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EDUCATIONAL DATAFICATION IN THE DIGITAL UNIVERSITY: TEACHERS' AWARENESS AND USE OF EDUCATIONAL ANALYTICS IN HIGHER EDUCATION

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ABSTRACT

The rapid datafication of higher education has transformed universities into digitally mediated environments that continuously generate large volumes of educational data. Although educational analytics are increasingly positioned as instruments for improving educational quality and supporting evidence-informed pedagogy, relatively little is known about how university teachers perceive and utilize educational data in everyday pedagogical practice. The present study investigates teachers' awareness and use of educational data generated within institutional digital learning environments (DLEs). The study involved 298 university teachers employed at higher education institutions in the Russian Federation. Data were collected using an author-designed questionnaire and analyzed through descriptive statistics, Kruskal–Wallis analysis, Spearman correlation analysis, and multiple regression analysis. The findings demonstrated that teachers primarily utilize traditional academic indicators, including academic performance, attendance, and student ratings, whereas communication-based and behavioral digital data remain substantially underutilized. Educational analytics were used most actively for improving educational quality and significantly less frequently for individualized student development and educational program updating. Higher awareness of educational data and DLE capabilities emerged as one of the strongest predictors of pedagogical integration of educational analytics. The findings suggest that the growing datafication of higher education does not automatically lead to data-informed pedagogical transformation. Instead, educational analytics continue to function primarily within institutional cultures of accountability and academic monitoring. The study contributes to contemporary discussions concerning teacher agency, algorithmic governance, and the cultural transformation of higher education in digitally mediated societies.

KEYWORDS: Educational Analytics; Datafication; Digital Learning Environments; Higher Education; Teacher Agency; Learning Analytics; Digital Culture.

1. INTRODUCTION

The rapid digitalization of higher education has fundamentally transformed the structure of contemporary educational environments. Universities increasingly operate through complex digital infrastructures that mediate communication, assessment, administration, and learning processes. Learning management systems, institutional platforms, videoconferencing tools, and algorithmically organized educational services continuously generate large volumes of educational data that can potentially be used to evaluate, predict, and optimize educational processes (Romero & Ventura, 2017; Williamson, 2019). Within this context, educational institutions are becoming progressively datafied environments in which educational activities are translated into measurable digital traces that can be analyzed and incorporated into institutional governance and pedagogical decision-making.

The growing integration of digital technologies into education reflects broader sociocultural transformations associated with platformization, algorithmic governance, and the expansion of data-driven management systems in contemporary society (Couldry & Mejias, 2019; van Dijck, Poell, & de Waal, 2018). Educational data are no longer limited to traditional indicators such as grades and attendance. Digital educational environments increasingly collect multidimensional information concerning students' learning trajectories, behavioral patterns, communication practices, engagement indicators, participation in online educational activities, and interactions within digital platforms (Fischer et al., 2020). As Selwyn (2019) argues, digital education is increasingly shaped by processes of quantification and computational management that redefine how educational effectiveness, participation, and achievement are interpreted.

These developments have stimulated substantial scholarly interest in educational analytics, educational data mining, and learning analytics as mechanisms for improving educational quality and institutional efficiency (Baker, 2015; Baek & Doleck, 2021; Lang et al., 2017). Researchers have demonstrated that educational data can support the prediction of academic performance, identification of learning difficulties, optimization of educational programs, and personalization of instruction (Asif et al., 2017; Fernandes et al., 2019; Fu et al., 2021). At the same time, the expansion of educational analytics has generated critical discussions regarding the transformation of pedagogical practices, teacher autonomy, surveillance mechanisms, and the ethical implications of data-driven governance in higher education (Knox, 2020; Lupton, 2021; Williamson, 2019).

Within the contemporary digital university, teachers occupy a particularly important position. On the one hand, educators are expected to integrate educational analytics into pedagogical decision-making and use educational data to improve learning outcomes, monitor student engagement, and individualize instruction. On the other hand, teachers often face increasing technological complexity, institutional accountability pressures, and insufficient preparation for interpreting and applying educational data in pedagogically meaningful ways (Datnow & Hubbard, 2016; Marsh, 2012). Consequently, educational analytics should not be understood merely as a technical instrument, but as a sociocultural practice that reshapes professional roles, forms of pedagogical expertise, and institutional power relations within higher education.

The numerous studies have explored the technical capabilities of educational analytics systems, substantially less attention has been devoted to how university teachers themselves perceive educational data, how aware they are of the analytical possibilities of digital learning environments, and how educational data are integrated into everyday pedagogical practice. Existing research predominantly focuses either on technological infrastructures or on institutional implementation models, while the perspectives and practices of educators remain comparatively underexplored.

From the perspective of critical digital culture studies, educational analytics cannot be understood solely as neutral technological instruments designed to optimize learning processes. Rather, they constitute part of broader sociotechnical systems that reshape the epistemological, organizational, and cultural foundations of higher education (Selwyn, 2019; Knox, 2020). The increasing reliance on educational data reflects a wider transition toward algorithmic forms of governance in which educational practices become progressively quantified, standardized, and integrated into systems of institutional accountability (Beer, 2019; Williamson, 2019).

