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# Learning Analytics Information Systems: A Critical Literature Review

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ABSTRACT

The adoption of Learning Analytics Information Systems (LAIS) has accelerated in recent years, driven by the COVID-19 pandemic and concurrent developments in Educational Technology research. The resulting proliferation of these complex systems provides a timely foundation for investigating LAIS from an Information Systems (IS) perspective. By critically analysing LAIS research that conceptualises the IT artefact from techno-rational, sociotechnical (further divided into the streams of social shaping of technology and social construction of technology), and sociomaterial perspectives, this critical literature review uncovers teacher-centrism, non-neutral terminology regarding the IS perspective, and prominent explanations for LAIS adoption gaps. The review concludes by advocating for closer dialogue between research and practice on LAIS policy and adoption. Additionally, it suggests aligning on a term for the LAIS IT artefact that is decoupled from any single IS perspective, in order to mitigate bias and theoretical constraints in current terminology, especially because terms such as Intelligent Tutoring Systems (ITS) and Artificial Intelligence in Education (AIED) are used near-interchangeably in practice but implicitly contain different theoretical assumptions.

## 1. Introduction

The COVID-19 pandemic accelerated the adoption of educational technology (EdTech) systems in schools and universities worldwide. Many of these systems include a vast array of Learning Analytics components that generate value and insights for practitioners and draw on the now-available mass of educational data (Papamitsiou & Economides, 2014). The practice of Learning Analytics (LA) covers 'the measurement, collection, analysis, and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environment in which it occurs' (Long & Siemens, 2011, p.32) and has been a growing research domain over the past 20 years (Boztaş et al., 2024). Due to its interdisciplinary nature, LA is present not only at the intersection of education and information technology but also draws heavily from other domains such as data science, the social sciences, and human-computer interaction (Ferguson, 2012). Educational Data Mining (EDM) is another research stream of this discipline, focusing on the construction and evaluation of computational techniques for extracting value from extensive educational data (Ferguson, 2012). The advancements of LA and EDM led to the development and exploration of increasingly complex systems in the technological domain (Papamitsiou & Economides, 2014), opening the door to a meta-level investigation through the lens of information systems (IS) research.

Currently, many systems are adopted and researched in the EdTech field, varying in functionality, context, and technical depth, including Tutoring Applications, Learning Management Systems, Prediction and Recommender Systems, and Emerging Technology Applications (Wang et al., 2024). This development, along with underlying research domains, led to greater fragmentation and the emergence of specific terms for data-driven EdTech systems (Oliver, 2013): Artificial Intelligence in Education (AIED), computer-based education systems, and educational IS (Bitzer & Johnson, 1971; Rahm & Rahm-Skågeby, 2023; Xu & Ouyang, 2022). This paper will use the term Learning Analytics Information Systems (LAIS) to refer to this class of IS. LAIS was first introduced by Nguyen et al. (2021) to foster more IS research in LA and address their critique that the IT artefact is often under-theorised in LAIS research. From a systems-theory perspective, typical EDM research outcomes are often specific technology instances that can be incorporated as components into LAIS and are therefore implicitly included in this definition (Papamitsiou & Economides, 2014). In IS research itself, many different theoretical lenses have emerged through the back-and-forth between technological advancements and research contributions, each conceptualising the IT artefact differently (Hirschheim & Klein, 2011). The theorisation of the IT artefact in IS has important implications for practitioners' and researchers' understanding of future advancements (Weigand et al., 2021). By critically analysing the current literature on LAIS through multiple IS lenses, this critical literature review (CLR) uncovers current shifts and tensions in LAIS and answers the following research question:

**Research Question:** How do different theoretical IS lenses shape the conceptualisation and adoption of LAIS in higher education?

