EQUITY IN EDTECH BY DESIGN

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CONTENTS

1. INTRODUCTION: WHY EQUITY IN EDTECH MATTERS

Recent policy emphasis has focused on measuring and supporting efficacy and effectiveness of educational technology (EdTech) solutions, as EdTech products, including K-12 apps, online platforms, and software tools, often lack evidence-based design and rigorous testing (UNESCO GEM Report, 2023). While 'evidence' has become the buzzword in education, the focus is primarily on effectiveness and efficacy (Kucirkova, 2023). However, for a comprehensive and impactful evaluation of EdTech, we need to look beyond effectiveness and efficacy. The **5Es of evidence** framework - Effectiveness, Efficacy, Ethics, Equity, and Environment - offers a holistic approach to evaluation of EdTech impact (Kucirkova, 2024).

The 5Es directly align with UNESCO's three fundamental pillars for unlocking digital learning: content, capacity, and connectivity (Giannini, 2024). UNESCO's strategy "aims to nurture and scale-up innovations and practices with technology that make education a pathway to peaceful, equitable and sustainable knowledge societies" with one of the global key pillars being "equitable access to technologies and innovation to enhance quality learning in a lifelong perspective, while protecting human dignity, human rights and promoting gender equality" (UNESCO, 2021). Emphasising efficacy and effectiveness, without also sufficiently considering the other verticals, may lead to evaluations that do not consider the needs of diverse learners, vulnerable populations, and underrepresented communities, and ignore wider social and environmental context. In this report, we focus on one of the aspects: **equity in EdTech**.

We aim to outline the significance of integrating equity considerations directly into the design of EdTech solutions and, consequently, integrating equity into the evaluation process of EdTech to ensure inclusive and equitable EdTech for diverse users. Given the complex nature of the concept of 'equity', our focus extends beyond product evaluation, diverging from traditional efficacy and effectiveness studies. Instead, we examine a broader spectrum of studies, literature, and resources to explore how the current understanding of the concept of 'equity' is applied to support a diverse range of users while encompassing both individual behaviours within an EdTech organisation and the organisation's approach to equity and its multiple aspects.

To operationalise **equity** for this report – by 'equity' we mean addressing the question of **WHO** benefits, individually and collectively, from the EdTech solution, particularly considering underprivileged and underrepresented groups and diverse constituent perspectives. While this definition is necessarily simplified, it allows for the incorporation of multiple aspects of equity based on a literature review of equity conceptualisation and its understanding within the context of education and EdTech specifically. As such, in our definition, an EdTech solution is deemed **equitable** through *both* the products' **inclusive design** and the provider's **explicit public commitment** to embed equity considerations into its operations within its particular context. Aligned to UNESCO's three pillars as mentioned above, an EdTech solution is equitable through its content, capacity, support for students and their teachers in developing their digital competencies, and connectivity, while taking into account individual contexts of use of each particular solution.

Our aim with this report is to explore the concept of equity in relation to EdTech. To that end, we first outline the current understanding of the concept in education more broadly from a global perspective (Section 2), followed by a literature review to identify key research themes in relation to equity in the EdTech field (Section 3). Section 4 gives an overview of current EdTech industry related equity certification, benchmarks, and indicators. Section 5 then provides a consolidated benchmark that draws on the findings from the previous sections.

This report seeks to support the EdTech community to align effectively with the goals through accepted indicators for monitoring and evaluation (M&E). We aim to consolidate the equity M&E frameworks into shared benchmarks to establish not only shared definitions and understanding of equity in EdTech but also implementable ways of identifying and understanding their presence using a specific set of indicators. Our objective is to facilitate the adoption of a shared language among multiple stakeholders in the EdTech field and to support effective alignment of EdTech equity indicators with the broader UN Sustainable Development Goals (SDGs; https://sdgs.un.org/goals). Several UN SDGs feed specifically into the questions of equity: in particular, SDG 5 (gender equality), SDG 10 (reduced inequalities) and SDG 16 (peace, justice, and strong institutions). The SDG 4 (quality education) also emphasises the significance of inclusive education, focusing on the inclusion of children with diverse needs, addressing the question of equity in education most directly.

2. EQUITY IN GLOBAL EDUCATION

5Es of evidence framework:

- Effectiveness
- Efficacy
- Ethics
- Equity
- Environment

Equity: Who benefits?

EdTech solution is deemed **equitable** through *both* the products' **inclusive design** and the provider's **explicit public commitment.**

Several UN conventions, forming a part of the broader framework of international human rights law seek to protect individuals from discrimination and to promote equity: for example, International Convention on the Elimination of All Forms of Racial Discrimination (1969), Convention on the Elimination of All Forms of Discrimination Against Women (1979), Convention on the Rights of the Child (1990), Convention on the Rights of Persons with Disabilities (2008).

Movement towards equity in education also includes development of global policies in inclusive education, such as the 'Salamanca Statement and Framework for Action on Special Needs Education' adopted in 1994 by the World Conference on Special Needs Education (UNESCO, 1994; Prado & Warschauer, 2024; Schuelka & Carrington, 2022).

The Salamanca Statement provided a foundation for future global initiatives, including the Convention on the Rights of Persons with Disabilities (Schuelka & Carrington, 2022). However, within the field of education, equity considerations extend beyond the legal framework. In very simple terms, the idea of equity "relates to issues of 'who gets what, when and how'" (Rizvi & Lingard, 2010, p. 76).

There has been a considerable ideological and political discursive struggle over the nuances of the meaning of 'equity' and the key associated societal values (Rizvi & Lingard, 2010). This discursive struggle is closely aligned with the broader discourse on educational justice, far too often narrowly conceptualised as access to institutions without sufficiently considering the "dynamics of educational experiences and their social and economic outcomes, as well as the historical conditions that produce inequalities", as "formal access to schooling does not always translate into effective equity outcomes" (Rizvi & Lingard, 2010, p. 141).

In the globalised field of education, there are three influential and vocal discourse participants with somewhat different ideological stances: UNESCO, OECD, and the World Bank (Rizvi & Lingard, 2010). Equity concerns are an integral part of their discourse, that is how they conceptualise and apply 'equity' within their operations. In order to better understand it, we have compiled a small corpus of texts (ca. 200,000 words) associated with these institutions, including, e.g., GEM 2023 report and PISA results reports (for full list of included texts, see Appendix A), based on which we conducted a brief analysis of the use of the word 'equity' in these texts, i.e. its discursive construction.

To this end, we used a linguistic concept of 'collocation', i.e., we looked at words that co-occur frequently and habitually with the word 'equity' in the texts published by these institutions. Collocations have the potential to show the meaning of words in their wider context as words do not have meanings in isolation. The meaning potential of words arises when they are used in discourse, word meanings have histories and they change, and the meanings are continuously negotiated by discourse communities. We used a corpus linguistic software (Anthony, 2023) to generate the collocations, see Figure 1.

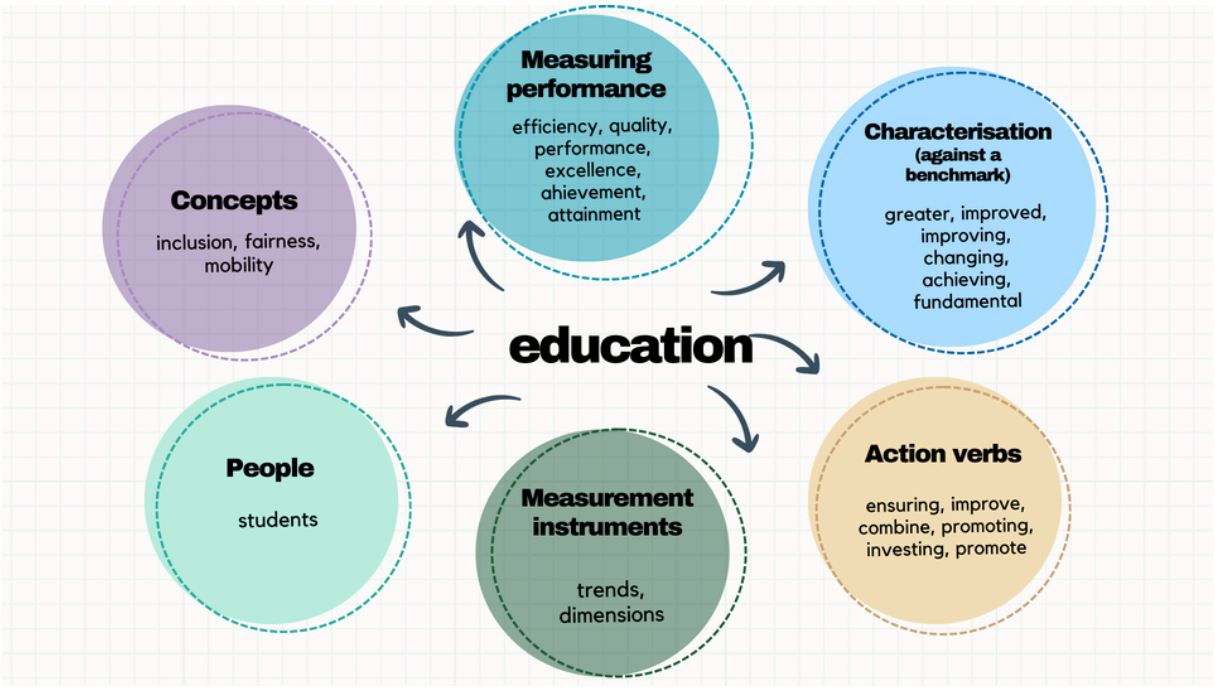

Figure 1. Collocates of the word *equity* in our 'equity' corpus (see Appendix A for the included texts). The collocates were calculated with AntConc software: Llikelihood statistical measure was used with a window of five words to the left and right. Figure 1 includes all the collocates generated by the software except functional words *in* and *and*, and text organising words: *chapter, volume, guide*.

As Figure 1 shows, the central collocate, that is the word most strongly associated with 'equity' in our corpus, is the word *education*. We have divided the remaining collocates into several thematic groups: words that relate to 'performance measurement' like *efficiency, quality, excellence, attainment*; words, mostly adjectives, that characterise a quality (of whatever is measured) such as *greater, improved, fundamental*; action verbs describing what needs to be done such as *ensuring, improve, promote*; and words that refer to measurement instruments *trends* and *dimensions*. All these collocates represent performance correlated vocabulary that suggests an understanding of equity as having the potential for aligning well with the effectiveness and efficacy agenda, as explained in the introduction.