Within digitally mediated universities, data increasingly function not merely as descriptive indicators, but as mechanisms that influence pedagogical priorities, define acceptable forms of educational participation, and structure institutional perceptions of effectiveness and quality (Couldry & Mejias, 2019). Educational analytics therefore

contribute to the construction of what Lupton (2021) describes as datafied subjectivities, in which teachers and students become visible through continuously monitored and measurable digital traces.

This transformation generates important tensions between pedagogical autonomy and data-driven institutional governance. While educational analytics may support evidence-informed decision-making and personalization of learning, they may simultaneously reinforce performative cultures centered on monitoring, ranking, and metric-based evaluation (Espeland & Sauder, 2016). As a result, teachers increasingly operate within hybrid professional environments where pedagogical judgment intersects with algorithmic systems of assessment and digital accountability.

From this perspective, educators should not be viewed merely as passive users of educational data, but as active interpreters of digital information whose professional agency shapes how educational analytics are incorporated into pedagogical practice. Investigating teachers' awareness and use of educational data therefore provides insight not only into technological adoption, but also into the broader cultural transformation of higher education under conditions of digitalization and datafication.

The present study seeks to address this gap by examining university teachers' awareness and utilization of educational data generated within institutional digital learning environments. Particular attention is devoted to the relationship between teachers' awareness of educational analytics, their professional experience, and the perceived pedagogical functions of educational data in higher education. By focusing on teachers' interaction with educational data, the study contributes to broader discussions concerning the cultural transformation of higher education under conditions of digitalization and datafication.

1.1. Educational Data and the Datafication of Higher Education

The emergence of digital educational environments has profoundly transformed the ways educational processes are organized, monitored, and evaluated. Contemporary universities increasingly rely on digital infrastructures that continuously generate and accumulate educational data derived from learning management systems, institutional databases, communication platforms, assessment systems, and online educational services (Romero & Ventura, 2020). Within this context, educational data encompass not only traditional indicators such as attendance and academic performance, but also behavioral, communicative, motivational, and interactional traces generated through students' engagement with digital platforms (Fischer et al., 2020).

Researchers increasingly conceptualize these developments through the notion of datafication, understood as the transformation of social and educational activities into quantifiable digital information that can be analyzed and operationalized within systems of governance and institutional management (Couldry & Mejias, 2019; Williamson, 2019). In higher education, datafication involves the expansion of computational forms of monitoring, prediction, and evaluation that influence how learning processes, educational quality, and institutional effectiveness are interpreted.

As van Dijck et al. (2018) emphasize, digital platforms do not merely mediate educational interaction; they actively restructure institutional practices, organizational logic, and forms of participation within educational systems. Educational data increasingly function as instruments of accountability and managerial control, contributing to the emergence of new forms of algorithmic governance in higher education (Beer, 2019; Knox, 2020). Consequently, educational analytics should be viewed not only as a technological innovation, but also as a cultural and organizational transformation affecting the epistemological foundations of education itself.

The widespread use of educational data analytics reflects broader tendencies toward metricization and quantification in contemporary institutions (Espeland & Sauder, 2016; Wilsdon et al., 2015). Williamson (2019) argues that higher education institutions increasingly rely on digital metrics and platform-generated indicators to evaluate educational performance, institutional reputation, and learning effectiveness. As a result, educational data become integrated into institutional decision-making systems that shape pedagogical priorities and influence the organization of educational processes.

1.2. Educational Analytics and Learning Analytics

Within the field of educational research, several major approaches to working with educational data have emerged. The two most influential directions are educational data mining (EDM) and learning analytics (LA). Educational data mining focuses primarily on the development of computational methods and algorithms for identifying patterns in educational data sets and solving technically

oriented analytical tasks (Bakhshinategh et al., 2018). Learning analytics, in contrast, is more strongly oriented toward understanding and optimizing learning processes through the interpretation and application of educational data in pedagogical contexts (Lang et al., 2017).

Although EDM and LA differ in emphasis, they share common objectives related to the analysis of educational processes, prediction of educational outcomes, and improvement of learning environments (Baek & Doleck, 2021). Additional approaches include academic analytics and institutional analytics, which focus on administrative and organizational effectiveness (Campbell et al., 2007; Siemens & Long, 2011), as well as data-driven decision-making models aimed at improving educational policy and institutional management (Custer et al., 2018; Datnow & Hubbard, 2016).

The emergence of Educational Data Science (EDS) further reflects the growing integration of statistical, computational, and machine learning approaches in the analysis of educational processes (Romero & Ventura, 2013). These approaches have demonstrated considerable potential for predicting academic achievement, identifying risk factors for student disengagement, evaluating teaching effectiveness, and personalizing learning trajectories (Asif et al., 2017; Fernandes et al., 2019; Fu et al., 2021).

At the same time, researchers increasingly emphasize that educational analytics are not pedagogically neutral. The interpretation of educational data depends upon institutional priorities, technological infrastructures, and cultural assumptions regarding educational effectiveness and desirable forms of learning behavior (Knox, 2020; Selwyn, 2019). Educational analytics therefore represent not merely technical systems of data processing, but sociotechnical mechanisms that shape educational values, institutional norms, and pedagogical practices.

