

Mapping the Ethics of Learning Analytics in Higher Education: A Systematic Literature Review of Empirical Research

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Abstract

Ethics is a prominent topic in learning analytics that has been commented on from conceptual viewpoints. For a broad range of emerging technologies, systematic literature reviews have proven fruitful by pinpointing research directions, knowledge gaps, and future research work guidance. With these outcomes in mind, we conducted a systematic literature review of the research on ethical issues that have been empirically approached in the learning analytics literature. In our final analysis, 21 articles published in the period 2014–2019 met our inclusion criteria. By analyzing this data, we seek to contribute to the field of learning analytics by 1) characterizing the type of empirical research that has been conducted on ethics in learning analytics in the context of higher education, 2) identifying the main ethical areas addressed in the selected literature, and 3) pinpointing knowledge gaps.

Notes for Practice

- Most of the selected empirical studies conduct surveys to understand respondents' perceptions, perspectives, attitudes, or views on the topic.
- Most of these respondents represent institutional rather than student views.
- Qualitative data is most often collected via individual interviews and electronic questionnaires.
- Empirical research on the ethics of learning analytics systems in higher education is, so far, concentrated in a few countries.
- The top three ethical areas most often addressed in the selected literature are transparency, privacy, and informed consent.
- The ethics of enabling interventions triggered by analytics needs to be further investigated in future studies.
- Studies on justice, equality, bias, ethical dissonance, moral discomfort, and intellectual freedom will help further develop research on the ethics of LA in higher education.

Keywords

Learning analytics, ethics, empirical studies, higher education, data-driven practices, systematic review

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1. Introduction

In the last decade, higher education institutions (HEIs) have begun using data mining and machine learning algorithms to better understand student learning and institutional decision-making (Sclater, 2016). These technical developments mirror the increasing attention to learning analytics (LA) research in the educational community. Since its emergence in 2011, the vibrant LA research field has maintained that the access to and analysis of educational data will improve the quality and value of the learning experience (Siemens & Long, 2011), will support self-regulated learning (Kim, Yoon, Jo, & Branch, 2018), will help identify how student learning and student services can be improved (Knight, Buckingham Shum, & Littleton, 2014), and will help students at risk of failing (Pardo & Siemens, 2014). Embracing LA practices in higher education, however, also raises a

series of ethical considerations (Slade & Prinsloo, 2013), some of which have recently been addressed in this journal, relating to how data is collected and by whom, how it is used, and for what purpose (Selwyn, 2019; Ferguson, 2019).

The concept of ethics in LA is often presented as an umbrella encompassing a wide range of sub-concepts (Ferguson, Hoel, Scheffel, & Drachslar, 2016; Ferguson, 2019) and reflecting divergent understandings (Willis, Pistilli, & Campbell, 2013). Discussions hitherto have been predominantly theoretical (Arnold & Sclater, 2017); ethics in LA have received comparatively little attention (Ferguson & Clow, 2017; Viberg, Hatakka, Bälter, & Mavroudi, 2018). Most importantly, “much of this work on ethics has been completed in the abstract, independent of concrete cases” (Kitto & Knight, 2019, p. 2856). Given these insights, our work here seeks to map how scholars in the LA field have approached and engaged with the study of ethical areas and issues in practice. This choice is motivated by the need to acknowledge the empirical work conducted on ethics in LA. For example, in medical ethics, scholars are concerned with patients’ well-being and experiences and perceptions of care (Wessel et al., 2013). Similarly, students are also exposed to institutional decisions and the impact that those decisions have vis-à-vis LA policies and practices. Because not only ethical reasoning changes over time (Glover, 2012), but also ethical practice is underpinned by values that are “rarely set out clearly, justified or interrogated” (Ferguson et al., 2016, p. 8), the LA research community has yet to provide an overview of how ethical issues have been studied in practice with those involved in the use, deployment, or conception of LA systems. This observation resonates with Kitto and Knight (2019), who stress the need to engage with concrete cases of the ethics of LA systems “to nurture practical reasoning across the community” (p. 2864).

While ethics is predominantly a philosophical discipline, empirical studies are commonplace to understand how people may reason about specific actions and how these views might align with, or run contrary to, different ethical positions and arguments. Therefore, our focus here on empirical work should be seen to complement the ongoing conceptual work conducted in the area and identify the most pressing issues to date to inform future research directions to develop our field further.

1.1. Aim and Research Questions

Our aim is to examine the current state of empirical studies on learning analytics that focus on ethical considerations in HE. To this end, we pose the following research questions:

1. How have empirical investigations of ethics in LA been conducted in the context of HE?
2. What are the main ethical areas addressed in these studies?
3. What are the knowledge gaps identified in the selected studies?

This article is organized as follows. The next section provides a background, followed by a presentation of the material and methods applied in this review. After that, we present a descriptive overview of the selected studies and map the main ethical areas addressed in them. Following this, we discuss the results and the main knowledge gaps identified in the selected literature.

2. Related Work

A wide range of ethical issues are identified in the literature, most often related to privacy (Reidenberg & Schaub, 2018; Pardo & Siemens, 2014); informed consent (Prinsloo & Slade, 2016); online tracking mechanisms, surveillance, and bias (Prinsloo & Slade, 2016); and the way data is de-identified (Khalil & Ebner, 2016) used, stored, protected, and acted upon (Oblinger, 2012; Daniel, 2019; Cormack, 2016). As LA systems continue to evolve and become more technically sophisticated, their potential use in HE brings new questions into view. Algorithmic decision-making and machine learning, for example, prompt questions about oversight and the prevention of harm (Johnson, 2018), algorithmic accountability (Knight, Buckingham Shum, Ryan, Sándor, & Wang, 2018), student vulnerability and agency (Prinsloo & Slade, 2016), and the erosion of student–teacher relationships (Slade & Prinsloo, 2013).

Although engaging with such issues is a complex matter, attempts have been made in the field to find common lenses, enabling researchers and practitioners to position themselves in the contested space of LA. Such attempts have resulted in multiple ethical frameworks (Swenson, 2014), guidelines, and principles, such as a policy and strategy framework (Tsai, Poquet, Gašević, Dawson, & Pardo, 2019), a decision-making framework (West, Huijser, & Heath, 2016), a set of design guidelines (Pardo & Siemens, 2014), the DELICATE ethics checklist (Drachslar & Greller, 2016), the SURF Privacy and Analytics (Engelfriet, Manderveld, & Jeunink, 2015), a code of practice (Sclater, 2016), and an ethical framework (Slade & Prinsloo, 2013). Moreover, multiple, interwoven assumptions underpin ethical decisions and prompt current questions about ethics that have been approached and discussed (Ferguson et al., 2016; Willis, 2014).