The 17 papers selected for the theoretical positioning in this CLR (appendix, table 1) were conducted through a semi-structured literature review approach, loosely following the framework of Webster & Watson (2002) (appendix, table 2). To gain this broad foundation of relevant contributions from the EdTech domain, the 11 most relevant research journals (appendix, table 3) were searched through the Web of Science database using the search terms ‘learning analytics, educational data mining, AIED, computer-based education’ in the title and ‘system*’ in the abstract. The body of papers was enhanced by further significant contributions from the IS literature. However, since the EdTech domain has emerged as a distinct research domain over the past 10 years (Boztaş et al., 2024), most of the final papers originate from it. Conference proceedings were excluded to maintain a consistent level of peer-review rigor and theoretical depth. Overall, for the final consideration, papers need to concentrate on conceptualisations, perspectives or the construction of higher education LAIS. Because of a lack of generalisability, simple models, component technology evaluations, and LAIS proofs-of-concept studies were not included, even though they make up the majority of the research body.

First, this CLR presents the current LAIS research within their classified IS perspective (techno-rational, sociotechnical (divided into social shaping of technology and social construction of technology), sociomaterial), explicitly reflecting on the attributes of each lens. These findings are then further discussed, uncovering three current trends (teacher-centrism, non-neutral terminology, and adoption gaps) within the LAIS research. Finally, in the conclusion, the outcomes are summarised and placed in perspective, along with their limitations and implications for EdTech and IS practice and research.

## 2. LAIS within the Techno-rational Perspective

Although there is no distinct definition of the techno-rational view in the IS literature, it is the default rationality that many scholars implicitly follow in their research. The theoretical groundwork states that IT artefacts can be characterised by their form, goals or purposes, and adaptation (Simon, 2008, pp. 3-5). This characterisation, along with the missing interplay with the social context, is often criticised by scholars from other perspectives (W. Orlikowski & Iacono, 2001). This critique implies that the techno-rational lens views the IT artefact as deterministic, leading to a substantial body of research focused on evaluating and analysing the impact of technologies, with Design Science Research (DSR) as one primary research stream that follows these premises (Hevner et al., 2004). Drawing on the identified literature, this section discusses the distinct attributes of techno-rational views in LAIS: the bounded technical object, the focus on design features, and the social context as external input.

First, all papers classified under the techno-rational perspective view LAIS as a stable, bounded system (Erümit & Çetin, 2020; Harrer et al., 2008; Huang & Ochoa, 2025; Kay & Kummerfeld, 2019; Santos & Jorge, 2013), often presenting artefact design principles that direct what it should comprise and set the boundaries for users on what to do (Nguyen et al., 2021). For example, three of the papers have Intelligent Tutoring Systems (ITS) as their LAIS (Erümit & Çetin, 2020; Harrer et al., 2008; Santos & Jorge, 2013). The overall concentration of ITS research within this perspective reflects the strong influence of DSR and engineering-oriented research traditions in this domain. Although their conceptualisations differ, some state that ITS aims to evaluate students' knowledge adoption (Erümit & Çetin, 2020), while others define the scope of their ITS based on their definitions of a tutor in terms of behaviour and functionality (Santos & Jorge, 2013). Overall, these insights indicate that, although LAIS are often seen as stable technology components in education, with teachers and students as users, these stakeholder groups are not necessarily the ones shaping them.

Second, the techno-rational view is also known for its richness in methodologies and frameworks for conceptualising technology systems. In their DSR, Nguyen et al. (2021) propose a set of design principles for LAIS in higher education: reporting actionable information, information delivery, interoperability, and data protection, which focus primarily on the system infrastructure and core functionalities (Nguyen et al., 2021). Other papers share this focus on principles and system logic, often framing them as one of their main contribution: Design framework for ITS (Erümit & Çetin, 2020), the TAP framework (Huang & Ochoa, 2025), guidelines for user models (Kay & Kummerfeld, 2019) and system architecture designs (Santos & Jorge, 2013). To conclude, the papers reflect the techno-rational characteristic by focusing on design features and system logics, which, in turn, reflect the already discussed bounded system view, but missing larger institutional dynamics.