1.3. Teacher Agency And Educational Data Practices

Within digital educational environments, teachers play a central role in interpreting and applying educational data in pedagogical practice. Educational analytics can support instructors in monitoring student engagement, identifying learning difficulties, adapting instructional strategies, and designing individualized educational trajectories (Švábenský et al., 2022; Chango et al., 2022). Educational data may also contribute to curriculum development, instructional quality management, and the evaluation of educational effectiveness (Munshi & Alhindi, 2021; Feldman-Maggor et al., 2020).

However, the integration of educational analytics into pedagogical practice requires not only technical infrastructure, but also the development of specific forms of digital competence, data literacy, and professional agency among educators (León et al., 2021). Romero and Ventura (2013) note that effective interaction with educational data presupposes familiarity with digital learning environments, understanding of the available data structures, and the ability to interpret analytical information within pedagogically meaningful frameworks.

A number of studies indicate that teachers' use of educational analytics is influenced by institutional support, access to digital tools, professional development opportunities, and motivational factors (Feldman-Maggor et al., 2020; Aljawarneh & Lara, 2021; Rodriguez et al., 2024). When educational data practices are perceived as relevant to pedagogical goals and capable of improving educational quality, educators demonstrate greater willingness to integrate analytics into their professional activities.

Nevertheless, researchers also identify substantial barriers to the adoption of educational analytics. These include technological complexity, information overload, insufficient training, ethical concerns, and the perception of data systems as mechanisms of institutional surveillance and accountability (Arantes & Buchanan, 2022; Lupton, 2021). Teachers may therefore experience tension between pedagogical autonomy and increasing institutional demands for data-driven educational management.

Despite the growing body of research on educational analytics, relatively little empirical attention has been devoted to how university teachers themselves perceive the educational data generated within institutional digital learning environments and how these data are incorporated into pedagogical decision-making. Most existing studies focus either on technological systems or institutional implementation models, while educators' awareness, interpretations, and practical uses of educational data remain insufficiently explored. The present study addresses this gap by investigating the awareness and utilization of educational data among university teachers within the context of contemporary digital higher education.

2. MATERIALS AND METHODS

2.1. Research Design

The present study employed a cross-sectional quantitative research design aimed at investigating

university teachers' awareness and use of educational data generated within institutional digital learning environments (DLEs). The study focused on how educators perceive the availability of educational data, evaluate their capacity to work with such data, and integrate educational analytics into pedagogical decision-making.

The conceptual framework of the study was grounded in contemporary approaches to educational analytics, learning analytics, and critical digital culture studies, which conceptualize educational data not only as technical resources, but also as sociocultural instruments influencing pedagogical practices and institutional governance (Williamson, 2019; Knox, 2020; Selwyn, 2019).

2.2. Participants

The study involved 298 university teachers employed at higher education institutions located in the central region of the Russian Federation. Participants ranged in age from 22 to 78 years (M = 49 years). Of the total sample, 11% were between 18 and 35 years old, 63% were between 36 and 55 years old, and 26% were over 55 years old. The majority of respondents (78%) had more than 10 years of teaching experience.

Regarding academic qualifications, 67% of participants held a Candidate of Sciences degree (PhD equivalent), 16% possessed a Doctor of Sciences degree, and 17% did not hold an academic degree at the time of the study.

All participating universities operated institutional digital learning environments that complied with the requirements established by the Federal Law on Education in the Russian Federation No. 273-FZ.

2.3. Instrument

Data were collected using an original author-designed questionnaire developed to assess teachers' awareness and pedagogical use of educational data available within university digital learning environments.

The questionnaire consisted of 19 items grouped into two major sections: awareness of educational data and digital learning environment capabilities; use of educational data in pedagogical activities.

The questionnaire evaluated awareness and use of educational data in relation to three principal pedagogical domains: improving educational quality; supporting individualized student development; updating educational program content.

Participants evaluated their level of awareness and frequency of educational data use using a five-point Likert scale ranging from 1 ("very low awareness/almost never use") to 5 ("very high awareness/frequent use").

The questionnaire included items assessing awareness of:

- student academic performance data;
- attendance data;
- student ratings;
- educational course evaluations;
- data generated by learning management systems;
- information regarding students' participation in additional educational activities;
- communication data from educational chats and digital platforms.

2.4. Validity And Reliability

Prior to the main stage of the study, the questionnaire underwent expert evaluation by specialists in educational psychology and digital pedagogy to assess content validity and clarity of item formulation.

A pilot administration involving university teachers was conducted to evaluate the comprehensibility and consistency of the instrument. Internal consistency analysis demonstrated acceptable reliability indicators for the principal questionnaire scales (Cronbach's α exceeded the acceptable threshold for exploratory educational research).

2.5. Procedure

The survey was conducted online in September 2024 using institutional digital communication channels. Invitations to participate were distributed via official university mailing lists and professional academic networks.

Participation in the study was voluntary and anonymous. Prior to completing the questionnaire, all respondents provided informed consent and were informed about the academic purposes of the study, confidentiality of responses, and their right to withdraw from participation at any stage.