In fact, the OECD texts repeatedly highlight that 'equity' does not come at the expense of high performance, e.g. PISA Report (2015) states: "PISA … consistently finds that high performance and greater **equity** in education opportunities and outcomes are not mutually exclusive" (PISA 2015, p. 39). In the OECD conceptualisation of 'equity', achieving greater equity is "not only a social-justice imperative, it is also a way to use resources more efficiently, and to increase the supply of knowledge and skills that fuel economic growth and promote social cohesion" (OECD, Equity in Education, 2022, p. 4).

In the OECD texts, 'equity' is frequently linked with *performance, excellence, quality, efficiency, access;* in PISA reports, it is also linked with *well-being* and *inclusion*. 'Equity' is monitored and *improvements, changes, progress, decline, differences, gains, levels* are noted. PISA reports specifically conceptualise "two dimensions of equity in education: **fairness and inclusion**" (PISA 2022, p. 111). '**Inclusion**' is defined as "the objective of ensuring that all students, particularly those from disadvantaged backgrounds or traditionally marginalised groups, have access to high-quality education and reach a baseline level of skills" and '**fairness'** refers to "the goal of removing obstacles to the full development of talent that stem from economic and social circumstances over which individual students have no control, such as unequal access to educational resources in their family and school environments" (PISA 2015, p. 202-203).

In both UNESCO and the World Bank texts, we find strong links between 'equity' and 'inclusion' and how these should be assessed. In the World Bank's framework paper (What Matters Most for Equity and Inclusion in Educations Systems, 2016), two types of **equity** are conceptualised – **vertical and horizontal**:

> ***Vertical equity*** *calls attention to the need for* ***unequal treatment of unequals,*** *while* ***horizontal equity*** *calls for* ***equal treatment of equals.*** *Vertical equity can be invoked to provide additional resources to vulnerable groups. But horizontal equity still matters in order to level the playing field among schools more generally.* (World Bank (2016), p. 21, emphases added)

However, among the collocate themes we have identified (Figure 1), there are also two smaller thematic groups: one of them concerns **agency**, that is who is involved, represented by the collocate *students* and the other group comprises concepts related to 'equity' – in addition to *inclusion* and *fairness* discussed above, *mobility* also occurs.

The collocate *students* suggests a more personalised and nuanced view of 'equity' in these texts. It shows that 'equity' links with concerns for *well-being, learning experience, learning opportunities, attitudes, education outcomes*. It shows that "strategies to include disadvantaged students" are needed (UNESCO, Wang, 31/10/2023); the aim is to ensure success for students "from all social backgrounds" (PISA 2015) and ensuring **upward social mobility** is likewise essential (UNESCO, Wang, 31/10/2023).

The idea of "all students" is necessarily extremely complex to operationalise. Rizvi and Lindgard (2010, p. 150) exemplify this in their discussion of gender equity in education by highlighting how dramatically different this may be in Global North and South. While in Global North, it is often the boys who are the focus of gender policy, in Global South, the main concern remains girls' access to schooling. What follows from Rizvi and Lingard's discussion is that **the most nuanced approach to gender equity asks 'which boys and which girls'** as gender cannot be considered in isolation but is very much an intersectional concept – considerations of class and race cannot be left out of the equation.

OECD's 'Equity and Quality in Education' report (2012, p. 36) clearly states that the policy landscape is conflicting "Governments are confronted with the need to respond simultaneously to both the efficiency and equity agendas; and ministries are required to reconsider their expenditures and the way education services are delivered."

The EdTech evidence ecosystem specifically is also full of **conflicting incentives** (Dockterman, 2024), which do not necessarily always fully align with equity considerations. The efficiency agenda favours efficacy studies (academic and at scale, which in turn favours quantitative studies) while educators and teachers, who are more sensitive to their specific contexts look for "practical efficacy" (see also briefing documents from the Sheffield Hallam University on how research moves and types of research that teachers encounter, https://research.shu.ac.uk/rmple/briefing-documents/).

OECD's conceptual framework for examining 'equity' in education (PISA 2015) can be seen adapted in Table 1. In terms of outcomes, 'equity' is linked to access to schooling, school performance and attitudes, considerations of the background of learners, socio-economic status, gender, and immigrant background . Additional mediating factors are also considered – disadvantage status, access to educational resources including opportunities to learn, and overall policy background.

I

Dimensions of equity	Outcomes	Background	Mediating factors
Inclusion Fairness	Access to schooling Performance Attitudes	Socio-economic Gender Immigrant background	Disadvantage Access to educational resources Policy ecosystem

Table 1. Adapted OECD conceptual framework for examining equity in education (Figure 1.6.1, p. 201, PISA 2015).

‘Equity’ is one of the UN SDG 4 targets (no. 4.5). UNESCO GEM Report (2023, p. 258) highlights in relation to ‘Equity’ a global indicator ‘Parity indices’, i.e. female/male, rural/urban, bottom/top wealth and others such as disability status, indigenous peoples, conflict-affected). Among the thematic indicators we find, for example, focus on percentages of children in primary education whose first (or home) language is the language of school instruction (indicator 4.5.2), and allocation of resources to disadvantaged students (indicator 4.5.3). GEM report addresses, in relation to EdTech, ‘equity’ together with ‘quality’ and ‘efficiency’ (see also above), and asks three questions:

> *In order to understand whether each form of technology addresses* ***equity, quality and efficiency of education****, three questions need to be answered.* ***First****, what is the logical mechanism that leads from the use of a piece of hardware or software to improved learning?* ***Second****, are the conditions under which a technological tool is supposed to work met in practice or is implementation failing?* ***Third,*** *what evidence is collected, by whom, and how in order to evaluate impact?* (UNESCO GEM, 2023, p. 9, emphases added)

World Bank in its ‘What Matters Most for Equity and Inclusion in Education Systems: A Framework Paper’ (Wodon, 2016, p. 40-41) gives several examples of considerations for children from minority and indigenous groups, such as bilingual education or mother-tongue instruction, children with disabilities, those that are relevant for EdTech include specialised teacher training, flexible teaching and assessment methods and access to assistive technologies (see also UNICEF ‘Disability and Inclusion Policy and Strategy, 2022-2030’).

To conclude, equity concerns remain far too often left out of impact evaluation frameworks. Well-being, inclusion, learning experience and attitudes, and qualities pertaining to equity considerations, are complex and challenging to measure. **We operationalise 'equity' as encompassing practices that inclusively address who benefits, individually and collectively, from the EdTech solution**. Thus, equitable EdTech practices are those in which the necessary supports are provided so that **all learners**, regardless of background or ability level, have full **access to a learning community's educational tools, resources, and practices** (Prado & Warschauer, 2024; Schuelka & Carrington, 2022).

All learners need to benefit while specific concern for inclusive frameworks paying attention to vulnerable groups and disadvantaged students (vertical equity) is emphasised. As discussed, **these groups are contextually defined** and delimited and may include, but are not limited to, students with immigrant backgrounds (with specific concerns to those coming from conflict-affected areas), indigenous peoples and ethnic minorities, and students with disabilities. More generally, background factors such as socio-economic status, gender, and race are included. **Learner variability** within these groups should be supported by flexible and scaffolded teaching and assessment, as well as accessible and collaborative uses of mainstream and assistive technologies (Prado & Warschauer, 2024). The three questions the GEM Report (2023) asks translate into **evaluation criteria of equity concerns in EdTech** solutions: **First**, who is targeted by the EdTech and what is the logical mechanism that the solution works for these specific groups? **Second**, what is the context of its use, how adaptable is the solution for various contexts?

'equity' concerns practices that **inclusively** address **who** benefits, individually and collectively, from the EdTech solution.

EdTech solutions asks questions:
who has access?
what is the learner **context**?
how can the **learner variability** be operationalised in this context?

3. LITERATURE REVIEW OF EQUITY INDICATORS IN EDTECH

3.1 METHODOLOGY

To begin the process of understanding what EdTech equity indicators are given consideration in the research literature, we conducted a rapid literature review. We selected keywords 'equity' and 'EdTech' (or 'educational', 'technology', 'apps') and searched the SCOPUS database for articles published after 2020. The search was further narrowed down to the field of social sciences and to articles. This initial search yielded 252 articles, which we reviewed for relevance - focus on K12 education and equity being the core foci of the reviewed article. This yielded a set of 20 studies that were analysed in depth for further discussion. During the review, **several themes emerged** for which we performed additional targeted searches, these included, for example, keywords 'AI' and 'inclusive design'.

Upon reviewing **recurring topics and themes** across all articles resulting from the literature review, four key themes emerged from this literature review: **theoretical perspectives on 'equity', biases incorporated into EdTech, inclusive and participatory design, and deficit-based approaches in Edtech.** Discussions of these are followed by studies showcasing mutually reinforcing ideas and interaction.

3.2 THEORETICAL PERSPECTIVES ON EQUITY IN EDTECH

As discussed in Section 2, 'equity' has been a persistent issue in EdTech specifically, and education more generally, as it is continuously being constructed and reconstructed (Rizvi & Lingard, 2010, p. 76). A primary issue highlighted in current research literature on EdTech is the insufficient emphasis on integrating equity considerations into EdTech solutions. Literature identifies a significant **equity gap** in the current education system globally with multiple studies underscoring the **urgency of addressing this gap and emphasising its implications for education, society, and broader democratic values.**

In *Rethinking the Digital Divide*, Warschauer (2003) contends that achieving equitable access to digital technology entails more than just supplying devices and internet access; it must consider supporting users' full engagement with digital technologies by integrating an understanding of language and literacy differences, interpersonal and communal connections, communities, and institutional frameworks in pedagogy and design. The '**digital divide**' is now commonly used to characterise **both global and local inequalities.** Equity in EdTech encompasses addressing the digital divide or digital equity, which is particularly relevant in the Global South but not limited to it, see, for example, Ventrella and Cotnam-Kappel's (2024) case study in Canada and the 2024 US Department of Education 'National Educational Technology Plan' framing three key divides: digital access, digital use, and digital design (U.S. Department of Education, 2024).

