A framework for integrating gender, equity, and social inclusion (GESI) in education data systems in sub-Saharan Africa: A discussion paper on education data systems in Uganda, Senegal, and Burkina Faso

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Abstract

Education data systems in sub-Saharan Africa often lack gender, equity, and social inclusion (GESI) indicators, face data fragmentation, and suffer from insufficient funding and technical capacity. This discussion paper synthesizes findings from a scoping review of national and sub-national education data systems in Burkina Faso, Kenya, Niger, Senegal, Uganda, and Zambia, complemented by GESI upskilling sessions and case studies from an ongoing KIX-SEEDS project in Uganda, Burkina Faso, and Senegal. The analysis identifies persistent policy-implementation and data gaps, along with structural, technical, cultural, and institutional barriers to GESI integration. It also addresses counterarguments related to cost, resource allocation, social norms, and accountability. Despite these challenges, promising practices emerge at individual, community, and structural levels including standardized GESI indicators, cross-sectoral collaboration, capacity building, participatory data governance, web-based and offline-capable digital tools. Case study evidence from Uganda (using DHIS2) and Burkina Faso (using "A Classroom in One Hand") illustrates how context-specific innovations can improve data disaggregation, feedback loops, and learner outcomes. The paper proposes a model framework for integrating GESI into education data systems and offers actionable recommendations: standardize indicators, invest in sustainable capacity and infrastructure, enhance interoperability, secure dedicated financing, promote data-driven accountability, and embed participatory governance. Strengthening these areas will enable evidence-based policymaking that effectively reaches marginalized populations.

Keywords: Education data systems; Gender Equity and Social Inclusion (GESI); Sub-Saharan Africa; indicators; marginalized populations; DHIS2

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1.0 Introduction

Reliable and trusted education data systems are crucial in advancing equity and inclusivity in education worldwide. Ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all is a specific aim for Sustainable Development Goal 4 (SDG 4). Globally, education data indicate that 617 million children and adolescents are not meeting minimum proficiency in reading and mathematics (UNESCO Institute for statistics, 2017). In Africa, about 88% of children and adolescents, roughly 202 million, are unlikely to achieve basic reading proficiency by the end of primary and lower secondary education. Girls are disproportionately affected, with nearly 90% of primary school-aged girls compared to 85% of boys, unlikely to reach proficiency levels. Further, approximately 258 million or 17% of the global total, children and youth are not in school, with the number from sub-Saharan Africa (SSA) surpassing that of Central and Southern Asia and still growing. A learner's experience and outcomes are significantly influenced by intersecting factors such as poverty, gender, disability, and location. However, education data systems rarely collect or utilize this information to guide systemic reforms, meaning these critical barriers to learning and inclusion remain unaddressed at the policy level (UNESCO 2020)

Governments and donors often are faced with the challenge of the availability of data and evidence in a user-friendly format to inform planning, policy, and practice. Globally, UNESCO has a set of indicators at the global monitoring level. Overall, 23% of countries report on the identified critical indicators related to SDG4 for the year 2030. While none of LICs report on percentage of population in a given age group achieving at least a fixed level of proficiency in literacy and numeracy skills vs 85% in HICs (UNESCO, 2017). Integration of data from various sources including administrative records, student assessments and demographic surveys and other relevant sectors is needed to address the data challenge. The lack of adequate resources, technical capacity and digital infrastructure limits the integration of such data. These data requirements demonstrate the need to shift current systems from average counts to individual records with robust data systems to measure progress and accountability toward these global commitments.

In 2016, the African Union adopted the continental education strategy for Africa. Its strategic objective No. 11 is to “Build and enhance capacity for data collection, management, analysis, communication, and improve the management of the education system as well as the statistical tool, through capacity building for data collection, management, analysis, communication, and usage.” (CESA 16-25). In response to the strategy, data systems in Africa have expanded significantly in the recent past, with many countries adopting education management information systems to collect data on learners’ progress, manage teachers’ deployment. Despite this advancement, education data systems in Africa continue to face infrastructural and operational gaps, including limited technological infrastructure, data fragmentation, insufficient funding, inconsistent data quality, a lack of considerations for Gender, Equity and Social Inclusion (GESI), etc. (World Bank 2021)

Incorporating GESI is fundamental to achieving educational equity because it provides the necessary evidence to identify critical areas of learning gaps to improve learning outcomes. In order to understand the learning landscape, disaggregated data reveals how factors like gender, disability, and poverty intersect to create barriers. Education systems continue to reinforce inequities among marginalized learners, rendering goals of 'quality education for all' unattainable. Typically, school reports and education data systems in Africa prioritize aggregates of enrolment numbers. While this information is important, it offers a limited view that overlooks quality dimensions like teaching effectiveness, individual learner's characteristics, social, and school environment. Focus on the average learner masks the true learning crisis where millions of children in school are not acquiring basic skills and poses challenges in tracking progress. Furthermore, the lack of disaggregated data by gender, disability, and socioeconomic status obscures inequalities, leading to inefficient resource allocation and undermining the principle of leaving no one behind. Keeping track of the quality of learners' progress, foster accountability for educational results ultimately creating a system for meaningful and inclusive education.