2.6. Data Analysis

Statistical analysis was conducted using nonparametric and multivariate statistical methods appropriate for the distribution characteristics of the data.

The following analytical procedures were employed: descriptive statistics; Kruskal–Wallis one-factor analysis of variance; Spearman correlation analysis; multiple regression analysis using the Enter

method.

The Kruskal–Wallis test was used to identify statistically significant differences between groups with different levels of awareness regarding educational data and DLE capabilities. Spearman correlation analysis was employed to examine relationships between professional experience, awareness indicators, and educational data use. Multiple regression analysis was conducted to identify predictors of teachers' perceived ability to utilize digital learning environments in pedagogical practice.

Statistical significance was established at $p < .05$.

2.7. Ethical Considerations

The study was conducted in accordance with ethical principles for research involving human participants. Participation was voluntary and anonymous, and all respondents provided informed consent prior to participation. No personally identifiable information was collected during the study.

3. RESULTS

3.1. Awareness Of the Structure and Educational Data Resources of Digital Learning Environments

As presented in Table 1 and Figure 1, teachers demonstrated the highest awareness of traditional academic indicators, including academic performance and attendance data, whereas awareness of socially and behaviorally oriented digital indicators remained substantially lower. Nearly all respondents identified access to institutional university websites (97%), electronic library systems (88%), personal teacher accounts (93%), personal student accounts (91%), and learning management systems (74%). In addition, 77% of respondents reported awareness of institutional educational regulation databases and electronic platforms for educational units within universities.

Table 1: Teachers' Awareness of Educational Data Categories Available in University Digital Learning Environments.

Educational data category	% aware
Academic performance data	86
Attendance records	86
Student ratings	82
Student contingent data	81
Academic and extracurricular achievements	73
Selected educational courses	64
Educational course and teacher ratings	46
Students taking additional educational courses	40
Educational chat and communication data	36

Note: Percentages indicate the proportion of respondents reporting awareness of specific categories of educational data generated within institutional digital learning environments.

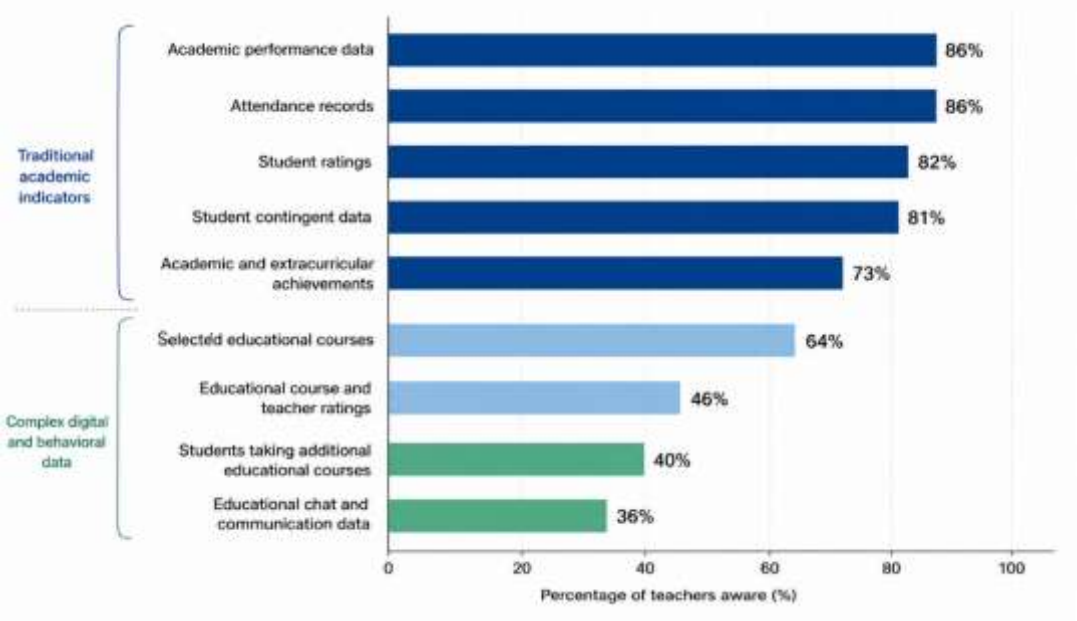

Figure 1: Awareness Of Educational Data Categories Among University Teachers.

At the same time, teachers' awareness of educational data varied substantially depending on the type of data involved. The highest awareness levels were associated with traditional educational indicators closely connected with institutional academic monitoring. Specifically, 86% of respondents reported awareness of academic performance data and attendance records, 82% were aware of student rating systems, 81% identified access to student contingent data, and 73% reported awareness of students' academic and extracurricular achievements.

In contrast, awareness of more complex forms of digital educational data was considerably lower. Only 46% of teachers reported awareness of educational course and teacher rating systems, 40% identified data concerning students' participation in additional educational courses, and only 36% indicated awareness of data generated through educational chats and digital communication environments.

A similar pattern emerged regarding educational data available through teachers' personal digital accounts. The majority of respondents reported awareness of discipline-related data (94%), attendance information (83%), current assessment data (81%), and intermediate certification results (76%). However, only 51% reported awareness of students completed tasks within learning management systems, and merely 32% identified awareness of educational chat data reflecting students' digital communication practices.