Persistent digital divides exacerbate existing socio-economic inequalities (Macgilchrist, 2019). The digital divide extends well beyond mere access to the internet and technology; it is recognized as a fundamental right by the UN (Kormos & Wisdom, 2023). Policy makers need to consider not only the persistent wider socio-economic issues posed by digital divide inequities, but also other overlooked and under-represented groups of users, as, for example, highlighted by Bright and Calvert (2023) regarding gifted students. Additionally, the digital divide is not only confined to disparities between developed and developing countries or urban and rural areas; it may be evident even within the same district or neighbourhood (Huffman, 2018).

The authors of this report acknowledge that characterising educational technology and its implementation often stems from particular Western perspectives, which may inadvertently perpetuate educational inequities. To address this, the authors acknowledge the need to expand perspectives and intentionally repair harms that contribute to '**educational debt**' (Ladson-Billings, 2006) by aiming to incorporate multiple perspectives, including non-western, to ideate what equitable implementation of educational technologies may look like.

For example, Garcia and Lee (2020) highlight the importance of an equity-centred approach to educational technology, emphasising teaching, pedagogy, and sustained relationships within classrooms. They introduce the concept of **Critical Computational Literacy** (CCL) as an equity-centred framework to produce technological tools that disrupt and dismantle structures upholding inequality while inventing new tools that sustain a more equitable and humanising world. CCL integrates critical literacy and computational thinking to create **technological tools for transformative social action**, aligning with the call for an instructional literacy approach focused on "**reading the world and reading the word**" as advocated by critical literacy scholars like Freire and Macedo (1987).

Critical Technology theory is pivotal in equity research, offering a framework for addressing technology-related biases within the education system (Bright & Calvert, 2023). This framework aids researchers in navigating complex issues, including the equitable use of technology and its effects on underrepresented student groups. Notably, Critical Technology theory includes the consideration of **groups, which may not be typically viewed as problematic or marginalised**, thus highlighting the multidirectional nature of equity considerations.

3.3 BIASES IN EDTECH

Building upon insights from Critical Technology theory, to ensure fair and inclusive educational opportunities for all learners, EdTech developers need to address **bias**, particularly for technologies relying on AI solutions. When conceptualising 'bias', usually two types are discussed: 1) **statistical bias**, i.e., systematic differences between the "truths" and "facts" of the world around us and the results of an algorithmic prediction, including systematic differences between a population and the representation of the population in the sample, and 2) **historical or social origins of the algorithmic bias** (Kinder-Kurlanda & Fahimi, 2024). Researchers have, therefore, proposed, for example, **socio-technical understandings of bias** (Kinder-Kurlanda & Fahimi, 2024; Lopez, 2021; Poechhacker & Kacianka, 2021). These understandings necessarily include much wider considerations about the data we use to formulate "truths" and "facts" of the world around us – **the data we collect (and how), the data we decide not to collect, and the data we do not even think to collect** (D'Ignazio & Klein, 2020; Wernimont, 2018).

By combining insights from socio-technical perspectives on bias, EdTech mirrors numerous statistical and societal inequities. A distinction between statistical and societal bias is important, as focusing on bias solely from the perspective of nationally protected classes (such as gender, race, ethnicity) may overlook serious impacts on other **under-investigated groups**. **Societal bias** pertains to concerns regarding objectionable social structures represented in the data (Mitchell et al., 2021), while **statistical bias** encompasses more technical issues like sampling bias and error measurement. **Both forms of bias can contribute to overall algorithmic bias** and lead to real-world discrimination and harms. This emphasises the need for a broader and contextualised examination of bias beyond nationally protected classes to ensure equity and fairness in algorithmic systems.

Researchers have identified some of the characteristics beyond traditional categories that are vulnerable to bias, including, for example, urbanicity, military-connected status, or speed of learning. Baker and Hawn (2022) summarise key types of bias, such as historical and representation bias, see Table 2 for an adapted overview.

Historical bias	mismatches between the actual world and desired values, leading models to replicate these mismatches, for instance, student demographics as predictors of grades
Representation bias	under-sampled groups in training data are predicted less accurately, for example, a model for college graduation prediction may perform poorly for indigenous learners due to their small representation in the dataset
Measurement bias	choosing variables that lack construct validity, causing unequal predictions across groups, for instance, a model predicting school violence may be biassed if labels of violent behaviour are created through a prejudiced process
Aggregation bias	distinct populations are combined in the same model, leading to a model that does not work well for some or all groups
Evaluation bias	test sets used to evaluate a model do not represent the eventual population where the model will be applied
Deployment bias	using a model in inappropriate ways, such as designing it for one purpose but using it for a different purpose

Table 2. Examples of types of bias, adapted from Baker and Hawn (2022).

Societal biases manifest in various, sometimes unexpected, forms within educational technology, including at-risk prediction for dropout or course failure, automated essay scoring, assessment of language proficiency, and detection of student emotion. Additionally, the biases contribute to broader divides in educational technology, impacting access, data representativeness, algorithm development, data interpretation in schools, and societal impact. It goes without saying, that the inequities experienced in various contexts may differ significantly, and therefore appropriate contextualisation is needed (see, e.g. evaluation and deployment bias above).

Baker and Hawn (2022) highlight three key implications for equity regarding algorithmic bias: **first**, concerns about the uneven effectiveness and lack of generalizability of educational algorithms across different populations, exemplified by the 2020 UK GCSE and A-Level grading controversy; **secondly**, varied definitions and interpretations of algorithmic bias, from statistical definitions to broader societal implications, underscoring the complexity of addressing bias in automated systems; **third**, categorization of harms into allocative and representational forms highlighting the potential impact of biassed algorithms on the distribution of opportunities and resources, and erroneously portraying underrepresented groups.

When social biases merge with statistical biases in algorithms, they distort representations of individuals and groups, leading to various manifestations based on different characteristics, which may have harmful consequences. In EdTech, examples of such socio-statistical biases include, for example, socioeconomic status or parental education background. Examples of the characteristics, based on Baker and Hawn (2022) are summarised in Table 3.

Bias	Characterisation
Socioeconomic status	individuals from different socioeconomic backgrounds are not equally and adequately represented in datasets, leading to algorithmic systems that may not consider specific challenges or circumstances faced by, for example, individuals from lower socioeconomic status backgrounds
Parental Education Background	individuals with different parental education backgrounds are not equally represented in datasets, leading to algorithmic systems that may not account for the influence of parental education on individuals' experiences or outcomes
Disability Status	individuals with disabilities are underrepresented or misrepresented in datasets, leading to algorithmic systems that may not adequately address their needs or experiences
Language related	individuals who speak languages (or varieties, including second language learners) other than the dominant language (often English) in a dataset are underrepresented or misrepresented, leading to algorithmic systems that may not effectively serve diverse linguistic backgrounds
National Region	individuals from specific geographic regions are inadequately represented in datasets, leading to algorithmic systems that may not consider their unique cultural or contextual factors

Table 3. Examples of characteristics underlying socio-statistical biases (adapted from Baker and Hawn, 2022).

Identifying and addressing these, and other, types of representation bias, is crucial for **developing algorithmic systems that are fair, inclusive, effective, and sensitive to the specific contexts** of diverse populations. For example, in the study by Durham (2024), bias towards multilingual students manifested through deficit perspectives regarding their linguistic abilities (see also Section 3.5). The study revealed that uncritical and indiscriminate implementation of technology may actually harm multilingual students instead of supporting their learning. This suggests a need for educators to address biases that may impact the educational experiences of their diverse students and approach technology implementation in a more contextually informed manner. For example, Nguyen and colleagues (2018) provide an example of disability status bias by highlighting in their discussion of learning analytics a potential benefit of uncovering previously undiagnosed learning disabilities; however, they emphasise, to use learning analytics effectively, there is a vital need for **specialised informed consent** procedures, particularly for learners with intellectual disabilities.

Socio-technical **understanding of bias** includes both societal and statistical bias. It is imperative to address both as, individually and combined, they distort representations of individuals and groups and may thus potentially have harmful consequences.

Algorithmis systems need to strive to be fair, inclusive, effective, and sensitive to specific contexts of diverse populations.

3.4 INCLUSIVE DESIGN

Inclusive design serves as **a pivotal approach to supporting equity in EdTech.** As the name implies, it aims to encompass, in design solutions, all groups, ensuring equitable access and representation. Implementing inclusive design often involves leveraging learning analytics to identify and address disparities, ultimately fostering an environment where all learners can thrive. Baek and Aguilar (2023), for example, discuss **learning analytics** as a means to assess and improve the design of educational technologies for students with disabilities. By leveraging data-driven insights, including learning analytics for disabled students – such as multimodal learning analytics in tracking the students' experience or analytics able to capture students' emotions (see also Boulton et al., 2018) – learning experiences for students with diverse disabilities could be substantially enhanced by creating more inclusive educational environments.

Multisensory approaches to design are another critical aspect of inclusive design in that they pay attention to the engagement of all senses, without privileging the so-called "higher senses" of vision and hearing but providing equal access and engagement possibilities through the "lower senses" of touch, smell, gustation (taste) and proprioception (kinesthetics and sense of being in the space). Examples of EdTech prototypes that draw on multisensory design principles include *oBooks*, which are digital books available on iPad with embedded sounds, images, texts, hotspots to touch and connected smell release (when activated from within the book, see Kucirkova & Tosun, 2023). The underlying assumption behind multisensory design in EdTech is that different sensory channels provide different information cues and access points to the learning content, building on the tradition of multisensory inclusive education (Lloyd-Esenkaya et al., 2020). The key questions explored in the research and development concerning **multisensory design** concern cognitive overload, that is how to ensure that children do not get overstimulated with a synchronous engagement of multiple senses. Strategic use of specific sensory stimulations, aligned with children's sensory profiles, is a nascent area of research, reflecting rapid advances in multisensory technology development (e.g. olfactory teleportation by *Osmo AI*) and crossmodal correspondences (Chen, Sørensen & Spence, 2024).