Such conceptual work on principles, guidelines, checklists, and frameworks has opened a dialogue on ethics and provided analytical and policy instruments to the LA research community. It has also contributed guidance in a terrain that is hard to navigate due to the interrelated character of educational, technical, legal, and social dimensions of LA ethics in HE. In this context, this systematic literature review seeks to contribute and further expand this later work by engaging with LA scholars’ efforts to study the ethics of LA systems from an empirical stance. As already mentioned, this choice responds to the necessity

to complement the conceptual work conducted earlier. It also relates to a specific view of ethics in HE that understands ethics not only as a bundle of abstract principles and guidelines (Johnson, 2018, p. 19), or as the outcomes of individual, rational decision-making (Prinsloo & Slade, 2017a), but also as practiced in daily decisions and enacted in cultural, personal/individual, and professional values (West et al., 2016). When put into practice, ethical principles are inevitably ingrained in social, organizational, political, economic, and intellectual structures designed, shaped, and regulated by people (Johnson, 2018). Moreover, ethics are also reflected in artifacts (Verbeek, 2005).

2.1. Ethical Dimensions of LA

To identify the ethical areas and issues addressed in the empirical work selected in this systematic review, we drew upon Sclater's (2016) code of practice and Slade and Prinsloo's (2013) ethical framework as they reflect two distinct points of view of ethics of LA systems in the field: 1) the pragmatic-oriented point of view represented in the code of practice (Sclater, 2016) and 2) the critical-oriented point of view reflected in Slade and Prinsloo's (2013) ethical framework. These two points of view represent the binomials of a continuum in which various stakeholders' values, interests, needs, concerns, and rights emerge.

Sclater's (2016) code of practice, developed for the Joint Information Systems Committee organization (JISC) in the UK, explains that "the main purpose of the Code would be to help remove barriers to the adoption of LA, and that it should provide a focus for institutions to deal with the many legal and ethical hurdles that they were encountering" (p. 20). The code of practice champions the use of LA and engages with ethical issues because they can "potentially deny students the benefits of predictive analytics and adaptive learning" (p. 16). Ethical dimensions are, from this point of view, addressed pragmatically, and more in particular as "barriers to the development of the field" and potentially "halting the implementation of learning analytics completely" (p. 16). Specifically, Sclater's (2016) code of practice is grouped into eight thematic areas: 1) responsibility, 2) transparency and consent, 3) privacy, 4) validity, 5) access, 6) enabling positive interventions, 7) minimizing adverse impacts, and 8) stewardship of data. According to ethical, legal, and logistic dimensions, these thematic areas are categorized into 86 distinct sub-categories. They reflect an institutional and pragmatic viewpoint that seeks to inform institutions that have decided to embrace LA in their HE practices.

Slade and Prinsloo's (2013) ethical framework addresses the unequal power relationship between the institution and the students and pays particular attention to their agency. In particular, Slade and Prinsloo (2013) view students not only as producers of data, but also as its co-interpreters, with student identity as a temporal and dynamic construct, and student success as a multidimensional phenomenon. Their framework aims to guide the emergence of sound, ethical data-driven practices while unpacking complex issues. More specifically, Slade and Prinsloo (2013) refer to a range of ethical issues in the following broad, overlapping categories: 1) location and interpretation of data, 2) informed consent, access to student data privacy, and de-identification, which point to issues around student awareness of tracking and analyzing student data without their explicit knowledge, as well as the acceptability of student surveillance, and 3) management, classification, and storage of data, which addresses the issue of transparency in data management and data governance structures that ensure data protection.

Although Sclater's (2016) code of practice aims to solve ethical issues, and Slade and Prinsloo's (2013) framework problematizes them, these two frameworks contribute a set of principles that overlap across a few common points that constitute the analytical lens for identifying the ethical areas addressed in the selected literature. Precisely, this lens consists of the following thematic foci:

Transparency describes the processes involved in presenting the analytics to students and staff. This mainly covers depicting the data sources, the purposes of the analytics, the metrics used, who has access to the analytics, the boundaries around usage, and how to interpret it.

Privacy refers to issues related to the access and de-identification of student data. It also points to the institution's responsibility to ensure that student data is protected when third parties are contracted to store data or carry out analytics.

Informed consent refers to issues around making students aware of practices, such as tracking and analyzing student data without their explicit knowledge and the acceptability of student surveillance. It also covers issues linked to the students' access to all LA performed on their data in meaningful and accessible formats.

Responsibility points to institutional accountability issues: institutions' responsibility for the legal, ethical, and effective use of LA, and issues related to student autonomy. This notion is protected by law.

Minimizing adverse impacts refers to the issue of harm, non-maleficence, and risks involved in student data stewardship.

Validity concerns the interpretation and location of student data and data accuracy, the algorithms' validity, and those metrics used for predictive analytics or interventions based on student data.

Enabling interventions refers to specific circumstances in which institutions should intervene due to analytics, suggesting that students could benefit from additional support.

These foci have guided us in identifying the main ethical areas addressed and discussed by the articles selected for this systematic review.

3. Materials and Methods

A systematic review was conducted to map out the empirical terrain of ethics in LA in the context of HE (Grant & Booth, 2009; Petticrew & Roberts, 2008). Systematic reviews in general, but on ethics in particular, have an essential role to play in research and policy development, enabling the synthesis of knowledge contributed on the topic, preventing the duplication of research efforts, and providing additional insights through the comparison and/or combination of individual pieces of research. Moreover, and perhaps most importantly, a systematic review of ethics from an empirical standpoint is instrumental in helping the LA research community summarize what has been done empirically on the topic of ethics in HE and what areas have been underexplored.

3.1. Data Collection: Search Strategy

A systematic search was conducted by two librarians, who are search-engine experts. They consulted five databases: Scopus, Web of Science Core Collection, ERIC (ProQuest interface), IEEE Xplore Digital Library, and ACM Digital Library (ACM full-text collection). The search terms used included ethics, big data, learning analytics, and HE. The search was applied to article titles, abstracts, and keywords. Only peer-reviewed papers published in English from January 2010 to November 2019 were included. The grey literature was not consulted. The conference proceedings selections used only papers published as part of the main conference. Workshop papers and posters were excluded. Table 1 summarizes the inclusion and exclusion criteria applied in our search strategy.