Third, although there are differences in how social contexts impact LAIS, they are always treated as external input. For example, Huang & Ochoa (2025) derive their features directly from research and incorporate pedagogical principles into their design, resulting in a context-informed LAIS. In contrast, Kay & Kummerfeld (2019) follow a typical techno-rational LAIS practice by directly incorporating learners and knowledge as model components to internalise external factors within their lifelong learner model framework. This inclusion of adaptations as internal system configuration also reflects their ongoing considerations of social contexts. In the proposed ITS framework, LAIS changes can be

accomplished by following specific adaptation criteria, such as student level, learning, cognitive style (Erümit & Çetin, 2020). In the life-long, life-wide learners approach, the authors discuss minor future updates to the underlying LAIS models and anticipated changes in learners and context over time, which will result in different data, but the system's functionalities themselves remain stable (Kay & Kummerfeld, 2019). Thus, the social context is directly translated into models, principles and rules, reflecting a bounded system and highlighting the limits of the techno-rational lens.

## 3. LAIS within the Sociotechnical Perspective

The sociotechnical perspective is not only focused on the IT artefact but also on its use by individuals in social contexts, positioning the overarching research object as emergent from both sides reciprocally (Briggs et al., 2010; Sarker et al., 2019). This lens is prominent in IS research and has therefore led to many sub-streams. In this work, the papers on LAIS will be further classified into the Social Shaping of Technology (SST) and Social Construction of Technology (SCOT).

### *3.1 Social Shaping of Technology (SST)*

SST is an IS lens that emerged from criticising the techno-rational belief that technology can be analysed mainly through its effects. Therefore, it emphasises 'opening the black-box' to expose the relations between technology and its social context, which are shaping each other (MacKenzie & Wajcman, 2011; Williams, 2019). The two critical attributes of SST are the mutual shaping of technology and social relations, as well as the alignment with policies and institutions (Williams, 2019).

The mutual shaping of technology and social relations is addressed at varying degrees in the derived research. Some papers focus on how LAIS shape people's perception of the quality and value of higher education, and also highlight that expanding data infrastructure can enhance curriculum design and foster a different kind of university (Williamson, 2019). Other works clearly acknowledge LAIS not only as a technological artefact but investigate different perspectives of higher education professionals (Clark et al., 2020). These educational values and pedagogical practices, in turn, shape the systems (Cukurova, 2025). Since these beliefs underpin policies and laws, regulatory gaps in data privacy and equity emerge with further technological advancements and, at the same time, hinder effective adoption (Sun, 2023). While these papers claim mutual shaping, they often focus on the institutional level rather than on how LAIS evolves over time in practice.

Focusing on the alignment of technology with policies and institutions, in his analysis of policy networks, Williamson (2019) criticises the metric-driven approach of educational institutions, which leads to constant performance comparisons among students, and calls for institutions to orchestrate future developments that do not exploit data or introduce bias. In addition, educational-level strategy and policy are identified as a critical success factor for LAIS adoption (Clark et al., 2020). This claim is further highlighted by Tsai et al. (2019), who note that the lack of strategic engagement and current resource allocations at higher institutions are hindering LA adoption. Cukurova (2025) supports this view by acknowledging that the policy landscape, institutional governance, pedagogical culture, technological infrastructure, and social support mechanisms provided to teachers have an important impact on adoption. These reviewed papers point to persistent tensions in the educational policy field regarding LAIS, which limits its broad adoption due to insufficient rules and problematisation within institutions. Overall, this emphasis on organisational and institutional alignment for

LAIS' success highlights the increasing acknowledgement of SST perspectives in higher education systems.

*3.2 Social Construction of Technology (SCOT)*

Similar to SST, SCOT also emphasises social interactions during the development of technology (and beyond), but focuses more on different perspectives on the IT artefact from different social groups, leaving room for interpretative flexibility. The different perceptions are usually further negotiated throughout the interaction between technology and humans, leading to a state of closure over time (Pinch & Bijker, 1984). In the educational domain, this translates into understanding the different needs and perspectives of students and teachers and allowing them to co-shape LAIS over time (Jones & Bissell, 2011).