Despite high-level commitments to inclusive education—including the Incheon Declaration (2015)[1], the Transforming Education Summit (2022)[2], the African Union's Continental Education Strategy for Africa 2016–2025 (CESA 16–25)[3], and the AU Gender Equality and Women's Empowerment Strategy (2018–2028)[4]—a persistent policy-implementation gap remains: these frameworks have not translated into equal learning benefits for all learners. In practice, equity issues continue to undermine current educational practices. A second, closely related gap is the absence of comprehensive Gender Equality and Social Inclusion (GESI)-sensitive data. This data gap directly limits governments and stakeholders from designing evidence-based policies to address systemic inequalities. Identifying and mapping these interconnected gaps is precisely where a scoping review adds value: it systematically charts existing literature, reveals where evidence is missing, and clarifies why policy ambitions fall short in practice. This paper draws on, firstly the findings from a scoping review conducted in Kenya, Senegal, Uganda, Zambia, Burkina Faso, and Niger, which examined GESI's role in education data systems, 2) GEI upskilling session and 3) the interviews with stakeholders using case studies in Uganda, Burkina Faso and Senegal. It identifies the main challenges, best practices, and practical recommendations for integrating GESI considerations into education data at both national and subnational levels.

This approach helps build more inclusive and responsive education systems that cater to learners' needs. The discussion paper further offers policymakers, educators, and researchers' insights into the significance of GESI-enhanced education data systems and outlines practical steps and proposes a framework for implementation. Therefore, in this paper we broadly discuss the challenges, lessons learned and best practices in integrating GESI in education data systems thus closing the GESI gaps in education outcomes. We will then propose a framework for integrating GESI in education data systems.

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[1] http://unesdoc.unesco.org/images/0023/002338/233813M.pdf
[2] https://www.un.org/en/transforming-education-summit
[3] https://education-au.org/strategies/185-cesa16-25
[4] https://au.int/en/articles/au-strategy-gender-equality-and-womens-empowerment

2.0 Methodological approach

In this paper, we synthesized findings from scoping reviews on SSA education data systems conducted by the African Population and Health Research Center (APHRC) between 2021 and 2024. In 2021, APHRC conducted a scoping review on policy frameworks and education data systems in Senegal, Uganda, Zambia, Burkina Faso, and Niger. In the same year, APHRC conducted two other scoping reviews in Niger and in two communes in Burkina Faso (Manga and Ternado).

Secondly, we triangulated these findings with experiences from a) GESI upskilling which brought together project staff from all the three countries. There was discussion on GESI integration in the whole project cycle from design to dissemination. During the session there was a practical aspect on how GESI has been integrated in the design of the project and in the data collection tool. and b) case studies: we identified three country-level case studies (Burkina Faso, Uganda, and Senegal) from an ongoing KIX Seeds project (2024–2026) focused on strengthening and scaling subnational education data systems. These countries were purposefully selected because they represented diverse socio-economic and linguistic contexts (Francophone and Anglophone) and had existing APHRC scoping review data. For each case study, we collected information through document analysis of project reports, baseline surveys, and meeting minutes. The qualitative insights from these case studies were used to understand how GESI integration operates in real-world subnational settings**.** In this discussion paper, we propose a framework for integrating GESI education data systems based on the findings of the scoping reviews and lessons from an ongoing KIX seeds project. The aim is to provide a framework that can be adopted and adapted to specific contexts.

3.0 Benefits of data systems integrating GESI for learners

Integrating GESI into education data systems is essential for tackling disparities in access and outcomes, as it moves beyond a one-size-fits-all approach to address the complex, overlapping identities of learners. Intersectionality acknowledges that individuals experience marginalization due to multiple social-demographics and environmental factors. Understanding this interplay ensures inclusiveness and supports better education outcomes. Achieving quality and inclusive education for all begins with data systems capable of identifying existing barriers. To address the data challenge, systems must collect and utilize inclusive, disaggregated data at all levels; to empower teachers to identify gaps and inform their professional development, and schools to identify areas of improvement for their learners.