Table 1. Inclusion and Exclusion Criteria

Inclusion	Exclusion
Ethics	Languages other than English
Moral	Reports and grey literature
Learning analytics	Posters and workshop papers
Educational data mining	
Data mining	
Higher education (synonym: tertiary education)	
Peer-reviewed original research or conference paper	
English language	
2010–2019	

A total of 352 articles were retrieved. After removing duplicates, 249 articles remained, all of which were exported to Mendeley Desktop for screening. All 249 articles were manually screened by reading their titles and abstracts. This process was done independently by both authors. After an initial screening, peer-reviewed articles that did not meet all the inclusion criteria — ethics, big data, learning analytics, and HE — were removed. This process rendered 73 articles for a second screening. Of these articles, 11 were randomly selected for shared reading and analysis. This process was done to reach a consensus on whether the articles were conceptual (i.e., frameworks, guidelines, principles, and codes of practice) or empirical (i.e., research that systematically engages with empirical data). Subsequently, each author screened approximately half of the 73 remaining articles to determine if their contribution was conceptual or empirical. Conceptual contributions were removed from the final analysis. After the de-selection was done, each author verified the other author’s choice, meaning that all articles were read twice. Disagreements about the inclusion and exclusion criteria were resolved based on an article’s relevance to the research question. At the end of this process, a total of 21 articles met the inclusion criteria (see Figure 1). One study (Arnold & Sclater, 2017) was included, although a small number (5%) of respondents come from further education instead of HE.

Papers excluded from the final review were assessed to be either conceptual; off-topic (for example, they addressed other domains than education such as medical practice); review articles; focused on K–12 education; or addressed technical elements of LA systems without considering ethical issues.

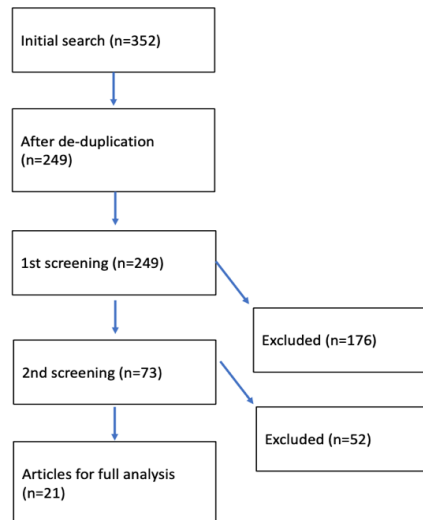


Figure 1. Identification, screening, and inclusion of studies for the review.

3.2. Data Analysis

In the analysis of the selected works, we aligned with Viberg et al. (2018) in order to characterize the types of empirical research conducted in terms of geographic location, LA examples explored (Buckingham Shum, 2012), and types of stakeholders (Drachler & Greller, 2012). As well, we used several methods of characterization from Denscombe (2014): research strategies applied, data collection methods selected, and data analysis methods chosen. Subsequently, we mapped the papers (based on reported findings) into main ethical areas using the lens introduced in the background section.

More precisely, for the research strategies, we considered surveys, case studies, experiments, ethnography, phenomenology, grounded theory, action research, and mixed methods, according to the distinction made by Denscombe (2014) and Yin (2017) for case studies. We considered questionnaires, interviews, observations, and documents for the data collection methods, and qualitative and quantitative data analysis methods, as explained by Denscombe (2014).

3.3. Limitations

The search was limited to November 2019, and new articles have undoubtedly been published since then. We may have failed to retrieve some relevant articles since we restricted our selection to articles containing LA and ethics in the title, abstract, or keywords. Our literature search was limited to peer-reviewed articles and conferences written in English, therefore, we may have missed key insights published elsewhere or in other languages. Our analysis combined ethical areas distinguished in conceptual frameworks (Sclater, 2016; Slade & Prinsloo, 2013), which are cited extensively, but we acknowledge that there may be different ways to address these issues, both conceptually and empirically. Our inclusion and exclusion criteria are presented herein but may be skewed; adding a broader range of other concepts may impact the number of included studies.

Moreover, we have described the methodological choices made transparently to enable others to replicate and critique the results. Furthermore, more work is needed to determine what student groups (e.g., ethnic and socioeconomic aspects) are represented in empirical research. The present literature review has not conducted a more fine-grained analysis of the selected populations.

4. Results

We first present a descriptive overview of the results that characterize the types of research conducted. This is followed by a discussion of the specific main ethical areas identified in the selected articles.

4.1. The Corpus

This literature review consisted of 21 articles, of which 16 are published in journals and five in peer-reviewed conferences (i.e., Learning Analytics and Knowledge [LAK], Conference on Human Factors in Computing Systems [CHI], Australasian Society for Computers in Learning in Tertiary Education [ASCILITE] and, European Distance and E-Learning Network). Although the search targeted the years 2010–2019, the articles selected were published between 2014 and 2019 (see Figure 2).

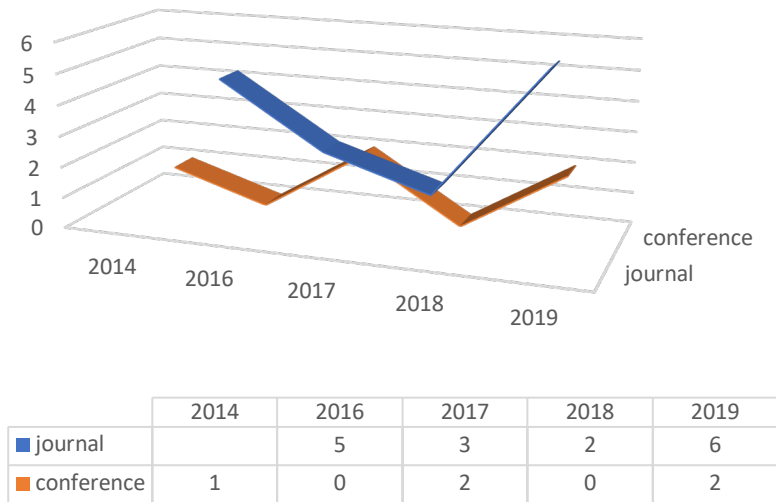


Figure 2. The corpus of the study.

