

How a data-driven smart classroom can create new spaces of injustice: a case study of the Xiaoya AI Smart Classroom

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Abstract. This essay examines how data-driven technologies reshape justice in everyday classrooms through a case study of the Xiaoya Smart Classroom. Drawing on data justice, decolonial critique, and the capability approach, it shows how constant capture of behaviour makes students hyper-visible while giving them little real choice about participation or appeal. The analysis traces how simple labels of attention and engagement compress diverse ways of learning into narrow categories, which can lead to both distributive and recognitional harms. It also explores the cultural scripts built into behavioural analytics and the risks of exporting one model of “good learning” across settings. In addition, the essay maps power at the public–private interface, where vendors influence rules and data uses that teachers and students cannot meaningfully contest. Finally, it considers the spatial effects of classroom hardware and seating, which can magnify uneven visibility and accuracy. The conclusion sets out conditions under which such systems might be justified: genuine opt-outs or low-tracking routes, published reasons and appeal pathways, third-party audit, and a shift from behavioural compliance to capability expansion as the primary measure of success. Together, these steps move data-driven education toward forms of governance that are fair, transparent, and freedom-enhancing.

Keywords: data justice, spacial justice, smart classroom, behavioural analytics

1. Introduction

Against the backdrop of a global “data revolution” [1], educational technology has shifted from data-assisted to data-driven practices [1]. Systems like the Xiaoya AI Smart Classroom have become central instruments of digital transformation in education. Despite the technological advancement, current research still focuses largely on online learning. Studies that touch on in-person teaching often examine fragmented behaviours in isolation. As a result, we lack a fuller response to the systemic effects of artificial intelligence embedded in physical classrooms, especially the reshaping of ethical structures and power relations.

This essay takes the Xiaoya AI Smart Classroom (hereafter “Xiaoya”) as the core case. Xiaoya is a data-driven platform now used in Chinese universities. It combines online data analytics with on-site classroom capture. It automatically identifies and continually tracks students’ physical behaviours in class, such as looking up, looking down, or resting on the desk. It also integrates traces from classroom interaction, such as distributions of viewpoints and inferred cognitive states. In this way it produces real-time diagnosis and feedback for teaching [2]. Built on a large language model, the system then generates course-level portraits to give teachers targeted preparation support and to suggest personalised learning paths for students. This platform is chosen not only because it represents a leading form of AI that reaches into face-to-face teaching, but also because of its fast expansion in real classrooms. Public figures show that Xiaoya’s users grew from 160,000 in 2024 to 990,000 by September 2025, covering more than ten universities and over 400 observation points, with ongoing roll-out across campuses (Central China Normal University, 2024–2025).

Accordingly, by examining Xiaoya, the essay aims to show how data-driven technology operates in the offline classroom and how it actually performs. More importantly, it offers a critical view on the ethical stakes beneath the surface, including educational fairness, data justice, and risks to agency and subjectivity. The analysis proceeds as follow. Firstly, this study looks at how data-driven tools work in the micro-setting of the classroom and how they reshape students’ learning experience and behavioural visibility. Then it discusses three dimensions: data justice, the hidden colonial traits of educational technology, and participation in technological governance. Finally, it shows how the smart classroom can become a site where new ethical problems and unequal relations take shape [1, 3–5].

2. Discussion

2.1. Data justice in educational technology

In practice, learning technologies often collect and analyse student data beforehand in order to personalise support or deliver services. Yet the collection process tends to run against the three pillars of international data justice highlighted by Linnet Taylor [1]: visibility, participation, and freedom from discrimination. These three standards are used here to assess Xiaoya's classroom behaviour analytics.

It must be acknowledged that the deployment of AI in education, particularly in a high-stakes environment like China, is partly driven by promises of standardisation and efficiency, aiming to alleviate teacher workloads and ensure resource parity across diverse regions [6]. However, these operational goals necessitate the continuous, real-time capture of student behaviour, which immediately raises questions about data justice. To monitor classroom performance, Xiaoya uses multi-angle cameras to follow students continuously, turning states with a private character, such as looking up or looking down, into measurable data points. Students are not given a genuine choice about being monitored, which weakens students' informational privacy and positions them as passive data subjects with little control [1]. Moreover, because classroom attendance is compulsory, students in effect lose the option to refuse digital monitoring. In many online courses, a student may close a camera or leave the session. In a physical classroom, however, entering the space means being enrolled in the capture system automatically. There is no meaningful "opt-out," which leads to a kind of mandatory, forced agreement. Beyond privacy and participation, Xiaoya's logic of data handling risks discriminatory effects. Behaviours such as resting on the desk or looking down can be tagged as negative states. Such single labels ignore reasonable differences between learners. For example, a head-down posture may mark deep thinking. By compressing complex acts into simple tags, the system reduces the educational meaning of behaviour and can produce representational harm for some students [1, 7, 8].

Similar issues appear in AI-based online proctoring. These systems scan the test environment in real time, flag "irregular rooms" or "abnormal viewpoints," track movements such as frequent head turns, and then send alerts to stop cheating. The scenario is different, yet the logic is similar. Stronger surveillance is introduced through technology, meaningful consent is overlooked, and standardised judgments are applied to behaviour. The ethical questions are close to those raised by Xiaoya. But we should recognise gains and losses together. Better visibility can help teachers prepare more efficiently and design lessons with higher precision. Nevertheless, if there is no right to opt out and no route to appeal, that efficiency comes at the cost of students' digital autonomy and group fairness [9]. In Xiaoya's case, the pattern points to excessive visibility, limited choice to participate, and representational bias that is hard to correct, which together form a data-justice risk.