Overall, these findings indicate that teachers primarily recognize and engage with educational data corresponding to traditional academic accountability structures, whereas socially and behaviorally oriented digital indicators remain substantially less visible within pedagogical practice.

3.2. Educational Data Use Across Pedagogical Domains

As shown in Table 2 and Figure 2, educational data were used most intensively for improving educational quality and considerably less frequently for individualized learning support and curriculum transformation.

Table 3: Use Of Educational Data Across Major Pedagogical Domains.

Educational data category	Quality improvement (%)	Individual student development (%)	Educational program updating (%)
Academic performance data	77	66	47
Attendance records	74	46	49
Academic and extracurricular achievements	50	65	46
Student ratings	45	45	23
Selected educational courses	44	52	36
Student contingent data	47	38	26
Students taking additional educational courses	34	40	40
Educational course and teacher ratings	24	19	29
Educational chat and communication data	21	16	17

Note: Percentages indicate the proportion of teachers reporting the use of specific categories of educational data for corresponding pedagogical purposes.

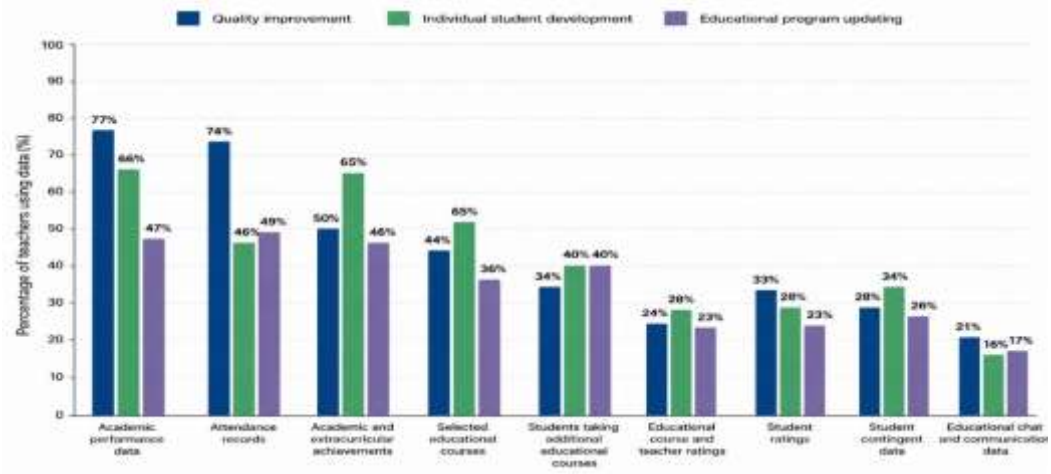

Figure 2: Patterns Of Educational Data Use in Pedagogical Practice.

In this domain, the most frequently utilized forms of educational data were academic performance indicators (77%), attendance records (74%), and information regarding students' academic and extracurricular achievements (50%). Approximately 47% of respondents reported using student contingent data and student rating systems to improve educational quality. By contrast, substantially fewer teachers reported using educational course and teacher ratings (24%), data regarding students' participation in additional educational programs (34%), or educational chat data (21%).

Educational data were used less actively for supporting individualized student development. In this area, teachers most frequently relied on academic performance data (66%), information concerning students' academic and extracurricular achievements (65%), selected educational courses (52%), and attendance data (46%). Data derived from educational chats were used by only 16% of respondents for individualized pedagogical support.

The lowest level of educational data utilization was observed in relation to updating educational program content. In this domain, the most frequently used data types included attendance records (49%), academic performance indicators (47%), and students' academic achievements (46%). Data concerning educational chats (17%), student ratings (23%), and student contingent data (26%) demonstrated particularly limited pedagogical application.

Importantly, only 1–2% of respondents reported using the full range of educational data available within institutional digital learning environments across the examined pedagogical domains. At the same time, between 7% and 13% of respondents reported that they did not use educational data at all for particular pedagogical purposes.

The Kruskal–Wallis analysis demonstrated statistically significant differences in the quantity of educational data used across pedagogical domains ($p < .001$). Teachers reported using the greatest amount of educational data for improving educational quality ($M = 4.16$), followed by individualized student development ($M = 3.87$), while educational program updating demonstrated the lowest level of data utilization ($M = 3.19$).

These findings suggest that educational analytics in contemporary universities continue to function primarily as instruments of academic monitoring and quality assurance rather than as mechanisms supporting pedagogical personalization or curriculum transformation.

3.3. Differences Between Teachers with Different Levels of Educational Data Awareness

To examine the relationship between educational data awareness and pedagogical use of educational analytics, respondents were divided into three groups according to their level of awareness regarding educational data and DLE tools. The low-awareness group included 49% of respondents, the medium-awareness group included 24%, and the high-awareness group included 27%.

The results presented in Table 3 and Figure 3 demonstrate that higher levels of educational data awareness are associated with significantly greater pedagogical integration of educational analytics.

Table 4: Differences Between Teachers with Low, Medium, And High Levels of Educational Data Awareness.