The studies selected report research on ethics and LA that addressed respondents from universities located in North America (6 studies), Europe (6 studies), Oceania (6 studies), and Africa (1 study presenting mixed locations). Three studies in total presented mixed locations. In more detail, the studies conducted in North America were located in the United States (Jones & VanScoy, 2019; Jones, 2019a; Jones, 2019b; Klein, Lester, Rangwala, & Johri, 2019; Sun, Mhaidli, Watel, Brooks, & Schaub, 2019; Scott & Nichols, 2017). The studies conducted in Europe were located in Germany (Ifenthaler & Schumacher, 2016) and the UK (Adejo & Connolly, 2017; Tsai et al., 2019; Whitelock-Wainwright, Gašević, Tejeiro, Tsai, & Bennett, 2019; Slade, Prinsloo, & Khalil, 2019; Slade & Prinsloo 2014). The studies conducted in Oceania were located in Australia (Brooker, Corrin, Fisher, & Mirriahi, 2017; Howell, Roberts, Seaman, & Gibson, 2018; Lawson, Beer, Rossi, Moore, & Fleming, 2016; Roberts, Howell, Seaman, & Gibson, 2016; West et al., 2016) and New Zealand (Mahroeian, Daniel, & Butson, 2017). The studies presenting mixed locations conducted comparative studies. One study addressed universities in the UK, South Africa, and the United States (Willis, Slade, & Prinsloo, 2016), one collected and analyzed data from both the UK and the United States (Arnold & Sclater, 2017), and another compared responses from Australian and Malaysian universities (West et al., 2018).

4.2. Empirical Investigations of LA Ethics in the Context of HE

In this section, we characterize how ethical issues have been empirically approached by looking at the nature of the research strategies applied, the data collection methods reported, the data analysis methods applied, the kinds of LA systems explored, and the types of stakeholders involved.

4.2.1. Research Strategies Applied

We identified the following five main research strategies applied in the works selected: surveys, case studies, experimental studies, mixed methods, and grounded theory (see Figure 3). Ethnography, phenomenology, and action research were not reported.

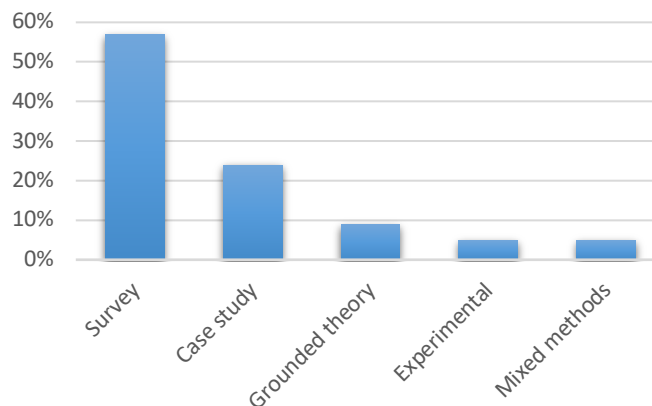


Figure 3. Research strategies applied.

Surveys (12) were applied in studies by West et al. (2016), Adejo and Connolly (2017), Arnold and Sclater (2017), Mahrooian et al. (2017), Howell et al. (2018), West et al. (2018), Slade et al. (2019), Tsai et al. (2019), Whitelock-Wainwright et al. (2019), Slade and Prinsloo (2014) and consisted of various data collection methods such as online and emailed questionnaires, face-to-face and videoconference interviews as well as focus groups (Brooker et al., 2017; Roberts et al., 2016). Most of the surveys aimed to measure respondents’ perceptions, attitudes, and expectations linked to LA. In particular, West et al. (2018) compared Australian and Malaysian universities regarding academics’ experiences and perceptions. Arnold and Sclater (2017) compared the responses of students enrolled at the United Kingdom (JISC) and American institutions (University of Wisconsin) and founded differences attributed to the cultural context and the institutional policies.

Case studies (5) included those conducted by Lawson et al. (2016) and Jones and VanScoy (2019) as well as a hermeneutic multiple case study (Willis, Slade, & Prinsloo, 2016), an instrumental case study (Klein et al., 2019), and a multiple stakeholder study (Sun et al., 2019). They collected data most often via documents (i.e., policy documents and syllabi), interviews, focus groups, and participatory observation. In particular, Willis et al. (2016) reported a cross-continental and cross-institutional case study based on an analysis of data collected in the United States, UK, and South Africa. Moreover, Lawson et al. (2016) addressed the ethical dilemmas experienced by academic staff after implementing and using an alert system facilitating interventions aimed at students at risk of failing.

Two studies applied constructivist grounded theory (Jones, 2019a, 2019b) and addressed how professional advisors and practicing librarians perceive ethical issues. Only one quasi-experimental study (Ifenthaler & Schumacher, 2016) focused on students perceptions concerning privacy principles. One study employed mixed methods (Scott & Nichols, 2017) combining clickstream data, data generated with interviews, and questionnaires.

4.2.2. Data Collection Methods Reported

As shown in Figure 4, in total, 30 data sets were reported, to which a variety of data collection methods were applied: interviews (11), questionnaires (10), focus groups (4), and document analysis (2). Observation (1) was reported in one study, as well as clickstream data and user-generated data (1), and text mining (1).

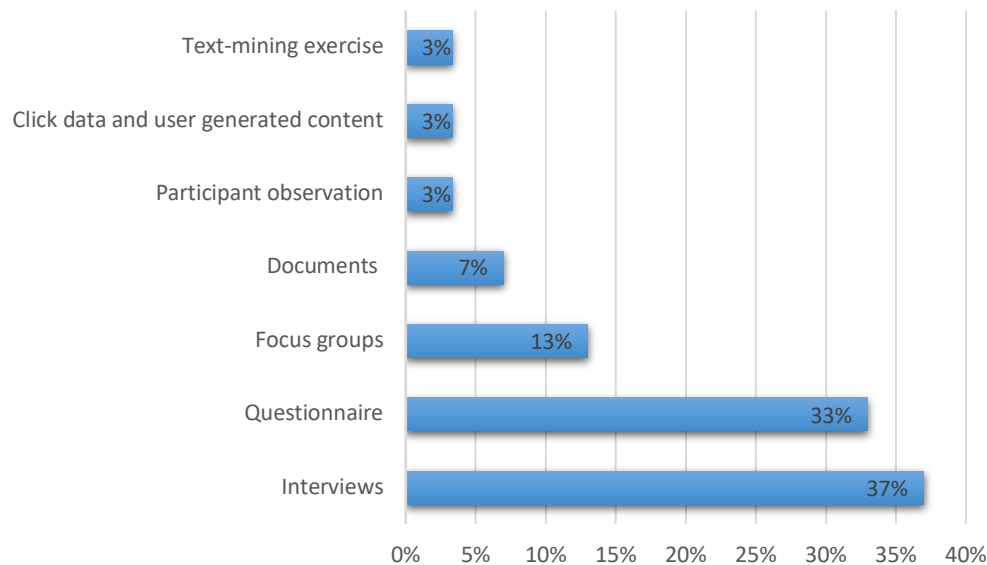


Figure 4. Data collection methods reported.