Universal Design for Learning (UDL) is a critical aspect of inclusive design (CAST, 2018). Three **UDL principles** inform equitable design: multiple means of engagement, multiple means of representation, and multiple means of action and expression. **Multiple means of engagement** in learning encompass diverse opportunities for student participation, acknowledging varying motivations, preferences, and comfort levels, fostering enthusiasm, collaboration, and self-regulation, ultimately resulting in a challenging, exciting, and motivating learning environment. **Multiple means of action and expression** promote diverse forms of demonstrating learning, such as exams, multimedia, papers, and projects, emphasising strategic application of knowledge through executive functioning skills, including information finding, creation, organisation, and use, with potential support levels and technological tools. Students may excel in certain mediums over others, allowing for graded assignments with alternative formats, while opportunities like notetaking, in-class assignments, and varied feedback sources further enhance expression, ultimately fostering a learning environment where learners can demonstrate comprehension through multiple avenues.

Finally, the principle of **multiple means of representation** focuses on understanding how learners perceive and comprehend information, recognizing that individuals have diverse educational backgrounds, languages, abilities, and cultural contexts, which influence their processing of information. This principle emphasises the importance of providing various methods and formats for presenting content to accommodate these differences, ensuring that all learners have equitable access to learning materials and opportunities for comprehension and engagement (Dzaman et al., 2022).

Inclusive design includes **assistive and accessible technologies** for disadvantaged users, such as users with visual, hearing, and motoric impairment but also special education needs users, e.g. support for dyslexia. Lazou and Tsinakos (2023) discuss specifics of **augmented reality** (AR) technologies (both visual and auditory) in relation to UDL framework and point to lack of a common robust framework for the implementation of immersive-based educational technologies, including ethical framework for learning analytics based on AR, which blend the technological, pedagogical, and psychological elements with the widely adopted learning analytics techniques (Christopoulos et al., 2021). Lazou and Tsinakos study (2023) suggests that designs based on the UDL principles coupled with AR features that provide meaningful contextualisation respond well to continuous changes to address diverse learners' needs and thus support inclusiveness.

Things to consider in **inclusive design:**

- inclusivity of learning analytics
- multisensory approaches
- universal design for learning (UDL) principles
- assisstive and accessible technologies, e.g. AR

3.5 PARTICIPATORY DESIGN

Participatory design, also referred to as **co-design,** is another crucial approach focused on equity in EdTech design and evaluation. Participatory design prioritises the **active involvement of usually unrepresented groups**. By engaging varied stakeholders, such as teachers and children, participatory design not only acknowledges their perspectives but also incorporates specific strategies to ensure their effective participation and inclusion of design solutions that might have not been considered otherwise. This inclusive process not only fosters a more equitable design and evaluation of EdTech but also empowers diverse user voices to contribute meaningfully to the development of equitable educational technology solutions.

Birch and Demmans Epp's study (2023) in the context of a project involving young music students serves as an example of how participatory research and design enabled students to express their preferences and needs. The students rejected already available apps that mainly detected mistakes or criticised their playing speed. Instead, they were motivated to design a solution that would enhance social interactions among their peers who played the piano. This approach empowered the students to shape the design process based on their own experiences and desires, ultimately leading to the creation of a solution that aligned more closely with their preferences and goals.

By involving end-users in the research process, EdTech developers can use participatory research and design to support equity and reduce bias by **integrating diverse perspectives**. In the report 'Responsible Innovation in Technology for Children', UNICEF (2022) researchers highlight the need for more research on digital play to include the voices of children from low-income countries and ensuring that diversity, equity, and inclusion are central to the design of digital play for all.

Children's access to data (as well as Internet) was highlighted as a barrier to inclusive digital play and so was the paid nature of many digital games:

> *Equity also extends to issues around the financial cost of digital play experiences. Children called for games that are free. They want additional features that do not cost money, and they are vocal about the fact that* ***children should not be made to watch advertisements t****o access parts of games*. (UNICEF 2022, p. 43, emphases added)

Designing for inclusion also means **co-designing with children** who are often marginalised. For example, *Kahoot!* recently published their White Paper Designing for Inclusion (Rosenheck & Limpiti, 2024), in which they discuss their co-design process with neurodiverse users. Participatory design and co-design approaches enhance the potential of technology to foster a range of cognitive, social, and communicative skills, as Fernández-Batanero and colleagues' (2024) study with ASD (autistic spectrum disorder) students shows. To fully realise the potential of EdTech to become "a fundamental ally to cultivate cognitive, social, and communicative skills" (Fernández-Batanero et al., 2024), educational technology should not only open up learning opportunities but also enhance active participation in society. However, to reach that potential, **the EdTech industry must prioritise participatory and inclusive design practices to address biases effectively.**

There is a long tradition of **child-centred design** in children's media and human-computer interaction studies, which can be considered the hallmark of participatory design of digital technologies with children. Various techniques are used by researchers-designers in these studies to elicit children's responses, in a cycle of iterative development that incorporates children's views directly into the design of the technologies. For example, drawing, photography, cultural probes (toolkits with various materials including craft-making materials), and arts-based methods have been used as techniques to expand adults' perspectives on design (e.g. Tare & Gugha, 2023). This research has recently expanded to participatory AI design with children (e.g. Wang et al., 2023), with strong connections to the **children's rights literature and ethical AI design** in EdTech (Livingstone & Third, 2017; Hadfield-Hill & Zara, 2024).

Things to consider in **participatory design:**

- active involvement of users, including underrepresented groupd
- child-centred design practices
- ethical considerations, including advertisement placement

3.6 ASSETS VERSUS DEFICITS BASED APPROACHES IN EDTECH

For a comprehensive evaluation and a **holistic understanding of EdTech impact**, efficacy and effectiveness studies must incorporate considerations of equity, ethics, and environment (Kucirkova, 2024). This entails conducting holistic evaluations that centre on marginalised groups, addressing the crucial question of who benefits from the technology and conducting examinations and analyses with this focus in mind.

Holistic evaluations stand **in contrast to deficit approaches** in EdTech (and education more broadly). Deficit approaches often underlie many design and evaluation studies, focusing on identifying and remediating problems within individual students using EdTech tools. These models unintentionally emphasise what learners lack or where they fall short of normative standards, locating issues within the student rather than considering the broader context. While some EdTech systems can empower students with different problem-solving strategies, defining students solely by what they lack can have severe consequences, particularly for those from diverse cultural backgrounds.

Asset-based frameworks, such as the Funds of Knowledge framework (Moll et al., 1992), as an alternative to deficit-based approaches, **emphasise students' existing knowledge, competencies, and diverse problem-solving strategies**, recognizing the importance of cultural context and resources in supporting learning, including those gained from outside of formal learning settings (see, e.g. Esteban-Guirtart & Moll, 2014; Verdin et al., 2021).

Within the context of AIED (Artificial Intelligence in Education), based on the Funds of Knowledge and asset-based approaches, Ocumpaugh and colleagues (2023) propose five principles to guide the development of EdTech:

1. Conceptualise and Define Learner Assets Expansively.
2. Detect Assets that Students Possess or Have Access to.
3. Leverage Existing Learner Assets Using System Features and Functions.
4. Develop New Assets Using System Features and Functions.
5. Make assets visible for learners, educators, and other stakeholders.

These principles aim to recognise the **multidimensionality of learners and learning experience,** acknowledging differences in knowledge, skills, misconceptions, strategies, metacognition, emotions, engagement, interests, values etc. Research on assets-based approaches emphasises the resources that students bring from their home and community, including linguistic and cultural practices (e.g. MacSwan, 2020). **Conceptualising and defining learner assets expansively** (principle no. 1), "differs from the common practice of simply identifying and fixing shortcomings in [learner's] knowledge" by focusing on "developing methods to incorporate students' existing knowledge" (Ocumpaugh et al., 2023) by, e.g., drawing on research on measuring sociocultural factors that influence student engagement (e.g. Duran et al., 2020 on students' sense of belonging) and incorporating these as additional data sources that have the potential to reveal a wider spectrum of students' strengths and can assist educators in better understanding their learning contexts.

'**Detecting assets**' principle can be followed, for example, through learners' self-reporting and expanding learner models, while using these in conjunction with real-time detection techniques that are adjusted so that not to be framed in a deficit style as is currently often the case. Ocumpaugh and colleagues (2023) emphasise that "pedagogies are not deficit based when they find places where students need support. They are deficit based when they only find areas where students are deficient."

Principle no. 3 proposes to **increase the number of pedagogical and student problem-solving approaches** - for example, Hunt and colleagues (2022) suggest that while students with learning disabilities benefit from open-ended problem solving, educators tend to underestimate the extent (and type) of their prior knowledge; Gobert and colleagues (2013) have developed models that detect a student's understanding of the concept of experimentation while using a different strategy than the expected approach; Nasiar and colleagues (2023) have built models that recognise a new strategy proposed by the student; Crossley and colleagues (2014) have modelled different approaches to successful writing.

Tools that support self-regulated learning (e.g., Azevedo et al., 2022; Roll et al., 2011; Roscoe & Craig, 2022) can empower learners to develop their own assets with greater agency and independence. Principle 4 emphasises the **variety of ways that students obtain knowledge**, and techniques and tools to be used in supporting them. Broadening learning content to offer culturally rich experiences serves all students, including those that are typically "privileged", it offers opportunities to make new connections and learn new skills and strategies.

Principle 5 encompasses everything from including the home and cultural assets of learners to **re-designing the data visualisations and dashboards** used to communicate about the learner. Ocumpaugh and colleagues (2023) stress that, for example, in designing dashboards, careful attention needs to be paid to how students are labelled as the evidence shows labelling (e.g., high performing) affects students' own self-conceptions and other people's expectations of their capabilities (see also, e.g., in O'Donnell & Sireci, 2022; Walker et al., 2023; and Bertrand & Marsh, 2021).

Assets based approaches are equitable as they emphasise students' existing knowledge, competencies, and diverse problem-solving strategies, and the importance of their cultural contexts.

Assets based approaches stand **in contrast to deficits based approaches** that emphasise what learners lack or where they fall short of normative standards, locating issues within the student rather than considering the broader context.