Variable	Low awareness	Medium awareness	High awareness	p
Subjective assessment of DLE competence	3.41	3.94	4.24	< .001
Subjective assessment of DLE quality	3.70	4.31	4.59	< .001
Number of identified DLE elements	10.16	11.91	11.66	< .001
Number of educational data categories identified	9.84	10.97	12.22	< .001
Educational data used for quality improvement	3.78	3.91	5.05	< .001
Educational data used for individual development	3.33	3.89	4.83	< .001
Educational data used for educational program updating	2.67	3.11	4.17	< .001

The Kruskal–Wallis analysis revealed statistically significant differences between these groups across all major study indicators ($p < .001$). Teachers with high awareness levels demonstrated substantially higher subjective evaluations of their ability to use digital learning environments ($M = 4.24$) compared to teachers with medium ($M = 3.94$) and low awareness levels ($M = 3.41$).

Similarly, teachers with high awareness evaluated the quality of institutional digital learning environments more positively ($M = 4.59$) than teachers with medium ($M = 4.31$) or low awareness levels ($M = 3.70$).

The quantity of educational data identified by respondents also increased consistently with awareness level. Teachers in the high-awareness group identified significantly more categories of educational data available within institutional DLEs ($M = 12.22$) than teachers in the medium-awareness group ($M = 10.97$) and low-awareness group ($M =$

9.84).

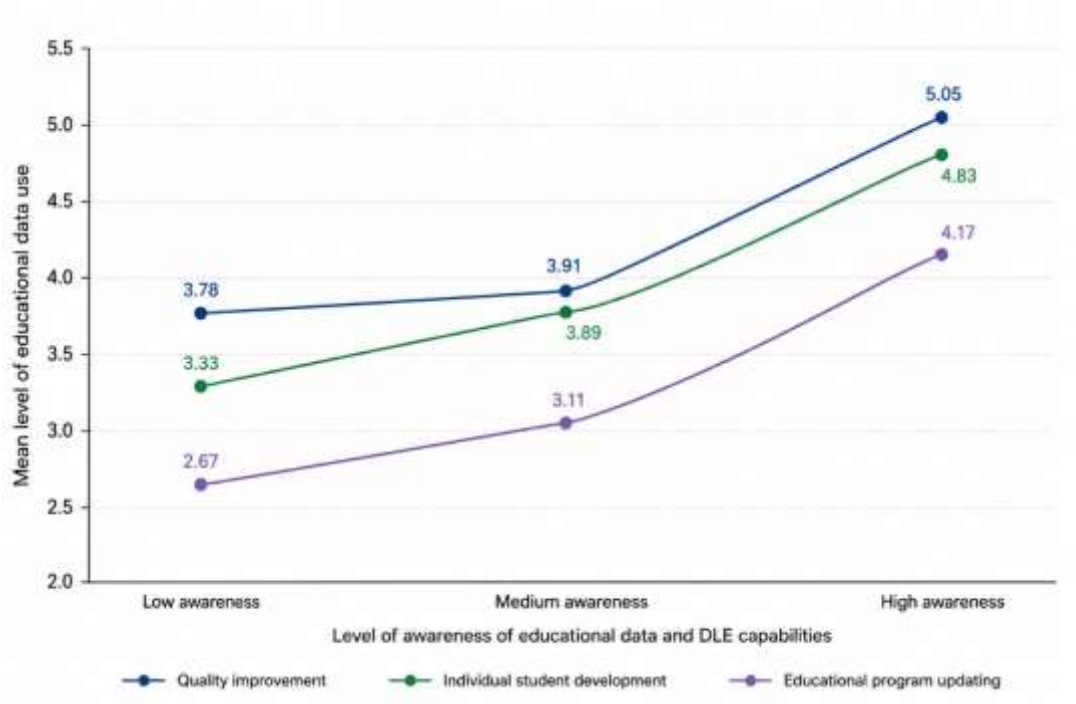

Figure 3: Relationship Between Educational Data Awareness and Pedagogical Use of Educational Analytics.

Most importantly, substantial differences emerged regarding the pedagogical use of educational data. Teachers with high awareness levels reported significantly greater use of educational analytics for improving educational quality (M = 5.05), supporting individualized student development (M = 4.83), and updating educational programs (M = 4.17) compared to teachers with low awareness levels (M = 3.78, M = 3.33, and M = 2.67 respectively).

The strongest differences were observed in perceptions regarding the pedagogical potential of educational analytics. Teachers with higher awareness demonstrated a broader understanding of how educational data could be integrated into pedagogical and organizational decision-making.

These findings indicate that awareness of educational analytics constitutes one of the principal conditions influencing the pedagogical integration of educational data in higher education.

3.4. Correlation Analysis

Spearman correlation analysis was conducted to investigate relationships between professional experience, participation in additional digital learning environment training, and indicators of educational data awareness and use.

The results revealed a statistically significant positive relationship between professional experience and general awareness of educational opportunities within university DLEs ($r = .203$, $p < .001$). More experienced teachers demonstrated greater awareness of the existence and structure of institutional educational data systems.

At the same time, professional experience demonstrated weak but statistically significant negative correlations with subjective evaluations of DLE quality ($r = –.138$, $p = .017$), perceptions regarding the usefulness of educational data for updating educational programs ($r = –.118$, $p = .041$), and actual use of educational data for curriculum updating purposes ($r = –.128$, $p = .027$).