The interviews conducted were usually semi-structured and lasted between 15 and 60 minutes (e.g., Tsai et al., 2019). They were conducted face-to-face (e.g., Jones, 2019a), by telephone (e.g., Howell et al., 2018), and through a web-conferencing tool (e.g., Jones, 2019b).

The questionnaires were electronic, typically included more than 40 items (e.g., Slade et al., 2019), consisted of open-ended and closed-ended questions, Likert scales, and single and multiple responses instances (e.g., West et al., 2018). Regarding the response rate, West et al. (2016) reported on an institutional survey with a 55% response rate; Arnold and Sclater (2017) reported on a survey of university students, administered twice, with response rates of 64% and 34%, respectively; Slade et al. (2019) reported a response rate of 2.7%, representing 71 responses out of 8,000 students. The rest of the work applying questionnaire data did not report the response rate obtained.

The focus groups were structured by questions, audio recorded, and transcribed verbatim (e.g., Roberts et al., 2016; Howell et al., 2018; Brooker et al., 2017). Of the eleven interviews reported, one was conducted in conjunction with participatory observation (Klein et al., 2019).

The document analysis included a review of policy frameworks across institutions in three countries (United States, UK, and South Africa), as reported in Willis and colleagues (2016). Jones and VanScoy (2019) report the analysis of a course syllabus. Only Klein et al. (2019) reported observation data. Only Scott and Nichols (2017) reported clickstream data and user-generated content collection methods. Lawson et al. (2016) reported text mining.

4.2.3. Data Analysis Methods Reported

As shown in Figure 5, the selected works report on four different data analysis methods: statistical analysis, open coding, thematic analysis, and content analysis. Based on 24 instances of data analysis methods reported, we identified that qualitative methods for analyzing text transcripts were most used in the selected works. Such methods included open coding (i.e., axial coding, selective coding) (7), thematic analysis (5), and content analysis (2). Statistical analysis was also reported in eight studies. Two studies do not explicitly report on the data analysis methods applied, although they clearly state the methodological approaches underpinning their studies (Lawson et al., 2016; Scott & Nichols, 2017).

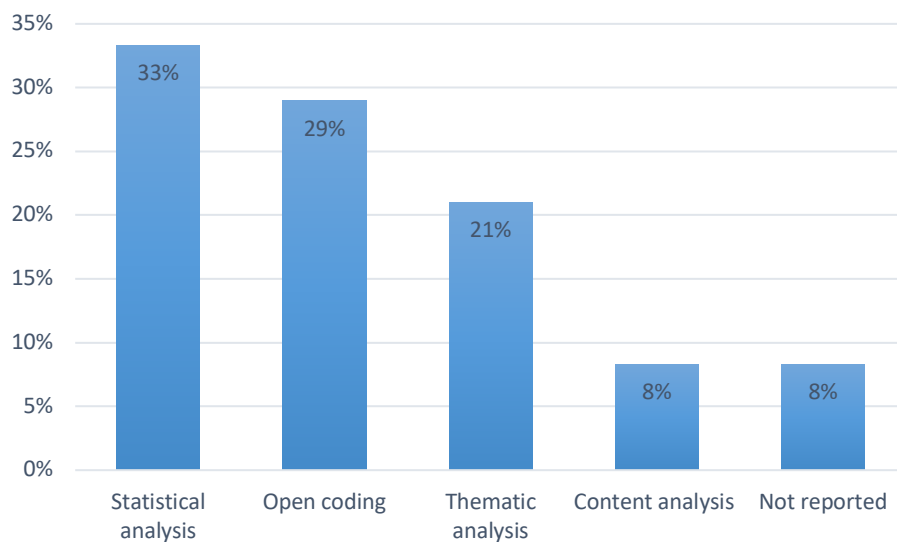


Figure 5. Data analysis methods reported.

Among the works applying statistical methods, we observe the use of the statistical package for social analysis (e.g., Ifenthaler & Schumacher, 2016; West et al., 2016; Adejo & Connolly, 2017; Mahroeian et al., 2017), including descriptive (e.g., Arnold & Sclater, 2017), inferential statistics (e.g., Slade et al., 2019), exploratory and confirmatory factor analysis (e.g., Whitelock-Wainwright et al., 2019), as well as Rasch analysis (e.g., West et al., 2018). In the works using open coding, we distinguish open and axial descriptive coding (West et al., 2016, 2018; Brooker et al., 2017; Klein et al., 2019; Jones, 2019a, 2019b; Tsai et al., 2019). Thematic analysis was applied to transcriptions (e.g., Roberts et al., 2016; Howell et al., 2018; Mahroeian et al., 2017; Sun et al., 2019; Jones & VanScoy, 2019). Content analysis was performed on documents such as policy and guiding frameworks for ethical review and forum posts (Willis et al., 2016; Slade & Prinsloo, 2014). Moreover, three studies combined quantitative and qualitative data analysis methods (West et al., 2016, 2018; Mahroeian et al., 2017).

4.2.4. Examples of LA Systems Explored

Most articles (14 articles or 67%) refer either to LA or to data and analytics in general terms without specifying the examples of LA systems addressed in the studies (West et al., 2016; Willis et al., 2016; Adejo & Connolly, 2017; Arnold & Sclater, 2017; Mahroeian et al., 2017; Howell et al., 2018; West et al., 2018; Brooker et al., 2017; Klein et al., 2019; Jones & VanScoy, 2019; Slade et al., 2019; Tsai et al., 2019; Whitelock-Wainwright et al., 2019; Slade & Prinsloo, 2014).