In sum, while a significant portion of learning sciences literature focuses on the innovations, effectiveness, and efficiencies of educational technology, there is limited research examining its role in tackling systemic and entrenched educational inequities. Our literature review highlighted a number of issues and biases embedded in the design of EdTech and calls for **more attention paid to how EdTech can contribute to promoting equity and addressing disparities in educational outcomes.**

Key things to consider when designing equitable EdTech:

BIAS - both societal and statistical

INCLUSIVE DESIGN

PARTICIPATORY DESIGN

and

ASSET-BASED orientation rather that deficit based

4. INDUSTRY-RELATED EQUITY CERTIFICATIONS AND CURRENT BENCHMARKS AND INDICATORS

4.1 EQUITY CERTIFICATIONS

COMMON SENSE MEDIA

While industry-related equity certifications are not yet widely utilised, there are several worth noting. Equity related questions are being addressed by various emerging frameworks and rubrics, these often fall into the areas of data interoperability or data privacy, for example, **Common Sense Media Privacy** ratings (https://privacy.commonsense.org/resource/privacy-ratings), though not specifically focused on EdTech only, are based on Quick, Basic, and Full privacy evaluations. Their 2021 'State of Kids' Privacy Report' focuses on practices in e.g. data sharing, collection and practices but also includes ads and tracking. Common sense also focuses on digital equity, for their work see https://www.commonsensemedia.org/what-we-stand-for/digital-equity.

DIGITAL PROMISE

Digital Promise offers 'Prioritising Racial Equity in AI Design' certification (https://productcertifications.microcredentials.digitalpromise.org/explore/1-prioritizing-racial-equity-in-ai-design-2), which focuses on mitigating **racial bias** in EdTech products through intentional design efforts. Key features include: a) identifying points of risk for racial bias in algorithmic training, b) establishing processes for accountability and transparency, implementing practices to minimise or eliminate racial bias in design, c) regularly updating of an Assumption Log to ensure accountability for actions taken to mitigate bias, d) identifying significant associated risks in products driven by AI or machine learning models, e) using practices to mitigate racial bias in datasets, training, or design of AI algorithms, f) integrating user-friendly feature allowing educators to override model decisions for individual learners, g) providing view access to primary inputs informing model decisions, and h) posting public statements on the website identifying specific ways the product minimises racial bias in datasets and training algorithms.

Other product certifications by **Digital Promise t**hat cover aspects of equity include the 'Learner Variability Product Certification' (for EdTech that have earned this certification, see https://productcertifications.digitalpromise.org/learner-variability-certified-products/) and 'UDL Product Certification'. Earlier this year, Digital Promise's Centre for Inclusive Design released a white paper 'A New Narrative: How Unlocking the Power of R&D Through Inclusive Innovation Can Transform Education' (Smith & Young, 2024) and their product certifications have been revised to include 'competency-based' and 'research-driven' certifications.

EDDS

EDDS's (https://www.edds-education.org/) five-point 'Manifesto for Education and Technology' addresses equity indirectly by focusing on the importance of diversity. Their EdTech Quality Framework section, 'Lawful, ethical and safe', 'Socio-ethical requirements' and 'Algorithmic fairness and human rights' addresses equity issues to some degree, however there is no publicly available documentation on how these topics are assessed. 'The Ten Verticals' of evaluation address equity issues by considering, for example, age appropriate design, cyber security, ethics, algorithmic justice, ethics, duty of care, data responsibility. Moreover, equity is specifically mentioned, in the Pedagogy section, and provides clear values to teaching and learning, to equity, and quality education.

EDGE Standards and Certification

EDGE Standards and Certification (EDGE Foundation - https://www.edge-cert.org/) is a standard for **Diversity, Equity, and Inclusion**, centred on workplace gender and intersectional equity. The standards offer a framework against which organisations can measure where they stand on gender and intersectional equity, as such the standard is company, rather than product, focused, for example, Abt Global (https://www.abtglobal.com/) has become the first U.S. government implementing partner to have been awarded the EDGE Certification, the certification process included an audit of Abt's gender equity practices, policies, employee perceptions - benchmarking them against other organisations.

4.2 EQUITY BENCHMARKS AND INDICATORS

DIGITAL INCLUSION BENCHMARK

In 2023, the **World Benchmarking Alliance** unveiled the 'Digital Inclusion Benchmark' (https://www.worldbenchmarkingalliance.org/research/2023-digital-inclusion-benchmark-insights-report/) which encompasses **16 indicators** across **four measurement areas**: expanding universal access to digital technologies, enhancing digital skills across all four levels of measurement, promoting trustworthy use, and fostering open, inclusive, and ethical innovation. These indicators align with the 17 Sustainable Development Goals (SDGs) established by all 193 United Nations (UN) member states in 2015. By mapping to the SDGs, these indicators serve as a tool for evaluating the performance of tech companies in advancing digital inclusion, with the goal of contributing to a more equitable and sustainable future through responsible and innovative technology use.

These indicators are precise, assume responsibility for equitable practice at the company level, and define inclusivity across four measurement areas: access, skills, use, and innovation, see Table 4 for the detailed criteria.

ACCESS	SKILLS
A1 The company contributes to digital technology access **A2** The company supports digital inclusivity for women and girls **A3** The company facilitates digital access for diverse users **A4** The company discloses its direct economic contribution	**S1** The company supports basic digital skills development **S2** The company supports intermediate digital skills development **S3** The company supports technical digital skills development **S4** The company supports school connectivity
USE	**INNOVATION**
U1 The company assigns accountability for cybersecurity at a senior level **U2** The company monitors, remedies and reports cybersecurity incidents **U3** The company applies responsible practices for personal data **U4** The company mitigates digital risks and harms	**I1** The company practises open innovation **I2** The company supports technology innovation ecosystems **I3** The company supports sustainable development **I4** The company practises inclusive and ethical research and development

Table 4. Summary of key deliverables of 2023 Digital Inclusion Benchmark Report.

IRIS+

In addition to the Digital Inclusion Benchmark, **the IRIS+ system** (https://iris.thegiin.org/) by **Global Impact Investing Network** offers several metrics aligned with equity considerations:

- IRIS metric II6610 (https://iris.thegiin.org/metric/5.3/ii6610/) is specifically focused on **racial equity** and it measures the value of assets under management deployed to communities predominantly inhabited by historically marginalised racial or ethnic groups. It requires organisations to provide context and footnote assumptions, including locally relevant definitions of marginalised groups. This metric aligns with initiatives like the Corporate Racial Equity Alliance's Investor Blueprint for Racial Equity, which aims to promote equitable investment practices.

- IRIS metric ID1046 '**Racial Equity Audit**' (https://iris.thegiin.org/metric/5.3/id1046/) captures whether the organisation completed a racial equity audit specifically during the reporting period.

- **Racial Equity Advocacy Strategy** (OD2311) (https://iris.thegiin.org/metric/5.3/od2311/) indicates "whether the organisation has an advocacy strategy in place to support racial equity and justice efforts at local and national levels as of the end of the reporting period."

- **Racial Equity Transparency Practice** (OD0482) (https://iris.thegiin.org/metric/5.3/od0482/) indicates "whether the organisation has a formalised and ongoing practice of sharing publicly its positions, practices, progress, and advocacy related to racial equity as a mechanism to build trust and ensure adherence."

UNICEF

More broadly, UNICEF's (2020) 'Community Engagement' guidance (https://www.unicef.org/topics/community-engagement for humanitarian and research contexts, specifies **technology use** as **being equitable when**:

- Two-way, transparent communication channels are established, ensuring meaningful engagement with communities.
- Communities are empowered to assert their rights and play leadership roles in decision-making processes.
- Participatory processes are inclusive and nondiscriminatory, reflecting the diversity of the community.
- Efforts are made to address power imbalances within communities, promoting equity in engagement.
- Mechanisms are in place for communities to provide ongoing feedback on the quality and accessibility of services.

5. A CONSOLIDATED BENCHMARK FOR EQUITY IN EDTECH

When developing a consolidated benchmark for equity in EdTech, we focused on **the equity principle within the EdTech product, considerations of its end-users, and also the company itself.**

In relation to Edtech product evaluation, **key indicators for monitoring and evaluation concern the target users and context of the product use**. Ideally, equitable EdTech solutions should aim to **offer inclusive and accessible design** as well as **diverse content** that is **culturally localised** for the contexts in which the EdTech solutions are to be used.

EdTech solutions are considered to be equitable when they can **be adapted to the variable needs of diverse learners**. Diverse learners include disadvantaged or marginalised students due to their socio-economic status, gender, race, disability, immigration, minority or language learner status. EdTech solutions are equitable when they build on students' diverse knowledge building pathways, and support self-efficacy and agency, rather than relying on deficits paradigms.

EdTech solutions are equitable when, **through their inclusive and/or participatory design features**, they address the **contextually situated needs** of diverse learners through flexible, accessible, and adaptable design features. Equitable EdTech solutions are also designed with considerations taken towards addressing bias across all stages of product development (see Tables 2 and 3), but also **implementation and scale** across **different environments**.

Finally, EdTech products are equitably designed when the EdTech company offers **explicit public commitment** to user accountability and transparency through clear, easy to understand, consent processes. **Company-level equity indicators** include access, skills, use and innovation (see Table 4).

In Table 5 below, we mapped **equity indicators at the product and organisation levels** onto existing frameworks to formulate equity indicators for EdTech products and organisations.

Equity Indicators on the Product Level	Equity Indicators on the Organisation Level
Product supports student variability Context of use is in line with diverse user groups	User consent is clearly and appropriately communicated
Inclusive and/or participatory design is used in product development	Commitment to inclusive and/or participatory design is institutionalised
Product development addresses bias	Bias in datasets, algorithms, and practices are publicly addressed, processes for user accountability and transparency are publically established.

Table 5. Equity monitoring and evaluation indicators in EdTech solutions.

At the organisation level, particularly with the increasing volume of AI-based applications, **equitable process for addressing bias** is of utmost importance; this includes identification of bias type and points of risk in algorithmic training and implementation of clear and transparent practices to minimise or eliminate bias in design. It also includes: a) regular updating of assumption logs to ensure accountability for actions taken to mitigate bias, b) use of practices to mitigate bias in datasets, training, or design of AI algorithms, c) integration of user-friendly features allowing educators to override model decisions for individual learners, d) provision of view access to primary inputs informing model decisions, e) measurement and deployment of assets to historically marginalised communities, with context and assumptions provided, and f) completion of equity audit and implementation of advocacy strategy and transparency practices.