Disaggregated data enable policymakers to develop targeted interventions and allocate resources more efficiently (Nancy Birdsall 2016); (UNESCO 2023). Furthermore, integrating GESI into education data systems aligns with the global development strategy, for SDG 4, which seeks to ensure boys and girls complete free, equitable, and quality primary and secondary education by 2030. The strategy for SDG 5 on Gender Equality highlights the importance of inclusivity in education planning and implementation. Using data-driven decision-making to empower marginalized groups fosters equitable educational opportunities

and encourages their active involvement in shaping policies and interventions (World Bank 2021).

4.0 Counterarguments to GESI in Education

4.1 Cost of infrastructure

While integrating GESI into education data systems is fundamentally a human right and essential, several policies and practical challenges remain. The primary concern is the high cost and resource demand for additional facilities, which can be prohibitive (Kevin Namiiro, Chidiogo Uzoamaka, and Chioma Ann 2024). The school administrators, especially in low-resource environments, often weigh the benefits of establishing gender-sensitive facilities, disability-friendly infrastructure, or support services for adolescent mothers against their financial feasibility. These infrastructural needs such as disability friendly structures, sanitation, and hygiene considerations for girls etc demand substantial investment from schools, which many limited- resource countries cannot afford. Consequently, in most resource-limited nations, policy priorities tend to focus on ensuring basic access and quality of education before addressing inclusivity.

4.3 Additional data collection resources for integrating GESI

My argument here is that collecting additional variables for GESI integration comes with real costs such as added human capacity and technical support. However, the value of this investment is demonstrated in the returns: better advocacy, more targeted resource allocation, and improved outcomes for all learners. In a low-resource setting, decisions must be made on where to allocate scarce resources. Opponents argue that channeling resources specifically to marginalized populations may yield short-term gains but erode the "greater good" (Cubi-Molla et al., 2023). Similarly, some contend that tailoring curricula for inclusivity could compromise overall educational standards.

This argument, however, is not justified in the context of GESI-sensitive data systems. First, collecting disaggregated data does not divert resources away from the majority; it simply reveals where existing resources are already missing entire groups. Without such data, resources are allocated blindly and often reinforcing, rather than reducing, systemic inequalities. Second, improving outcomes for marginalized learners (e.g., girls with disabilities, pastoralist children) does not come at the expense of others; inclusive systems typically raise overall performance, as evidenced by the "**All means All**" principle of UNESCO's 2020 Global Monitoring Report (UNESCO, 2020). Finally, decision-makers must take a human rights approach, guided by SDG 4's aspiration of inclusivity. From that perspective, excluding marginalized populations is not an efficient trade-off but it is a violation of the very commitment to leave no one behind.

4.4 Social-cultural norms

The contextual, cultural, and social norms are one of the major contributors to counterarguments against GESI integration in education. In many African settings, educating

the girl child has been undervalued compared to educating boys. This stems from norms that assign girls primary responsibility for domestic care (cooking, cleaning, sibling care) and view their education as less valuable than boys' because girls are expected to marry into another family, reducing the perceived return on investment. Similarly, norms around masculinity such as the expectation that boys must be prioritised as future providers reinforce unequal school attendance, while school environments often fail to protect girls from harassment or accommodate menstruation. Additionally, there is a general misconception of GESI being considered a feminist agenda and understood as an external pressure to push for gender diversification in an African setting. This misconception ignores both the evidence that quality inclusive education benefits the entire communities and the longstanding advocacy by African women for equal access. These norms, taken together, continue to influence girls' consistent school attendance and limit the effectiveness of policy commitments.

4.5 Accountability for policies

Another counterargument is related to the capacity and implementation challenges. Where policies to support inclusivity in education data systems exist, implementers may lack the necessary technical capacity, or the lack trained personnel and effective monitoring systems to implement them effectively. Therefore, the GESI agenda remains on paper, but weak accountability mechanisms exist in practice.

5.0 Challenges in integrating GESI in education data systems.

Efforts to integrate GESI into education data systems across SSA are constrained by a range of structural, technical, cultural, and institutional barriers. A scoping review conducted in Kenya, Senegal, Uganda, Zambia, Burkina Faso, and Niger highlights both systemic gaps and context-specific challenges that undermine progress (APHRC 2021).

Lack of disaggregated data by sex, age, and other characteristics. Although some countries, such as Senegal and Burkina Faso, have adopted policies mandating gender- and region-disaggregated data, implementation remains uneven (APHRC, 2024; UNESCO, 2020). Similarly, data on school dropout and learning continuity are either weak or non-existent, masking the accurate scale of exclusion, particularly for adolescent girls and children with disabilities. Lack of secondary school level data is also a major factor that hinders tracking of learners longitudinally.