Seven works addressed using dashboards, alert systems, predictive analytics, adaptive LA, simple completion of assignments, and social analytics networks. More specifically, dashboards were addressed in four papers (Ifenthaler & Schumacher, 2016; Roberts et al., 2016; Sun et al., 2019; Scott & Nichols, 2017), alert systems in three papers (Roberts et al., 2016; Lawson et al., 2016; Sun et al., 2019), predictive analytics in two papers (Jones, 2019a; Scott & Nichols, 2017), adaptive LA in one paper (Ifenthaler & Schumacher, 2016), and simple completion of assignments in one paper (Ifenthaler &

Schumacher, 2016). One paper briefly touched upon ethical questions concerning the use of social analytics networks (Scott & Nichols, 2017).

4.2.5. Types of Stakeholders Involved

Most works included in this review addressed two types of stakeholders in their studies, namely academics — including advisors, instructors, teachers, and researchers (11 instances) — and students (10 instances). These main stakeholders are followed by administrators (3 instances), which include decision-making staff (e.g., vice principals, deans of learning and teaching, and directors of e-learning centres; as reported in West et al., 2016; Mahroeian et al., 2017; Tsai et al., 2019) Tsai et al. (2019) and Sun et al. (2019) reported on developers. Only Jones (2019b) reported on librarians. One study did not explicitly report this information (Willis et al., 2016). Interestingly, three studies employed a multi-stakeholder approach by addressing both students and academics (Scott & Nichols, 2017). Sun et al. (2019) included systems developers, academic advisors (primary users), and students. West et al. (2016) targeted both administrative and academic staff. See Figure 6 for a breakdown of different types of stakeholders addressed.

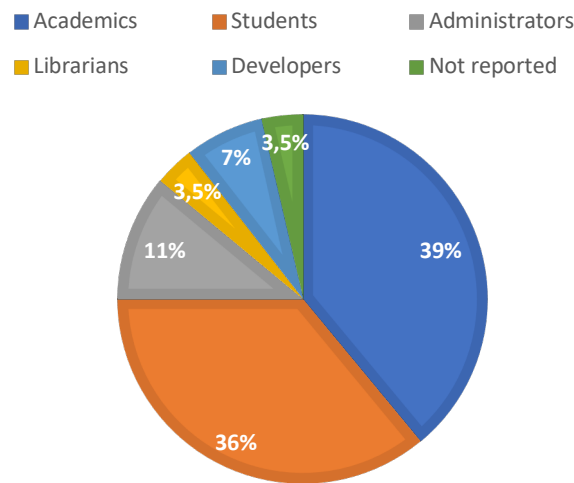


Figure 6. Main stakeholders addressed in the selected studies.

4.3. Main Ethical Areas Addressed

As mentioned in the background section, we analyzed the main ethical areas addressed in the selected empirical studies using the lens on ethics we adapted from Sclater (2016) and Slade and Prinsloo (2013). In this way, we identified that the areas of transparency (15 papers) and privacy (13 papers) dominate, followed by informed consent to access data (11 papers), responsibility (10 papers), minimizing adverse impacts (9 papers), the validity of data (9 papers), and enabling interventions (1 paper). Figure 7 provides distribution in relative numbers.

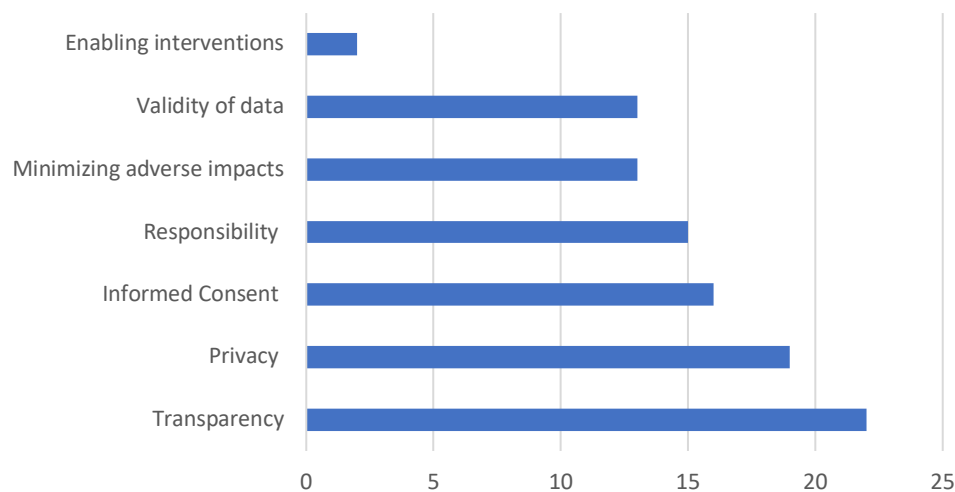


Figure 7. Main ethical areas addressed.

Table 2 shows that, with a few exceptions, most papers address more than one ethical area in their findings.

Table 2. Ethical Areas Addressed in the Selected Works

Ethical Areas/ Studies	Transparency	Privacy	Consent	Responsibility	Minimizing Adv. Impacts	Validity	Enabling Interventions
Slade & Prinsloo (2014)	X			X		X	
Ifenthaler & Shumacher (2016)	X	X	X			X	
Lawson et al. (2016)	X	X	X		X		
Roberts et al. (2016)		X	X	X		X	
Willis et al. (2016)		X	X		X		
West et al. (2016)	X	X		X	X		
Arnold & Sclater (2017)		X					
Adejo & Connolly (2017)	X	X	X	X		X	
Brooker et al. (2017)	X	X					
Scott & Nichols (2017)	X						
Mahroeian et al. (2017)	X	X				X	
Howell et al. (2018)	X		X	X	X	X	
West et al. (2018)	X		X	X	X		
Jones (2019a)					X		
Jones (2019b)		X	X				
Jones & VanScoy (2019)	X	X		X			
Klein et al. (2019)	X				X	X	
Slade et al. (2019)	X		X	X	X		
Sun et al. (2019)	X		X	X		X	
Tsai et al. (2019)		X					
Whitelock-Wainwright et al. (2019)	X	X	X	X	X	X	X
Total	15	13	11	10	9	9	1

The 21 articles included in this review all refer to ethical considerations when carrying out empirical studies. Such considerations are expressed by most of the articles reviewed in general terms. Such considerations refer to prior work conducted in the field of LA (e.g., Slade & Prinsloo, 2013; Drachsler & Greller, 2012, 2016; Sclater, 2016; Sclater & Bailey, 2015; Pardo & Siemens, 2014; Drachsler et al., 2015; Willis, 2014; Cormack, 2016). A minority of the articles reviewed refer more specifically to theorizations on privacy (e.g., Nissenbaum’s work on contextual integrity, 2004, 2011; Heath, 2014).