Transforming the literature-based indicators into a benchmark involved categorising the key indicators into **three levels** in order to establish a **comprehensive benchmark** that can offer valuable guidance for EdTech users, providers, and evaluators alike. Certification providers can feed the consolidated benchmark into **an adaptable rubric** with clear parameters for technology characteristics at product level and organisation's characteristics more broadly. A rubric with clear criteria for each level can effectively guide the EdTech field toward adopting best practices. These will need to be evaluated holistically to ensure a representative score. An **'Example rubric' in Table 6** illustrates criteria focused on equitable design that can be developed into an evaluation and rating system for EdTech tools:

GOLD	SILVER	BRONZE
*Equitable design **comprehensively** addresses indicators **both** at the product and organisation levels.* **All** features of equitable design clearly support each other and are adaptable to various learner groups and contexts of use. **All three** of the following indicators are met: The product has documented inclusive **and** participatory design features. The product addresses bias in its design. The product developer publicly provides clear documentation of its practices **and** demonstrates transparency and accountability in addressing users' feedback.	*Equitable design addresses indicators at either the product **or** organisation levels.* **All** features of equitable design clearly support each other and are adaptable to various learner groups and contexts of use. **At least two out of three** of the following indicators are met: The product has documented inclusive **and**/or participatory design features. The product addresses the issue of bias in its design. The product developer is publicly committed to its users, provides clear documentation of its practices **and** shows demonstrates transparency and accountability in addressing users' feedback.	*Equitable product design **partially** addresses indicators at either the product **or** organisation levels.* **All** features of equitable design clearly support each other and are adaptable to various learner groups and contexts of use. **At least one out of three** of the following indicators are met: The product has documented inclusive **and**/or participatory design features. The product and addresses the issue of bias in its design. The product developer is publicly committed to its users, provides clear documentation of its practices and shows demonstrates transparency and accountability in addressing users' feedback.

Table 6. An adaptable example rubric of M&E criteria of equitable design.

6. CONCLUSION

This report aims to provide **guidance for improving equitable EdTech design, policy and practice**. We identified relevant academic literature and captured **best practices** in identifying equitable EdTech features, as well as **biassed design** and **organisational practices** in EdTech. Our approach draws from existing literature indicating that accepted standards and indicators have generally proven to positively influence developer and consumer awareness, as well as policy-makers' decision-making.

The benchmark and example rubric developed for this report are designed to be dynamic resources that should undergo continuous evaluation and modification in response to developers' and consumers' evolving needs, research, and insights from industry and practice.

In this conceptualisation, **we also hope to initiate a dialogue** among community constituents invested in the development and evaluation of equitable EdTech products, tools, and resources . This includes discussion at the intersection of digital equity and inclusion taking the position that "the implementation of inclusive educational practices is a matter of equity and social justice" (Prado & Warschauer, 2024, p. 17) and "the cornerstone of the modern democratic state" (Schuelka & Carrington 2022, p. 3).

Discussion of equity in EdTech also necessitates conversations about how constituents can support development of EdTech practices and tools that support students of all ability levels in achieving full access - building on the premise that inclusion of students within their learning communities supports educational equity (Prado & Warschauer, 2024).

Finally, we hope that these resources will foster the continued development of equity in Edtech knowledge-base that enhances the standards and indicators used to design EdTech that is equitable in its aims to serve a diverse range of users across multiple contexts.

Cited research publications and resources

Anthony, L. (2023). *AntConc* (Version 4.2.4) [Computer Software]. Tokyo, Japan: Waseda University. Available from: https://www.laurenceanthony.net/software

Azevedo, R., Bouchet, F., Duffy, M., Harley, J., Taub, M., Trevors, G., Cloude, E., Dever, D., Wiedbusch, M., Wortha, F. & Cerezo, R. (2022). Lessons learned and future directions of MetaTutor: Leveraging multichannel data to scaffold self-regulated learning with an intelligent tutoring system. *Frontiers in Psychology*, *13*.

Baek, C. & Aguilar, S. J. (2023). Past, present, and future directions of learning analytics research for students with disabilities. *Journal of Research on Technology in Education*, 55 (6), 931–946.

Baker, R. S. & Hawn, A. (2022). Algorithmic Bias in Education. *International Journal of Artificial Intelligence in Education*, 32 (4), 1052–1092.

Bertrand, M. & Marsh, J. (2021). How data-driven reform can drive deficit thinking. *Phi Delta Kappan,* 102 (8), 35–39. https://doi.org/10.1177/00317217211013936

Birch, H.J.S. & Demmans Epp, C. (2023). Diverse stakeholders on educational technology development teams: supporting software developers and children. *Education Tech Research Dev*, 71, 2021–2046.

Boulton, H., Brown, D., Standen, P., Belmonte, M., Kwiatkowska, G., Hughes-Roberts, T. & Taheri, M. (2018). Multi-modalities in classroom learning environments [Paper presentation]. *INTED2018 Proceedings: 12th Annual International Technology, Education and Development Conference*.

Bray, A., Devitt, A., Banks, J., Sanchez Fuentes, S., Sandoval, M., Riviou, K., Byrne, D., Flood, M., Reale, J. & Terrenzio, S. (2024). What next for Universal Design for Learning? A systematic literature review of technology in UDL implementations at second level. *British Journal of Educational Technology,* 55 (1), 113-138.

Bright, S. & Calvert, E. (2023). Educational Technology: Barrier or Bridge to Equitable Access to Advanced Learning Opportunities? *Gifted Child Today,* 46 (3), 187-200.
CAST (2018). Universal Design for Learning Guidelines version 2.2. Retrieved from http://udlguidelines.cast.org (accessed 14/02/2024)

Chen, N., Sørensen, T. A. & Spence, C. (2024). Crossmodal correspondence. *Frontiers in Psychology*, *15*, 1385480.

Christopoulos, A., Mystakidis, S., Pellas, N. & Laakso, M.-J. (2021). ARLEAN: An Augmented Reality Learning Analytics Ethical Framework. *Computers, 10*, 92.

Close, K., Warr, M. & Mishra, P. (2024). The ethical consequences, contestations, and possibilities of designs in educational systems. TechTrends, 68 (1), 186-194.

[

Crossley, S. A., Roscoe, R. & McNamara, D. S. (2014). What is successful writing? An investigation into the multiple ways writers can write successful essays. *Written Communication*, 31 (2), 184– 214. https://doi.org/10.1177/0741088314526354

D'Ignazio, C. & Klein, L. F. (2020). *Data Feminism*. The MIT Press.

Dockterman, D. (2024, April 17). *The Other EdTech Evidence*. [Pulse article]. LinkedIN. https://www.linkedin.com/pulse/other-edtech-evidence-david-dockterman-5qfde/?trackingId=%2F%2BsxMgRYReazYue3WHMxpQ%3D%3D

Duran, A., Dahl, L. S., Stipeck, C. & Mayhew, M. J. (2020). A critical quantitative analysis of students' sense of belonging: Perspectives on race, generation status, and collegiate environments. *Journal of College Student Development*, 61 (2), 133–153. https://doi.org/10.1353/csd.2020.0014

Durham, C. (2024). Centering Equity for Multilingual Learners in Preservice Teachers' Technological Pedagogical Content Knowledge (TPACK). *Journal of Teacher Education*, 1–14.

Dzaman, S., Fenlon, D., Maier, J. & Marchione, T. (2022). *2.2 Clearly Define Learning Outcomes*. Universal Design for Learning: One Small Step.

Esteban-Guitart, M. & Moll, L. C. (2014). Funds of identity: A new concept based on the funds of knowledge approach. *Culture & Psychology*, 20 (1), 31–48. https://doi.org/10.1177/1354067X13515934

Fernández-Batanero, J-M., Montenegro-Rueda, M., Fernández-Cerero, J. & López-Meneses, E. (2024). Fostering Motivation: Exploring the Impact of ICTs on the Learning of Students with Autism. *Children*, 11 (1), 119.

Freire, P. & Macedo, D. P. (1987). *Literacy: Reading the word & the world*. South Hadley, MA: Bergin & Garvey Publishers.

Garcia, A. & Lee, C. H. (2020). Equity-Centered Approaches to Educational Technology. In M. J. Bishop, E. Boling, J. Elen & V. Svihla (Eds), *Handbook of Research in Educational Communications and Technology. Learning Design* (5th ed.), 247-261. Springer.

Gaskins, N. (2023). Interrogating Algorithmic Bias: From Speculative Fiction to Liberatory Design. *TechTrends*, 67 (3), 417-425.

Giannini, S. (2024, March 19). Today we mark the first-ever International Day for #DigitalLearning, an important reminder of technology's potential to expand access, enhance learning outcomes, and combat inequalities in and through education. [Post]. LinkedIN. https://www.linkedin.com/feed/update/urn:li:activity:7175889629441638400/

Hadfield-Hill, S., & Zara, C. (2024). Being participatory through the use of app-based research tools. In *Being Participatory: Researching with Children and Young People: Co-constructing Knowledge Using Creative, Digital and Innovative Techniques* (pp. 169-195). Cham: Springer International Publishing.

Huffman, S. (2018). The digital divide revisited: What is next? *Education*, 128 (3), 239–246.

Hunt, J., Taub, M., Marino, M., Duarte, A., Bentley, B., Holman, K. & Banzon, A. (2022). Enhancing engagement and fraction concept knowledge with a universally designed game based curriculum. *Learning Disabilities: A Contemporary Journal*, 20 (1), 77–95.

Kinder-Kurlanda, K. & Fahimi, M. (2024). Making Algorithms Fair: Ethnographic Insights from Machine Learning Interventions. In J. Jarke, B. Prietl, S. Egbert, Y. Boeva, H. Heuer & M. Arnold (Eds), *Algorithmic Regimes.* Amsterdam University Press.

Kormos, E. & Wisdom, K. (2023). Digital divide and teaching modality: Its role in technology and instructional strategies. *Education and Information Technologies*, 28, 9985–10003.