The interpretative flexibility of LAIS systems is present in three of the identified papers. In their five-step co-designing process for a multimodal LAIS, Martinez-Maldonado et al. (2022) clearly define the different stakeholder groups, their perspectives, and their influence. Because practitioners were actively involved in the design process, their current perceptions shape future enhancements, but this involvement can also lead to changes in beliefs, fostering even more fundamental changes to the learning design itself. This emphasis on teachers' perspectives, as well as the fact that changes in perspective and understanding of the tool drive further change, is similarly addressed by Karademir et al. (2024). Poquet (2024) also acknowledges the perceptions of different groups in her research on conceptualising sensemaking as a socio-cultural process within organisational contexts. However, all papers mentioned either treat teachers as a single group or focus on individual voices; they do not incorporate students or other groups into their proposed design processes or differentiate teachers into further subgroups. This teacher-centricity may reflect both their accessibility as research participants along with their institutional role as primary decision-makers in educational settings.

Additonally, within their research, the authors' proposed design processes to guide closure through negotiation across different perspectives. Martinez-Maldonado et al. (2022) translate their findings into design principles (a premature state), which are subsequently verified and tested with teachers. A similar process is also evident in the co-design of teacher dashboards, with the authors pointing out that future changes in technology and teachers will lead to a 'right balance' in the automation intensity of teacher-student feedback practices (Karademir et al., 2024). In the sensemaking research, the author stresses that a common language and constructs for operationalising sensemaking in LAIS are needed, which, in turn, is a call to stabilise general perceptions of LAIS in research practice (Poquet, 2024). To conclude, the negotiation process is present in all papers of this category; however, the co-design processes do not cover cross-group negotiation and only weakly address future negotiation loops.

## 4. LAIS within the Sociomaterial Perspective

In general, sociomaterialism is grounded in the idea of constructed entanglement, the belief that neither social nor material aspects have fixed meanings but acquire meaning through their consolidation (W. J. Orlikowski, 2007). ANT, with its focus on technology as an actor with agency in a network, is often cited as a foundational stream that led to sociomaterialism, and both challenge the separation of technology and humans (W. J. Orlikowski & Scott, 2008). None of the derived research papers fit the sociomaterialism view or ANT perfectly, which also reflects the extremely theoretical

perspective it holds in IS research (Cecez-Kecmanovic et al., 2014; Leonardi, 2013). This limited presence of fully sociomaterial perspectives in the reviewed literature suggests their marginal stance in LAIS research. However, three papers show tendencies in that direction, going beyond the sociotechnical attributes discussed in the previous section. Building on these observations, the following sections review how the identified papers discuss constructed entanglement, recombination of the educational domain, and technological agency.

The constructed entanglement can be derived from all papers in this category. In analysing teachers' perspectives on AI-collaboration in education, Kim (2024) discusses the nature of AI-teacher interaction as a 3-stage process: teachers as passive AI recipients, teachers as active AI users, and teachers and AI as constructive partners. She describes humans and AI as collaborative partners who co-orchestrate teaching activities that could not have emerged from either party alone, underscoring the sociomaterial belief in the inseparability of the two (Kim, 2024). This view is supported by Lawrence et al. (2024), who explore the multiple perspectives that teachers have on sharing control with an AIED and their co-design process, emphasising the co-orchestration of the learning experience. Coming from a more theoretical approach in discussing imaginaries and problematisations, Rahm and Rahm-Skågeby (2023) are directly taking on a sociomaterial perspective in emphasising how AIEd system solutions are not solely constructed by societal and policy beliefs but do take on very practical forms and agencies, which also underlines the inseparability of social and material.