Importantly, no statistically significant relationships were identified between participation in additional professional development courses related to DLEs and the practical use of educational data in pedagogical activities. The absence of such relationships suggests that existing professional training programs may insufficiently support the practical pedagogical integration of educational analytics.

The findings indicate that professional experience contributes primarily to institutional familiarity with digital educational systems rather than to broader pedagogical engagement with educational analytics.

3.5. Regression Analysis

As indicated in Table 4, awareness of educational data and subjective evaluations of DLE quality emerged as the strongest predictors of perceived

competence in using digital learning environments. The resulting regression model demonstrated satisfactory explanatory power ($R = .641$; $R^2 = .411$; Adjusted $R^2 = .380$), explaining approximately 41% of the variance in perceived DLE competence. The model was statistically significant overall ($F = 13.144$, $p < .001$).

The strongest positive predictors of perceived DLE competence included:

- awareness of educational data and DLE capabilities ($\beta = .274$, $p < .001$);
- subjective evaluation of DLE quality ($\beta = .231$, $p < .001$);
- work experience ($\beta = .176$, $p = .002$);
- number of identified DLE elements ($\beta = .127$, $p = .030$);
- quantity of educational data recognized within the DLE ($\beta = .147$, $p = .024$).

Table 4: Regression Analysis Predicting Teachers' Perceived Ability to Use Digital Learning Environments.

Predictor	β	t	p
Age	-.275	-4.599	< .001
Work experience	.176	3.086	.002
Educational data awareness	.274	5.015	< .001
Perceived DLE quality	.231	4.106	< .001
Number of DLE elements identified	.127	2.182	.030
Number of educational data categories identified	.147	2.275	.024

Note: The regression model explained 41% of variance in perceived DLE competence ($R^2 = .411$, $p < .001$). Awareness of educational data and perceived DLE quality emerged as the strongest predictors.

Age demonstrated a statistically significant negative relationship with perceived DLE competence ($\beta = –.275$, $p < .001$), indicating that older teachers evaluated their ability to work with digital educational environments less positively.

Taken together, these findings suggest that the pedagogical integration of educational analytics depends primarily on teachers' awareness, subjective acceptance, and interpretation of digital educational infrastructures rather than solely on the formal availability of technological systems. Educational data continue to function predominantly within the logic of academic monitoring and institutional accountability, while their transformative pedagogical potential remains comparatively underutilized within higher education practice.

4. DISCUSSION

The findings of the present study demonstrate that the integration of educational analytics into university pedagogical practice remains selective, uneven, and largely oriented toward traditional forms of academic monitoring. Although contemporary digital learning environments generate substantial amounts of educational data, university teachers primarily utilize indicators associated with conventional institutional accountability systems, including academic performance, attendance records, and student ratings. More complex forms of digital educational data, such as communication patterns, behavioral indicators, and learning interaction traces, remain comparatively underutilized within pedagogical decision-making.

These findings support broader discussions within critical digital education research concerning the incomplete pedagogical transformation of higher education under conditions of digitalization (Selwyn, 2019; Williamson, 2019). The increasing availability of educational data does not automatically produce data-informed pedagogical cultures. Rather, teachers tend to incorporate digital analytics into already existing institutional logics centered on academic control, performance evaluation, and quality assurance. In this sense, digital learning environments appear to reinforce traditional organizational models of higher education more often than they fundamentally transform them.

The dominance of academic performance and attendance indicators within pedagogical practice reflects the persistence of historically established educational cultures in which measurable academic outcomes continue to function as the primary indicators of educational effectiveness. From the perspective of critical digital culture studies, this finding suggests that datafication in higher education remains shaped by institutional traditions and organizational norms rather than by the full pedagogical potential of educational analytics. Educational data become integrated into educational practice selectively, depending on how compatible they are with existing systems of pedagogical accountability and institutional governance.

At the same time, the relatively weak use of communication and behavioral educational data demonstrates that the transition toward genuinely data-informed and personalized education remains limited. Although digital learning environments allow educators to access complex information regarding student engagement, interaction patterns, and learning trajectories, these forms of educational analytics remain marginal within routine

pedagogical practice. This may indicate not only insufficient technological competence, but also uncertainty regarding the pedagogical meaning, reliability, and ethical legitimacy of such data.

The study also demonstrated that educational analytics are used substantially more frequently for improving educational quality than for supporting individualized student development or updating educational programs. This finding is particularly important in the context of contemporary discussions surrounding the transformation of higher education under digital conditions. It suggests that educational analytics currently function primarily as instruments of institutional quality management rather than as mechanisms supporting pedagogical innovation or curriculum transformation.

Such tendencies correspond to observations by Espeland and Sauder (2016) and Beer (2019), who argue that data-driven institutional environments often contribute to the expansion of performative cultures focused on monitoring, ranking, and measurable outcomes. Under these conditions, educational analytics may gradually shift from instruments supporting reflective pedagogy toward mechanisms of institutional accountability and managerial control.