Kucirkova, N. (2023, 27 March). *Are EdTech companies the casualties or winners of educational evidence wars?* [BERA blog] https://www.bera.ac.uk/blog/are-edtech-companies-the-casualties-or-winners-of-educational-evidence-wars

Kucirkova, N. (2024). *The 5Es of Evidence and SDGs, Springer Nature Research Communities*, https://communities.springernature.com/posts/the-5es-of-evidence-and-sdgs

Kucirkova, N. I. & Tosun, S. (2023). Children's olfactory picturebooks: Charting new trends in early childhood education. *Early Childhood Education Journal*, 1-10.

Ladson-Billings, G. (2006). From the achievement gap to the education debt: Understanding achievement in U.S. schools. *Educational Researcher*, 35 (7), 3-12.

Lazou, C. & Tsinakos, A. (2023). Critical Immersive-Triggered Literacy as a Key Component for Inclusive Digital Education. *Education Sciences*, 13 (7), 696.

Livingstone, S. & Third, A. (2017). Children and young people's rights in the digital age: An emerging agenda. *New media & society*, *19* (5), 657-670.

Lloyd-Esenkaya, T., Lloyd-Esenkaya, V., O'Neill, E. & Proulx, M. J. (2020). Multisensory inclusive design with sensory substitution. *Cognitive Research: Principles and Implications*, *5* (1), 37.

Lopez, P. (2021). Bias does not equal bias: A socio-technical typology of bias in data-based algorithmic systems. *Internet Policy Review*, 10 (4). https://doi.org/10.14763/2021.4.1598

Macgilchrist, F. (2019). Cruel optimism in edtech: When the digital data practices of educational technology providers inadvertently hinder educational equity. *Learning, Media and Technology,* 44 (1), 77-86.

MacSwan, J. (2020). Academic English as standard language ideology: A renewed research agenda for asset-based language education. Language Teaching Research, 24 (1), 28–36. https://doi.org/10. 1177/1362168818777540

Martin, F., Zhuang, M. & Schaefer, D. (2024). Systematic review of research on artificial intelligence in K-12 education (2017–2022). *Computers and Education: Artificial Intelligence*, 6.

Mehta, P., Chillarge, G. R., Sapkal, S. D., Shinde, G. R. & Kshirsagar, P. S. (2023). Inclusion of children with special needs in the educational system, Artificial Intelligence (AI). In A. Kumar, A. Nayyar, R. K. Sachan & R. Jain (Eds), *AI-Assisted Special Education for Students with Exceptional Needs*, pp. 156-185. IGI Global.

Mitchell, S., Potash, E., Barocas, S., D'Amour, A., & Lum, K. (2021). Algorithmic Fairness: Choices, Assumptions, and Definitions. *Annual Review of Statistics and Its Application*, 8. https://doi.org/10.1146/annurev-statistics-042720-125902

Moll, L., C., Amanti, C., Neff, D. & Gonzalez, N. (1992). Funds of knowledge for teaching: using a Qualitative approach to connect homes to classrooms. *Theory into Practice*, 31 (2), 132-141.

Nasiar, N., Baker, R. S., Zou, Y., Zhang, J. & Hutt, S. (2023). Modelling problem-solving strategy invention (PSSI) behavior in an online math environment. In N. Wang, G. Rebolledo-Mendez, V. Dimitrova, N. Matsuda & O.C. Santos (Eds), *Artificial Intelligence in Education*. Posters and Late Breaking Results, Workshops and Tutorials, Industry and Innovation Tracks, Practitioners, Doctoral Consortium and Blue Sky. AIED 2023. Communications in Computer and Information Science, Vol. 1831. Springer, Cham https://doi.org/10.1007/978-3-031-36336-8_70

Nera, G. R. & Nyikadzino, T. (2023). Factors Hampering the Realization of Equity and Quality Education in Zimbabwe's Rural Schools: Experiences of Chipinge Central Circuit, Manicaland. *Journal of Asian and African Studies*, 1–15.

Nguyen, A., Gardner, L. A., & Sheridan, D. (2018). A framework for applying learning analytics in serious games for people with intellectual disabilities. *British Journal of Educational Technology*, 49 (4), 673–689. https://doi.org/10.1111/bjet.12625

Nicolai, S., Jordan, K., Taskeen, A., Kaye, T. & Myers, C. (2023). Toward a holistic approach to EdTech effectiveness: Lessons from Covid-19 research in Bangladesh, Ghana, Kenya, Pakistan, and Sierra Leone. *International Journal of Educational Development,* 102.

Ocumpaugh, J., Roscoe, R. D., Baker, R. S., Hutt, S. & Aguilar, S. J. (2023). Toward Asset-based Instruction and Assessment in Artificial Intelligence in Education. *International Journal of Artificial Intelligence in Education,* https://doi.org/10.1007/s40593-023-00382-x

O'Donnell, F. & Sireci, S. G. (2022). Language matters: Teacher and parent perceptions of achievement labels from educational tests. *Educational Assessment,* 27 (1), 1–26.

OECD (2016). *PISA 2015 Results (Volume I): Excellence and Equity in Education, PISA*. Paris: OECD Publishing. https://doi.org/10.1787/9789264266490-en.

OECD (2018). *Equity in Education: Breaking Down Barriers to Social Mobility, PISA*. Paris: OECD Publishing. https://doi.org/10.1787/9789264073234-en.

OECD (2023). *PISA 2022 Results (Volume I): The State of Learning and Equity in Education*, PISA. Paris: OECD Publishing. https://doi.org/10.1787/53f23881-en

Pham, S. T. H. & Sampson, P. M. (2022). The development of artificial intelligence in education: A review in context. *Journal of Computer Assisted Learning*, 38 (5), 1408-1421.

Poechhacker, N. & Kacianka, S. (2021). Algorithmic accountability in context: Socio-technical perspectives on structural causal models. *Frontiers in Big Data*, 3. https://doi.org/10.3389/fdata.2020.519957

Prado, Y. & Warschauer, M. (2024). *Voices on the Margins: Inclusive Education at the Intersection of Language, Literacy, and Technology*. The MIT Press.

Rizvi, F. & Lingard, B. (2010). *Glogalizing Education Policy*. Routledge.

Roll, I., Aleven, V., McLaren, B. M. & Koedinger, K. R. (2011). Improving students' help-seeking skills using metacognitive feedback in an intelligent tutoring system. *Learning & Instruction*, 21 (2), 267–280.

Roscoe, R. D. & Craig, S. D. (2022). A heuristic assessment framework for the design of self-regulated learning technologies. *Journal of Formative Design in Learnin*g, 6, 77–94.

Rosenheck, L. & Limpiti, P. (2024). *Designing for Inclusion, Designing for All*. A White Paper by Kahoot!. Available: https://files-cdn.kahoot.it/DesigningForInclusion.pdf

Schuelka, M. J. & Carrington, S. (Eds) (2022). *Global Directions in Inclusive Education*. Routledge.

Smith, K., & Young, V. (2024, January). *A new narrative: How unlocking the power of R&D through Inclusive Innovation can transform education.* Digital Promise. https://doi.org/10.51388/20.500.12265/202

Tare, M. & Guha, M. L. (2023, June). "We're Hinged. They're Not. It's in that Space that Creativity Happens": Adult co-designers' perspectives on designing technology with children. In *Proceedings of the 22nd Annual ACM Interaction Design and Children Conference* (pp. 574-577).

UNESCO (1994). T*he Salamanca Statement and Framework of Action on Special Needs Education*. Salamanca.

UNESCO (2021). *UNESCO strategy on technological innovation in education (2021-2025)*. Available at: https://unesdoc.unesco.org/ark:/48223/pf0000375776

UNESCO GEM Report (2023). *Global education monitoring report, 2023: technology in education: a tool on whose terms*?. DOI: https://doi.org/10.54676/UZQV8501

UNESCO (2024). *Challenging systematic prejudices: An investigation into bias against women and girls in large language models.* Available at: https://unesdoc.unesco.org/ark:/48223/pf0000388971 [accessed 8/3/2024].

UNICEF (2020). *Minimum quality standards and indicators for community engagement*. New York: UNICEF.

UNICEF (2022.) *Responsible Innovation in Technology for Children, Digital technology, play and child well-being.* RITEC Project funded by the LEGO Foundation.

UNICEF *Disability and Inclusion Policy and Strategy, 2022-2030*. Available at: https://www.unicef.org/media/134511/file/An%20inclusive%20world,%20starts%20with%20me,%20with%20you,%20with%20all%20of%20us.pdf

U.S. Department of Education, Office of Educational Technology (2024). *National Educational Technology Plan*, Washington. Available at: https://tech.ed.gov/files/2024/01/NETP24.pdf

Ventrella, F. M. & Cotnam-Kappel, M. (2024). Examining digital capital and digital inequalities in Canadian elementary schools: Insights from teachers. *Telematics and Informatics*, 86. https://doi.org/10.1016/j.tele.2023.102070

Verdín, D., Smith, J. M. & Lucena, J. (2021). Funds of knowledge as pre-college experiences that promote minoritized students' interest, self-efficacy beliefs, and choice of majoring in engineering. *Journal of Pre-College Engineering Education Research (J-PEER)*, 11(1), Article 11. https://doi.org/10.7771/ 2157-9288.1281

Walker, M. E., Olivera-Aguilar, M., Lehman, B., Laitusis, C., Guzman-Orth, D. & Gholson, M. (2023). *Culturally Responsive Assessment: Provisional Principles*. ETS Research Report Series. https://doi. org/10.1002/ets2.12374

Wang, G., Sun, K., Atabey, A., Pothong, K., Lin, G. C., Zhao, J. & Yip, J. (2023, April). Child-Centred AI Design: Definition, Operation, and Considerations. In *Extended Abstracts of the 2023 CHI Conference on Human Factors in Computing Systems* (pp. 1-6).

Warschauer, M. (2012). The digital divide and social inclusion. *Americas Quarterly,* 6(2), 131–135.

Wernimont, J. (2018). *Numbered Lives. Life and Death in Quantum Media*. The MIT Press.

Wodon, Q. (2016). *What Matters Most for Equity and Inclusion in Education Systems: A Framework Paper.* Working Paper Series no 10. World Bank Group.