5. Discussion and Conclusion

This study contributes to the LA research community by mapping the empirical studies on ethical considerations in HE. The study focused on the following questions: 1) How have empirical investigations of the ethics of LA been conducted in the context of HE? 2) What are the main ethical areas addressed in these studies? 3) What are the knowledge gaps identified? This section discusses the results obtained and introduces the knowledge gaps and potential future studies.

5.1. Characteristics of Empirical Investigations of Ethics in LA Conducted in HE

First, the analysis of the 21 articles selected for this systematic review shows that most of the empirical studies on ethics in LA conduct surveys (57%) aimed to understand respondents' perceptions, perspectives, attitudes, or views on the topic rather than engaging with the actual use of LA systems in-situ. In this respect, Lawson et al. (2016) is the only article about a user study reporting on the academics' erroneous use of an early alert system to identify students at risk of failure. The low number of user studies focused on ethics may be due to the novelty of LA systems for educational practice. Although LA techniques have been previously used for research purposes (Buckingham Shum, 2018), LA systems are relatively new to educational practitioners and students (Buckingham Shum & Luckin, 2019).

Second, the reviewed studies show that interviews (37%) and questionnaires (33%) are most often applied while observation and log-data (3%) are least applied. The collected data are most often qualitative (58%) rather than quantitative (33%), which indicates a tendency to conduct exploratory, descriptive, and interpretive empirical studies on LA ethics in HE.

Third, few studies specified a particular focus on the ethical questions associated with dashboards (Ifenthaler & Schumacher, 2016; Roberts et al., 2016; Sun et al., 2019; Scott & Nichols, 2017), alert systems (Roberts et al., 2016; Lawson et al., 2016; Sun et al., 2019), predictive modelling (Jones, 2019a), adaptive LA (Ifenthaler & Schumacher, 2016), and social analytics networks (Scott & Nichols, 2017). However, the majority (67%) of the studies refer to LA systems in generic terms. As ethical concerns may vary according to the type of LA system considered (Ferguson et al., 2016), it becomes challenging to seize the specific ethical concerns identified.

Fourth, most of the respondents addressed in the selected studies represent institutional (50%) rather than student views (36%) on the topic. This is important to note since the use of LA systems involves mostly student data. Nevertheless, it is worth mentioning that reporting on institutional staff (i.e., academics and administrative staff) and student views on the topic is a laborious task. The findings contributed to the selected articles show that staff and students are misinformed about LA systems and student data management (Roberts et al., 2016). The students report inconsistent understanding of LA systems (Mahroecian et al., 2017) and uncertainty (West et al., 2016) around them. Students are unaware of the following: 1) the ethics and data protection policy operating within their institutions (Adejo & Connolly, 2017), 2) the use of LA systems in their courses (Sun et al., 2019; Roberts et al., 2016), and 3) the potential implications of data-driven practices for student learning (Slade et al., 2019; Brooker et al., 2017). Asking respondents (i.e., students) to share experiences or perceptions on ethical issues related to systems they know little about illustrates the inherent methodological complexities of conducting empirical studies on the ethics of emerging sociotechnical educational practices in HE. This observation resonates with Brooker et al. (2017), who underscore the need for HE institutions and LA designers to reflect on how to frame conversations with students to ensure a common understanding.

Furthermore, the analysis reflects that empirical research on the ethics of LA systems is, so far, concentrated in a few countries (i.e., most often in the USA, Australia, and the UK) and by a small number of individual researchers or groups of researchers. Consequently, we currently know very little about how the ethical considerations of LA systems are approached or play out in other parts of the world (e.g., the Global South).

5.2. Main Ethical Areas Addressed

The top three ethical areas most often addressed in the selected works are transparency, privacy, and informed consent. These areas correspond to those extensively discussed in conceptual investigations (Ferguson et al., 2016; Pardo & Siemens, 2014; Drachsler & Geller, 2016). The least addressed ethical area is enabling interventions, pointing to specific circumstances in which institutions should intervene due to analytics, suggesting that a student could benefit from additional support (Whitlock-Wainwright et al., 2019). A closer look at the issues associated with transparency, privacy, and informed consent reveals that the selected articles indicate multiple layers of understandings within these issues that need yet to be addressed. Such layers are delineated in terms of the *purposes* driving the use of the LA systems in HEIs (Slade & Prinsloo, 2014; Slade et al., 2019; Adejo & Connolly, 2017), the *power* entrenched in who gets to aggregate, own, and control institutional and student data (Avella, Kebritchi, Nunn, & Kanai, 2016; Scott & Nichols, 2017), and the contingent nature of the *contexts* involved (Ifenthaler & Schumacher, 2016). In particular, the contingency of the contexts involved is specifically discussed in terms of the high dependency of ethical considerations on cultural, sociotechnical, and pedagogic contexts (e.g., West et al., 2016; Jones, 2019b; Jones & VanScoy, 2019). For instance, the geographical places and the specific universities, institutions, educational programs, courses, and classrooms in which data-driven practices unfold enact multiple cultural contexts where

specific ethical considerations emerge (West et al., 2016). Differences in terms of investment in infrastructure (West et al., 2018), institutional policies in place (Willis et al., 2016), and sociocultural differences (Arnold & Sclater, 2017) also have an impact on the contexts that configure how ethics are perceived and enacted in practice. In this sense, there is a sociotechnical context, constituted by technical infrastructure and the associated social and educational practices (Cerratto Pargman, 2019, 2020; Cerratto Pargman & Jahnke, 2019) that play a central role in configuring and shaping ethical issues and how they are subsequently addressed. Furthermore, the design of the syllabi and the learning activities created in the learning management systems (e.g., quizzes, assignments) are central elements in capturing student data and defining ethical issues associated with the pedagogical context in which LA systems are used (Jones & VanScoy, 2019).