An important finding concerns the role of teachers' awareness of educational data and DLE capabilities. Higher levels of awareness were consistently associated with broader pedagogical use of educational analytics across all examined domains. Teachers who demonstrated greater familiarity with digital educational infrastructures also reported significantly stronger integration of educational data into educational quality management, individualized student support, and curriculum updating.

This result highlights the importance of teacher agency within datafied educational environments. Educational analytics do not operate autonomously; their pedagogical significance depends on how teachers interpret, evaluate, and integrate digital information into professional practice. From this perspective, educational analytics should be understood not simply as technological systems, but as sociocultural tools whose effectiveness depends upon professional competencies, institutional culture, and pedagogical meaning-making.

The absence of significant relationships between participation in professional development programs and practical educational data use is also noteworthy. This finding may indicate that existing training programs primarily focus on technical interaction with digital systems rather than on the pedagogical interpretation and meaningful application of educational analytics. Similar conclusions have been reported in previous studies emphasizing the gap between technological digital competence and data-informed pedagogical expertise (León et al., 2021).

The regression analysis further demonstrated that teachers' perceived competence in using digital learning environments depends primarily on awareness of educational analytics, subjective evaluations of DLE quality, and familiarity with digital infrastructures. Age demonstrated a negative relationship with perceived DLE competence, suggesting possible generational differences in adaptation to increasingly datafied educational environments. However, professional experience simultaneously contributed positively to perceived competence, indicating that institutional familiarity and pedagogical expertise continue to play an important role in the integration of digital educational systems.

Taken together, the findings suggest that contemporary higher education exists in a transitional state between traditional pedagogical cultures and emerging forms of data-driven educational governance. Although digital learning environments generate increasingly sophisticated educational data, their pedagogical integration remains constrained by institutional traditions, limited data literacy, organizational priorities, and unresolved tensions between pedagogical autonomy and algorithmic forms of accountability.

Importantly, the study contributes to ongoing interdisciplinary discussions concerning the cultural transformation of higher education in the digital era. The findings demonstrate that educational analytics are not merely technical innovations, but sociocultural mechanisms that reshape professional identities, institutional practices, and the epistemological foundations of educational decision-making. Consequently, understanding how teachers perceive and utilize educational data becomes essential for understanding broader transformations occurring within contemporary digital universities.

5. CONCLUSIONS

The present study demonstrated that university teachers primarily use educational data associated with traditional forms of academic monitoring, including academic performance, attendance, and student ratings, while more complex behavioral and communication-based digital indicators remain substantially underutilized.

Educational analytics were used most actively for

improving educational quality and significantly less frequently for individualized student development and educational program updating. These findings indicate that educational data in higher education continue to function predominantly within the logic of institutional accountability and quality control rather than within models of pedagogical personalization and curriculum transformation.

Teachers' awareness of educational data and digital learning environment capabilities emerged as one of the strongest predictors of pedagogical integration of educational analytics. Higher awareness levels were associated with broader and more active use of educational data across all examined pedagogical domains.

The findings also suggest that the mere presence of digital infrastructure and formal digital competence training does not guarantee meaningful pedagogical integration of educational analytics. The effective use of educational data depends on the development of data literacy, pedagogical interpretation skills, and teachers' professional agency within digital educational environments.

More broadly, the study demonstrates that the datafication of higher education represents not only a technological transformation, but also a cultural and organizational shift that reshapes pedagogical practices, institutional priorities, and forms of educational governance.

6. LIMITATIONS

Several limitations of the study should be acknowledged.

The study relied on self-report questionnaire data, which may be influenced by subjective evaluations and social desirability effects. The findings therefore reflect teachers' perceptions and reported practices rather than direct observation of pedagogical behavior within digital learning environments.

The sample included university teachers from institutions located in the central region of the Russian Federation, which limits the generalizability of the findings to other national and institutional contexts.

The cross-sectional design does not allow causal relationships between educational data awareness, digital competence, and pedagogical practices to be established. Longitudinal research designs would be necessary to examine how teachers' interaction with educational analytics evolves over time.

The study focused primarily on teachers' perspectives and did not include institutional administrators, students, or digital platform developers, whose perspectives may significantly influence educational data practices within universities.

The study concentrated on general indicators of educational data use and did not examine discipline-specific differences or variations associated with particular educational technologies and institutional models.

7. FUTURE RESEARCH DIRECTIONS

Future research should further investigate how university teachers interpret and integrate educational analytics into concrete pedagogical practices across different educational and cultural contexts.

Particular attention should be devoted to examining the development of teachers' educational data literacy; ethical perceptions of educational analytics; tensions between pedagogical autonomy and algorithmic governance; institutional cultures of data use in higher education; discipline-specific differences in educational analytics adoption.

Further studies may also benefit from mixed-methods and longitudinal research designs combining quantitative surveys with qualitative interviews, digital ethnography, and observational analysis of pedagogical practices within digital learning environments.

In addition, future research should investigate how educational analytics influence teachers' professional identities, pedagogical decision-making, and perceptions of educational quality within increasingly platformized and datafied universities.

Finally, comparative international studies may provide important insights into how sociocultural, technological, and institutional factors shape the adoption and interpretation of educational analytics across different higher education systems.

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