World Benchmarking Alliance (2023). *Digital Inclusion Benchmark 2023 Insights Report*. Available from: https://www.worldbenchmarkingalliance.org/research/2023-digital-inclusion-benchmark-insights-report/

Yan, D. (2023). Impact of ChatGPT on learners in a L2 writing practicum: An exploratory investigation. *Education and Information Technologies*, 28 (11), 13943-13967.

APPENDIX A

The texts for the 'equity' corpus were selected from three sources: OECD, UNESCO and the World Bank webpages. The 'search' function at each website was used with the keyword 'equity' and the top 10 results examined (for modification in the search at the World Bank webpages, see below). The relevant results (i.e. results concerning 'equity' and 'education' globally) were selected. The texts were downloaded, processed into .txt format, please note that figures and tables were not included. See below for details.

OECD

The search was carried out on 15/04/2024. The top 10 results included the following texts:

1. OECD (2016), PISA 2015 Results (Volume I): Excellence and Equity in Education, PISA, OECD Publishing, Paris, https://doi.org/10.1787/9789264266490-en.
Published on December 06, 2016, available at: https://www.oecd.org/education/pisa-2015-results-volume-i-9789264266490-en.htm
The following chapters were included: Foreword, Ch. 1 - Overview: Excellence and equity in education, Ch. 6 - Socio-economic status, student performance and students' attitudes towards science

2. OECD (2018), Equity in Education: Breaking Down Barriers to Social Mobility, PISA, OECD Publishing, Paris, https://doi.org/10.1787/9789264073234-en.
Published on October 23, 2018, available at: https://www.oecd.org/education/equity-in-education-9789264073234-en.htm
The following chapters were included: Foreword, Executive Summary, Ch. 1 - Overview and policy implications, Ch. 2 - How is equity in education changing?, Ch 3 - Academic and socio-emotional resilience among disadvantaged. Students

3. OECD (2012), Equity and Quality in Education: Supporting Disadvantaged Students and Schools, OECD Publishing, Paris, https://doi.org/10.1787/9789264130852-en.
Published on February 9, 2012, available at: https://www.oecd-ilibrary.org/education/equity-and-quality-in-education_9789264130852-en
The following chapters were included: Foreword, Executive Summary, Ch. 1 Investing in equity in education pays off

4. 'Financial corporations debt to equity ratio' - not included

5. Webpage 'Equity in education - The foundation for a more resilient future' (https://www.oecd.org/stories/education-equity/) contained further 5 links:

5a. https://www.oecd.org/stories/education-equity/#1 with a link to report
OECD (2022), Improving Early Equity: From Evidence to Action, OECD Publishing, Paris, https://doi.org/10.1787/6eff314c-en.
Published on October 26, 2022, available at: https://www.oecd-ilibrary.org/education/improving-early-equity_6eff314c-en

5b. https://www.oecd.org/stories/education-equity/#2 with a link to report 'Value for Money in School Education' (not included)

5c. https://www.oecd.org/stories/education-equity/#3

5d. https://www.oecd.org/stories/education-equity/#4 with a link to 'Education Policy Outlook 2022' (not included)

5e. https://www.oecd.org/stories/education-equity/#5 with a link to 'Education at a Glance 2022'

6. 'Improving Early Equity – From evidence to Action' webpage (https://www.oecd.org/education/improving-early-equity-6eff314c-en.htm), included under 5a

7. OECD (2023), Shaping Digital Education: Enabling Factors for Quality, Equity and Efficiency, OECD Publishing, Paris, https://doi.org/10.1787/bac4dc9f-en.
Published on July 11, 2023, available at: https://www.oecd.org/publications/shaping-digital-education-bac4dc9f-en.htm
The following chapter were included: Foreword, Executive Summary, Ch1 - Building a digital education policy ecosystem for quality, equity and efficiency,Ch4 - Guidance and regulatory frameworks for digital education, Ch6 - Accessible, innovative and high-quality infrastructure for digital education

8. Webpage 'Global Outlook on Financing for Sustainable Development 2023 - No Sustainability Without Equity'(https://www.oecd.org/finance/global-outlook-on-financing-for-sustainable-development-2023-fcbe6ce9-en.htm), not included

9. OECD (2023), PISA 2022 Results (Volume I): The State of Learning and Equity in Education, PISA, OECD Publishing, Paris, https://doi.org/10.1787/53f23881-en
Published on December 5, 2023, available at: https://www.oecd.org/publications/pisa-2022-results-volume-i-53f23881-en.htm
The following chapters included: Preface, Foreword, Executive summary, Ch1 - The state of learning and equity in education in 2022, Ch4 - Equity in education in PISA 2022, Ch5 - Changes in performance and equity in education between 2018 and 2022, Ch6- Long-term trends in performance and equity in education

10. https://www.oecd.org/education/school/equityandqualityineducation-supportingdisadvantagedstudentsandschools.htm
The same source material as no 3 above

UNESCO

The search was carried out on 18/04/2024. The top 10 results included the following texts:

1. Event – symposium 'No efficiency without Equity!', 31 March 2023
https://www.unesco.org/en/articles/no-efficiency-without-equity-discussion
(not included)

2. https://www.unesco.org/gem-report/en/inclusion-education
Webpage: 'Monitoring SDG4: Equity and inclusion', 24 November 2022 Infographics and web-based resources, with link to GEM Report UNESCO (2023), 'Global education monitoring report, 2023: technology in education: a tool on whose terms?', DOI: https://doi.org/10.54676/UZQV8501
The following chapters included: Short Summary, Forewords 2x, Ch1 – Introduction, Ch2 - Equity and inclusion: Access for disadvantaged groups, Ch3 - Equity and inclusion: Access to content, Ch7 - Access to technology: Equity, efficiency and sustainability, Ch16 – Equity

3. https://www.unesco.org/en/articles/equity-inclusion-and-transformation-higher-education
Idea [rubric]: 'Equity, inclusion and the transformation of higher education' By Libing Wang
Published 31 October 2023
[This is a lightly adapted version of an opinion-editorial that first appeared in University World News, 28 October 2023.]

4. https://www.unesco.org/sdg4education2030/en/knowledge-hub/equity-index-school-funding
'Equity Index for School Funding' report
(not included)

5. https://www.unesco.org/en/fieldoffice/almaty/inclusive-ed
'Equity and Inclusive Education'
With links to country profiles and reports
(Not included)

6.
https://media.unesco.org/sites/default/files/webform/r2e002/ec3a90e616de2a2b9aa9d0bfa16168b9545df911.pdf
'Observatory on the Right to Education – Equity Plan – 2008'
(in Spanish, not included)

7. https://www.unesco.org/en/articles/equity-should-be-heart-international-higher-education
Idea [rubric] 'Equity should be at the heart of international higher education' - 'Equity and inclusion should extend to students' learning experiences and campus lives.'
By Libing Wang
Published: 18 December 2023
This is an edited and lightly adapted version of a speech delivered at the UK ENIC 23 Conference, 5 December 2023, at the Queen Elizabeth II Centre, Westminster, London; the speech was first published by University World News on 16 December 2023.

8. https://www.unesco.org/en/fieldoffice/bangkok/ed/equity-inclusion-education
'Promoting Equity and Inclusion in Education'
Education Section, UNESCO Regional Office in Bangkok
(Not included)

9. https://www.unesco.org/en/articles/promoting-digital-education-equity
Article 'Promoting Digital Education with Equity'
Published 3 May 2020; last update: 20 April 2023

10. https://www.unesco.org/sdg4education2030/en/knowledge-hub/education-africa-placing-equity-heart-policy
'Education in Africa: Placing equity at the heart of policy'
(not included)

WORLD BANK

The search was carried out on 20/04/2024. The top 10 results did not include resources relevant to 'education' and 'equity'. The search parameters were modified to include two keywords: 'equity' AND 'education'.

1. https://documents1.worldbank.org/curated/en/798681600707797522/pdf/Inclusive-Education-Resource-Guide-Ensuring-Inclusion-and-Equity-in-Education.pdf
'Inclusive Education: Resource Guide. Ensuring Inclusion and Equity in Education'
publication date unclear
The following chapters included: Introduction, Conceptualising inclusive education, Glossary

2. https://datatopics.worldbank.org/education/wQueries/qdhs
'Education Statistics'
(not included)

3. http://wbgfiles.worldbank.org/documents/hdn/ed/saber/supporting_doc/Background/EAI/Framework_SABER_EAI.pdf
'What Matters Most for Equity and Inclusion in Education Systems: A Framework Paper'
SABER, Working Paper Series no 10
World Bank Group / Quentin Wodon
Global Engagement and Knowledge Team
February 29, 2016
(Annexes not included)

4. https://documents1.worldbank.org/curated/en/590781562905434693/pdf/Equity-and-Inclusion-in-Education-in-World-Bank-Projects-Persons-with-Disabilities-Indigenous-Peoples-and-Sexual-and-Gender-Minorities.pdf
'Persons with Disabilities, Indigenous Peoples, and Sexual and Gender Minorities'
May 2019
Equity and inclusion in education in World Bank projects

5. Same as no. 3

6. https://www.worldbank.org/en/topic/educationalequityandinclusion
various web resources, not included

7. https://openknowledge.worldbank.org/entities/publication/f3bab3c2-6b58-5d37-881f-adf7d436c9ea
'Education in Ghana: Improving Equity, Efficiency and Accountability of Education Service Delivery'
(not included)

8. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/798681600707797522/inclusive-education-resource-guide-ensuring-inclusion-and-equity-in-education
'Inclusive Education Resource Guide: Ensuring Inclusion and Equity in Education'
H. K. Alasuutari, C. J. Thomas, S. M. Powers, L. S. Mcdonald, & J. Waite
Published: 2020/09/01

9. https://blogs.worldbank.org/en/education/promoting-equity-education-prepare-greying-europe
Promoting equity in education to prepare for a greying Europe
(not included)

10. https://documents1.worldbank.org/curated/en/497341595425543327/Building-Back-Better-Education-Systems-for-Resilience-Equity-and-Quality-in-the-Age-of-COVID-19.pdf
Building back better: Education systems for resilience, equity and quality in the age of Covid-19
Published July 21, 2020
B. Thanh Vu & I. O. Savonitto
Education Global Practices, World Bank Group