This technology and human inseparability have direct consequences for how changes in the educational domain itself are theorised, as reflected in the work of two authors. Kim (2024) derives how teaching curricula are anticipated to change with the adoption of AI and the future evolution of teacher-AI collaboration. In her conclusion, she supports other research findings that AI will transform teachers' roles as instructional designers, decision-makers, and facilitators (Kim, 2024). This view is supported by Rahm and Rahm-Skågeby (2023), who, although having a strong focus on perspectives towards AIED, emphasise the co-creation process between technologies, policies and also beliefs in teachers and learners of education itself, stressing that problematisations of education will always include political content and implications that they contain (Rahm & Rahm-Skågeby, 2023). In summary, authors within the sociomaterialistic view anticipate upcoming significant changes in the educational domain through further advancements in LAIS, but these are not yet widely present or reflected in the literature.

Although full technological agency for LAIS is not explicitly mentioned in any of the papers, two papers (Kim, 2024; Lawrence et al., 2024) view educational AI tools as 'partners' to teachers. Additionally, in the proposed design process for teacher conceptualisations, Kim (2024) suggests features for LAIS design that directly connect to the idea of LAIS being perceived as having agency: control, trust, responsibility, efficiency, and accuracy. To conclude, agency has not yet been demonstrated in LAIS but is instead attributed to a specific set of systems.

## 5. Discussion

The analysis through multiple IS lenses in the previous chapter revealed how these perspectives shape both the conceptualisation and adoption of LAIS in higher education, which becomes visible through three central themes: teacher-centrism, non-neutral terminology, and adoption gaps.

First, across all IS lenses, LAIS research focuses on teachers as the primary group of interest, which reflects how teacher-centric LAIS are conceptualised within the academic literature. Many research papers emphasise human-centric design (Huang & Ochoa, 2025; Martinez-Maldonado et al., 2022), i.e., by incorporating human-computer interaction methods, but the IS lenses approach them differently, e.g. through interviews or co-design processes (Karademir et al., 2024; Lawrence et al., 2024). Although LAIS systems directly interact with and impact both teachers and students, students' perceptions are usually modelled within the LAIS, derived through proxies (teachers, educational organisations), and are not given the same consideration as teachers. This teacher-centricity uncovers a research blind spot that might result from the accessibility and power dynamics of these user groups, and also highlights current research gaps.

Second, by analysing the specific LAIS through the different IS lenses, it becomes clear that almost all papers on ITS are classified into the techno-rational perspective, while the sociomaterial perspective is dominated by AIED systems (appendix, table 1). ITS and AIED are not mutually exclusive; in fact, an ITS typically includes AI components, while an AIED system can be an ITS. This finding indicates that IS lenses shape not only how LAIS are analysed but also how they are conceptualised, with terminology implicitly embedding specific theoretical assumptions. Hence, the chosen LAIS terminology is already reflecting a specific IS view. In general, this is not problematic and might be a simple effect of research practice, but it also limits researchers' views of LAIS when they unconsciously choose a term.

Third, the current LAIS challenges mentioned in the papers reflect the restrictions that IS lenses impose. The comparison of techno-rational and sociotechnical papers reveals that many challenges mentioned in sociotechnical papers, such as adaptation and recognition at the educational institution level, result from treating the IT artefact as stable and the social context as external. Although the techno-rational view is highly appropriate for evaluating new technologies and algorithms, the adoption and ultimate value of LAIS depend on external factors and individual perceptions, which can be easily overlooked when focusing solely on the techno-rational perspective. In addition, the body of this CLR revealed that LAIS systems are currently not fully theorised as sociomaterial. This situation might result from general hesitation about adoption, but also from the risks to privacy and ethics when a LAIS becomes an actor with full agency without appropriate policies in place. Therefore, these differences illustrate how IS lenses shape adoption outcomes. The techno-rational perspectives conceptualise LAIS as stable artefacts and therefore overlook institutional and social dynamics, whereas sociotechnical approaches explicitly account for these factors, highlighting why adoption gaps persist.