Digging deeper into the ethical areas addressed by the works selected, we notice that although the respondents welcomed the use of digital tools aimed at benefiting students learning (Howell et al., 2018), they also reported conflicting and contradictory views vis-à-vis the use of LA in HE (Jones, 2019b). More precisely, the teachers, advisors, and librarians working closely with the students shared concerns regarding LA systems that can potentially provide an inaccurate, inconsistent, and incomplete representation of student performance (e.g., Sun et al., 2019; Jones 2019a, 2019b; Brooker et al., 2017; Lawson et al., 2016; Klein et al., 2019). They also mentioned concerns about misuse (Adejo & Connelly, 2017; Howell et al., 2018), perceived surveillance mechanisms, the opacity of the algorithms involved, the potential for increased bias (Klein et al., 2019), moral discomfort (Jones, 2019a), ethical dissonance (Jones, 2019b), impeding student responsibility, and adverse impact on student well-being (Howell et al., 2018). Notably, the students expressed an interest in gaining access to tools that provide elaborated adaptive and personalized dashboards (e.g., self-assessments, dynamic content recommendations, visual signals, suggestions for social interaction, and personalized learning activities). However, they also were reticent to share personal data and data trails of online behaviour (Ifenthaler & Schumacher, 2016). Some students underscored the value of being personally in charge of their education and mentioned risks concerning LA systems driving inequality, bias, and privacy (Roberts et al., 2016). Such concerns are challenging to map into the ethical areas predefined for this study, but they reflect ethical and moral dilemmas that require further attention.

Furthermore, the works selected often contribute instruments, such as ethical frameworks, principles, or strategies (e.g., West et al., 2018; Adejo & Connelly, 2017) to solve ethical issues, while others, fewer in comparison, point to the necessity of nurturing dialogue among all involved stakeholders, not least the students (e.g., Slade & Prinsloo, 2014; Slade et al., 2019; Sun et al., 2019). Concerns regarding the need to engage directly with students have been pointed out by Arnold and Sclater (2017) and extensively by Slade and Prinsloo (2013, 2014) and Prinsloo and Slade (2015, 2016).

5.3. Knowledge Gaps Identified in the Selected Studies

First, from the analysis of the ethical areas addressed in the selected literature, it emerges that there is a lack of research focusing on how educational institutions should intervene due to analytics that point to students who could benefit from additional support. A focus on, for instance, which types of institutional interventions can lead to and how such interventions can be crafted may help the LA community to reconsider what kind of data is essential to collect, store, and analyze, and for which purpose? These questions were underscored by Prinsloo and Slade (2014, 2017b) regarding the obligation of institutions to act, so a cogent allocation of resources can ensure appropriate and effective interventions to increase effective teaching and learning (Prinsloo & Slade, 2017b, p. 1). Most recently, Ferguson (2019) pointed out the “duty to act” as one of the ethical challenges in LA. Furthermore, other ethical considerations that go beyond the areas contemplated by the analytical lens applied in this study have been mentioned in terms of lack of justice (West et al., 2016), inequality (Roberts et al., 2016; Lawson et al., 2016), unclear definition of harm (Willis et al., 2016), power embedded in LA systems (Scott & Nichols, 2017), profiling (West et al., 2018), moral discomfort (Jones, 2019a), ethical dissonance, and lack of intellectual freedom (Jones, 2019b). Paying more attention to these ethical areas is important; it will help the LA community better situate the opportunities and limits of specific LA systems in HE practices.

Second, as the specific sociotechnical context configured by both LA systems and educational practices plays a significant role in the types and gravity of the ethical considerations, more research needs yet to be done on concrete cases so that situated reasoning can also be considered in discussions about ethics (Kitto & Knight, 2019). In this vein, it becomes central to articulate both the specificities of the institutional contexts and the design of the LA systems under investigation, as their characteristics matter in the emergence of new practices (Lawson et al., 2016), knowledge infrastructure (Buckingham Shum, 2018), and their associated ethical considerations (Sun et al., 2019). For instance, studies on the design of LA systems, building on human-centred design (Buckingham Shum, Ferguson, & Martinez-Maldonado, 2019), will help unpack the ethical practices involved in their conception, design, deployment, and use. Furthermore, studies addressing multiple stakeholders’ views on the ethics of LA will expand the current understanding of ethics from various perspectives (Sun et al., 2019).

Third, there is a need to find out how ethical aspects of LA systems unfold in everyday educational practices. This is important since computer systems for learning need to be based not on grandiose claims about digital technology as an all-purpose tool for enhanced teaching/learning, but on specific accounts of how the use of digital technologies configures

students' achievements and knowledge (Cerratto & Waern, 2000; Cerratto Pargman, 2006). In this sense, studies investigating how ethical principles, guidelines, or codes of practices in LA are put into practice will help us gain a more grounded understanding of how these instruments work in everyday higher education and which ethical issues or moral dilemmas are not covered by them. In this respect, studies engaging with ethical issues from the messy ground-up perspectives will complement the substantial conceptual work conducted on ethics in LA. With this in mind, research strategies such as ethnographic studies, phenomenological studies, or action research that were not reported in the selected articles could be instrumental in capturing and unpacking how ethical considerations play out in HE practice.

Fourth, in light of Buckingham Shum and Luckin's (2019) insights about the future of studies on LA, we perceive a need to seek ways to increase the geographic and cultural diversity of studies on ethics in the LA technology-enhanced learning communities. This is important considering Ferguson et al.'s (2016) observation that ethical values are not consistent from country to country, from institution to institution, or even from classroom to classroom (p. 8). It seems evident that more empirical studies from a broader range of countries are needed. Increasing the geographic and cultural diversity of studies in LA may also be essential to avoid making informed decisions without understanding the situated views of teachers, students, and learners. Because there have been concerns in society around using algorithms and data, conducting empirical studies on a diverse range of populations will help identify bias and prevent harm in vulnerable communities in HE (Jones, 2019a).

Fifth, studies that further develop the sociocritical perspectives of LA in HE, focusing on the students (Slade & Prinsloo, 2013; Prinsloo & Slade, 2017a) and that engage with the structural power imbalance between LA stakeholders are promising (Chen & Zhu, 2019). In this line of thinking, perspectives that view ethics as matters of care (Prinsloo & Slade, 2017a; Puig de la Bellacasa, 2011) and data as a form of power (D'Ignazio & Klein, 2020) will certainly provide insights to reflect on decisions that, while seemingly just and fair, may not necessarily care about the people involved in HE (Johnson, 2018).

Finally, the areas for future research outlined here are insufficient to capture the breadth of the empirical work on the ethics of LA that remains to be done. As LA systems are still in the making and practices emerging, future studies on the use of such systems by students, academics, and institutions are yet to be conducted for a more grounded understanding of the diversity and depth of the ethical issues at hand.

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