2.2. The hidden coloniality of educational technology

Xiaoya's behavioural categories, such as equating "looking up equals attention" or "looking down equals distraction," are rooted in a cultural frame of obedient cognition associated with some Western classroom traditions. This frame standardises one set of good behaviours and treats it as a universal foundation for assessment, while diversity and complexity in other learning cultures fade from view.

One line of historical discussion traces this script to the rise of the Prussian school system in the nineteenth century. After defeat in 1807, reformers linked failure to soldiers' excessive independence of thought and designed mass schooling to restrain autonomy and strengthen discipline [10]. The classroom form stressed uniform schedules, uniform content, and prohibition of questioning. In 1843, the American reformer Horace Mann introduced the model to build common schools. Over time, row seating, silent listening, and choral response became institutionalised classroom rules. Through space and behaviour alike, schooling worked as a system of discipline [11].

Conversely, in Confucian traditions, the forms of learning look quite different from those of the Prussian script. In classical study, chanting was central, and "never ceasing to sing with strings" appears in the transmission of the *Shi Jings* 诗经/Book of Songs [12]. Swaying with the rhythm signalled immersion rather than distraction. In private academies, moving with the cadence of the text could show deep engagement rather than misbehaviour [13]. Even in Chinese language, expressions like "brooding in thought" or "thinking with head lowered" point to a wide tolerance for bodily postures in the act of learning. When the single cultural frame that equates "looking up" with attention is applied to diverse classrooms, non-Western modes such as "bent-head thinking" are suppressed. In mechanism, this becomes a form of algorithmic coloniality. The appearance of neutrality in educational technology hides built-in cultural assumptions and extends the exclusion of non-Western ways of knowing [7]. In scholarly debates, a normalised classroom order is often treated as a hallmark of modern schooling. Once such norms are encoded as the only "correct" posture, cultural differences are erased. If Xiaoya fixes "looking up equals attention" as a scoring rule, diverse learning styles are counted as anomalies and are amplified each time the model is retrained.

Pushed further, this logic does not only colonise culture. It also turns students into compliant instruments. By quantifying behaviour, the system pushes students to maintain correct postures, narrowing learning into compliance with platform rules.

Freedom to choose one's learning style is weakened. Behaviours like note-taking with head down or turning to talk with a peer may be misread as irregular. Data capture then drifts into systematic bias, and evaluation loses authenticity. In the end, educational value is reduced to a tool-like link between behavioural data and test scores, while the inner value of education drops out, including the depth of thought, quality of interaction, and critical capacity [5]. If this path continues, the body script of a good student is algorithmised as the only standard, the plurality of learning paths shrinks, and space for real capability growth is squeezed. Therefore, students would no longer be an independent thinker who is guided and encouraged, but a disciplined subject under data-led gazes.

2.3. When the classroom turns into a space of tech hegemony

In settings where technologies like Xiaoya are embedded, the rules of algorithms—such as behaviour categories and data uses—are usually set by technology providers. Teachers and students, who are key stakeholders, rarely have a say. For example, the developer iFlytek leads system design and also appears as a technical authority in national-level education policy discussion, which strengthens its voice in governance. When rules are set unilaterally and there are no procedural rights to appeal or hold actors to account, classroom governance tilts toward technical interests [5]. This goes against the participatory parity principle put forward by Fraser. Students, who are constantly monitored, cannot question the reasonable limits of monitoring or take part in interpreting the meaning of their behaviours. Overall, classroom norms shift toward technical logic and a soft form of tech hegemony emerges.

Simultaneously, the platform uses behaviour data to optimise its learning gain prediction model. In essence, everyday bodily practices become a resource in the data economy. Educational progress is used to justify this process, yet silent actions by students are folded into the accumulation of digital capital. This resembles the unpaid capture and use of learners' "data labour", highlighting the ethical tensions of commercialisation in EdTech. In addition, the physical structure of the classroom reproduces inequalities. Students in the back rows may be partly blocked from the camera's view, which leads to incomplete data and weaker accuracy in judging their learning state. Resource allocation then follows skewed analytics. If the system tends to "see" the front rows better, suggested interventions also lean toward those students. Differences in visibility and evaluation are then hardened. Under a surface of fairness produced by technology, structural inequality inside the classroom can grow [14].

3. Conclusion

This essay has argued that the main ethical and justice issues raised by data-driven technologies in education centre on three intertwined areas: data justice, decolonial and representational concerns, and gaps in participation and accountability. Xiaoya is only one representative example among many data-driven tools, but it reveals problems that the wider field must face. Based on the case, several conclusions stand out.

First, the data collection process risks violating basic rights. Continuous monitoring turns behaviour into data, weakens informational privacy and digital autonomy, and casts students as passive data subjects. Second, algorithmic logic can fix cultural bias and behavioural discrimination. When a single cultural frame such as "looking up equals attention" guides assessment, non-Western learning modes are pressed down and a subtle form of algorithmic coloniality appears [1]. Third, technical architectures may increase structural inequality. From the physical limits of capture, such as blocked views in back rows, to the internal biases of models, the system may reproduce and even amplify pre-existing classroom inequalities. What is more a cause for concern is that business leads rule-making and data use. Teachers and students are left out of decisions. Educational data shift into commercial resources, which raises concerns about data exploitation. Taken together, these issues point to a deeper risk. As education pursues precision and personalisation through full datafication, it can drift toward new regimes of discipline. In doing so, it weakens the humanistic core of education and challenges core values of fairness, participation, and plural forms of justice [4,5]. Only under genuine opt-out or low-tracking routes, published reasons and appeal pathways, third-party audit, and a shift from behavioral compliance to capability expansion as the primary success metric, can data-driven classrooms be justified.

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