size of the sample, given that in the HEI, the population of the instructors and students is around 1.200 and 17.000, respectively. Additionally, a large part of the responses were provided by students and instructors from IT related courses, who are most likely to accept the use of new technologies in their context.

Our evidences and the related work within LALA and SHEILA projects, in Latin America (HILLIGER et al., 2020a) and globally (WHITELOCK-WAINWRIGHT et al., 2019)(KOLLOM et al., 2021), reinforce the importance of stakeholder buy-in for the successful implementation of LA services. Together, the empirical evidence collected so far by researchers reveal convergent findings, such as: the need for HEI to ensure all collected data is safely kept, within a transparent process with stakeholders' consent; the benefits that LA can bring to the learning process by shedding light on students' needs and making this visible for them and for the instructors; the desire students have for receiving timely and quality feedback; and the instructors' need for institutional support for helping them understand data and take effective action.

There are key challenges worth further investigation. Our study and other similar surveys (KOLLOM et al., 2021; WHITELOCK-WAINWRIGHT et al., 2019) showed that ideal expectations are above realistic expectations. The reasons for this disparity may vary substantially in different contexts, including instructors' self-efficacy, familiarity with technology and analytics, institutional resources, bureaucracy, and data privacy legislation. Given the particularities of Latin America since colonization, which led to deep socioeconomic inequality, lack of resources and systemic institutional efficiency (HILLIGER et al., 2020a), stakeholders' wishes may be more distant to their actual beliefs than in other regions of Europe and North America. The lack of belief in the country's institutions, the lack of self-belief, and low levels of familiarity with technology can be barriers to stakeholder buy-in, thus important aspect to be considered and addressed

by administrators.

Another key topic on which opinions and expectations diverge in the literature relates to whose main responsibility it is to act, once data becomes available. Instructors' opinions vary on the extent to which they should be the main group expected to take action, for example to rescue students at-risk, versus the students themselves, upon being informed of their progress with rich information, taking control of their own learning, with instructors' support. In other words, who should be the protagonist once data is visualized by all? Instructors' "obligation to act"is still in debate (PRINSLOO; SLADE, 2017), along with discussions on the risk of discouraging students' autonomy and creating a culture of passivity. This involves complex pedagogical and political decisions that need to be carefully considered, while maintaining instructors' and students' autonomy.

For future work, we intend to broaden the reach of the survey and extend the study to managers and institutional leaders, based on the SHEILA framework. Additionally, we want to establish partnerships with other Brazilian and Latin American institutions, to run similar studies and further compare the results. In this way, we hope to add efforts with other researchers to create a solid corpus of evidence that reflects the identity(ies) of Latin America (HILLIGER et al., 2020b; HILLIGER et al., 2020a), and leads to effective strategies that promote the adoption of LA in Latin American institutions.

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