Finally, a secondary cross-lens observation is that design principles are no longer a distinct term within the techno-rational perspective. Although focusing more on process (Karademir et al., 2024; Lawrence et al., 2024) or attribution principles (Kim, 2024), rather than on principles for system functionalities, other lenses use the term heavily to frame their research outputs. Overall, the findings demonstrate that IS lenses do not merely provide analytical perspectives but actively shape how LAIS are conceptualised, which in turn influences their adoption and perceived value in higher education.

## 6. Conclusion

This CLR explored LAIS in higher education from techno-rational, sociotechnical (SST, SCOT), and sociomaterial perspectives.

Indicative literature was derived semi-structured from established EdTech and IS journals. In answering the research question of how different theoretical IS lenses shape the conceptualisation and adoption of LAIS, the analysis showed that different IS lenses shape both the conceptualisation and adoption of LAIS, as reflected in their teacher-centricity and the non-neutrality of LAIS terminology. The overall distribution and intensity of LAIS literature across these IS perspectives present important insights into the current state of the EdTech domain. These findings indicate that challenges in embedding LAIS in education stem from lens-driven conceptualisations that overlook socio-technical dependencies and broader regulatory conditions.

This CLR has limitations in its coverage and interpretative validity, which should not be overlooked when building on its claims. First, it focused only on a specific set of journals, which may have led to important nuances in LAIS being overlooked and the exclusion of major conference proceedings may have omitted practice-oriented contributions to recent LAIS research. Additionally, slight categorical overlaps due to the nature of IS theorising are evident in the literature analysis, but they still weaken the interpretative validity. The semi-structured literature review approach partially addresses coverage. However, a comprehensive systematic literature review with a bottom-up classification of LAIS could further support the research outcomes.

As for implications for educational practitioners and LAIS providers, it will be crucial to focus on the sociotechnical implications, as the adoption of these systems is clearly constrained by the current policy landscapes of countries and institutions (Cukurova, 2025; Tsai et al., 2019). They need to work with researchers and institutional representatives to lay a foundation for the safe, secure adoption of more LAIS, so that more teachers and students can benefit from their advancements. In addition, this might even set the stage for broader structural changes in the educational domain, as it shapes critical perspectives and advocates cultural openness to change.

For research practitioners, it is beneficial to align on a single umbrella term that classifies data-driven, ML- and AI-based LA systems, without tying it to any specific IS lens. LAIS might help unify the scattered research landscape on EdTech systems (Oliver, 2013). Additionally, the review showed that students are less involved in LAIS research than teachers, although user-centricity runs through all IS perspectives (Huang & Ochoa, 2025; Martinez-Maldonado et al., 2022). Therefore, future LAIS research should include more student perspectives and co-creation with students for valuable results.

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## Appendix:

**Table 1.** Final classification of IS lens attributes of the 17 identified papers

| | | | | Techno-rational Attributes | | | Sociotechnical Attributes | | | | Sociomaterial Attributes | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SST | | SCOT | | | | | |
| # | Title | Authors | Year | Final Categorisation | bounded object | design features | external context | mutual shaping | policy alignment | interpretative flexibility | stabilisation process | constructed entanglement | domain recombination | technological agency |
| 1 | Design framework of adaptive intelligent tutoring systems | Erumit, AK; Cetin, I | 2020 | Techno-rational | X | X | X | | | | | | | |
| 2 | The Scalable Adapter Design Pattern: Enabling Interoperability between Educational Software Tools | Harrer, A; Pinkwart, N; McLaren, BM; Scheuer, O | 2008 | Techno-rational | X | X | X | | | | | | | |
| 3 | Charting the Development of Collaboration Skills through Collaborative Learning Analytics Systems | Huang, XM; Ochoa, X | 2025 | Techno-rational | X | X | X | | | | | | | |
| 4 | From data to personal user models for life-long, life-wide learners | Kay, J; Kummerfeld, B | 2019 | Techno-rational | X | X | X | | | | | | | |
| 5 | Design principles for learning analytics information systems in higher education. | Nguyen, A; Tuunanen, T; Gardner, L; Sheridan, D | 2020 | Techno-rational | X | X | X | | | | | | | |
| 6 | Interoperable Intelligent Tutoring Systems as Open Educational Resources | Santos, GS; Jorge, J | 2013 | Techno-rational | X | X | (X) | | | | | | | |
| 7 | Critical success factors for implementing learning analytics in higher education: A mixed-method inquiry | Clark, JA; Liu, YL; Isaias, P | 2020 | SST | | | | X | X | | | | | |
| 8 | The interplay of learning, analytics and artificial intelligence in education: A vision for hybrid intelligence | Cukurova, M | | SST | | | | X | X | (X) | | | | |
| 9 | Gaps, guesswork, and ghosts lurking in technology integration: Laws and policies applicable to student privacy | Sun, JC | 2023 | SST | | | | (X) | X | | | | | |
| 10 | Complexity leadership in learning analytics: Drivers, challenges and opportunities | Tsai, YS; Poquet, O; Gasevic, D; Dawson, S; Pardo, A | 2019 | SST | | | | (X) | X | | | | | |
| 11 | Policy networks, performance metrics and platform markets: Charting the expanding data infrastructure of higher education | Williamson, B | 2019 | SST | | | | X | X | | | | (X) | |
| 12 | I don't have time! But keep me in the loop: Co-designing requirements for a learning analytics cockpit with teachers | Karademir, O; Di Mitri, D; Schneider, J; Jivet, I; Allmang, J; Gombert, S; Kubsch, M; Neumann, K; Drachsler, H | 2024 | SCOT | | | | | | X | X | | | |
| 13 | Designing translucent learning analytics with teachers: an elicitation process | Martinez-Maldonado, R; Elliott, D; Axisa, C; Power, T; Echeverria, V; Shum, SB | 2022 | SCOT | | | | (X) | | X | X | | | |
| 14 | A shared lens around sensemaking in learning analytics: What activity theory, definition of a situation and affordances can offer | Poquet, O | 2024 | SCOT | | | | | | X | (x) | | | |
| 15 | Leading teachers' perspective on teacher-AI collaboration in education | Kim, J | | Sociomaterial | | | | (X) | | | | X | X | X |
| 16 | How teachers conceptualise shared control with an AI co-orchestration tool: A multiyear teacher-centred design process | Lawrence, L; Echeverria, V; Yang, KX; Aleven, V; Rummel, N | 2024 | Sociomaterial | | | | | | X | | X | (X) | (X) |
| 17 | Imaginaries and problematisations: A heuristic lens in the age of artificial intelligence in education | Rahm, L; Rahm-Skågeby, J | | Sociomaterial | | | | | | X | | X | X | (X) |

**Table 2:** Exclusion table of the systematic literature extraction

| Filter process step | Number of results | Author's comment |
|---|---|---|
| Database results | 454 | |
| 1 Remove duplicates | 423 | *Duplicates occurred due to sequential search* |
| 2 Relevance by title | - | *Skipped to get a better understanding of the literature* |
| 3 Relevance by abstract | 75 | |
| 4 Relevance by full text | 16 | |
| 5 Adding IS papers | 7 | *Additional IS paper instead of forward-backward search* |

**Table 3:** EdTech Journals for semi-structured literature extraction

| Journal Title |
|---|
| British Journal of Educational Technology |
| Journal of Learning Analytics |
| Education and Information Technologies |
| IEEE Transactions on Learning Technologies |
| Interactive Learning Environments |
| Journal of Computer Assisted Learning |
| Internet and Higher Education |
| Journal of Computing In Higher Education |
| Australasian Journal of Educational Technology |
| International Journal of Information and Learning Technology |
| Computers and Education Open |