One of the most pressing issues is the lack of standardized GESI indicators for education. The absence of a universally accepted framework for collecting and reporting inclusive education data has led to inconsistencies both within and across countries (African Union 2016); (UNESCO 2020). This lack of harmonization contributes to interoperability challenges, making it difficult to integrate education data with other sectors such as health or social

protection and limiting opportunities for cross-country comparison and regional learning (OECD 2023)

At the subnational level, technical barriers in terms of technological capacity coupled with limited human resource present additional barriers. Local education offices frequently lack the tools, trained personnel, and financial resources to collect and process disaggregated data effectively (UNESCO 2023). In rural and limited-resource areas, inadequate access to electricity, internet connectivity, and digital platforms further restricts efforts to digitize education data systems. Funding constraints further compound these challenges, as many governments heavily rely on donor support for data collection initiatives, leading to collapse or slow progress once donor funding ends (World Bank 2021); (APHRC 2021).

Beyond infrastructure, cultural and social barriers affect the quality and completeness of GESI data. Norms and stigma surrounding disability, gender identity, or marginalized groups often discourage disclosure or prevent officials from collecting sensitive information (World Bank 2021); (Cassidy 2006). To navigate these challenges, the approach must be participatory and culturally sensitive to ensure buy-in and trust from the community.

Even when data is collected, its use remains limited. National education systems often lack the human resource capacity to collect and analyze data disaggregated by gender, disability, or socioeconomic status, resulting in data gaps that hinder responsive policymaking (APHRC, 2024; (UNESCO 2020). In countries like Niger, education data is mainly used for reporting rather than guiding targeted interventions. Policymakers and education officials might not recognize the importance of GESI-sensitive data or may not prioritize it in decision-making, revealing gaps in political will and institutional incentives (Nancy Birdsall 2016); (UNICEF 2024). Weak coordination across ministries, departments, and agencies also obstructs the effective use of data throughout the entire process, from collection and processing to integration and policy response.

Even when GESI-sensitive data are collected at national or subnational levels, a critical bottleneck remains at the school level: most schools lack the capacity, tools, and time to translate data into actionable improvements for learners' outcomes. Teachers and headteachers, already overburdened, rarely receive training on how to analyze disaggregated data (by sex, disability, or socioeconomic status) or how to use that analysis to adjust pedagogy, target remedial support, or reduce exclusion within the classroom. In many rural schools across SSA, paper-based records are incomplete or never digitized, and there is no feedback loop from ministry data systems back to the school. Consequently, data that could identify which learners are dropping out or which learners with disabilities are underperforming sits unused. At the same time, demand for inclusive data is rising—driven by community advocacy, donor requirements, and global frameworks like SDG 4. Parents of marginalized learners increasingly ask why their children are invisible in school records, and civil society organizations push for transparent, school-level equity dashboards. This growing demand creates pressure on education systems, but without targeted investment in school-level data literacy, infrastructure, and a culture of evidence-based improvement, the gap between data collection and better learner outcomes will persist.

Finally, community views on the role of education add another layer of complexity (APHRC 2021). Questions about whether education mainly prepares learners for jobs, promotes social mobility, or strengthens cultural identity often influence community involvement with education systems. Without a clear explanation of how equity is addressed in these stories, marginalized learners may be ignored, and data collection might not fully show the extent of exclusion.

6.0 Best practices and lessons learned.

Despite the challenges outlined above, several promising practices are emerging from efforts to incorporate GESI considerations into education data systems across SSA. The scoping review (APHRC 2021) provided evidence at three interconnected levels—individual, community, and structural showing how practical strategies can help strengthen inclusive education data systems.

At the individual level, the review found that training data collectors, teachers, and school principals to understand and use disaggregated data directly improves data quality and local decision-making. At the community level, participatory approaches that involve parents, local leaders, and civil society groups increase trust, disclosure of sensitive information, and the relevance of collected data. At the structural level, national policies, cross-sectoral coordination (e.g., linking education, health, and social protection data), and sustained government funding create the enabling environment for GESI-sensitive data systems to function and endure.

The scoping review identified several key best practices for effectively integrating GESI into education data systems. First, a foundational step is the identification and systematic measurement of context-specific GESI indicators. This moves beyond mere enrollment figures to capture disaggregated data on learning outcomes, retention, school climate, and post-education pathways for marginalized groups. Second, data collection is futile without the capacity to act on the findings; therefore, strengthening the capability of relevant stakeholders, from ministry officials to school principals to interpret and utilize this data is critical. This enables them to identify disparities and respond with targeted interventions. A third, and crucial, lesson is the need to actively promote the utilization of the data systems themselves. This involves creating feedback loops where data directly informs policy review, resource allocation, and teaching practices, thereby closing the gap between evidence and action and ensuring that the data system is a dynamic tool for equity, rather than a static repository of information.

Cross-sector collaboration is especially effective because it breaks down data silos, creating a more holistic picture of the barriers marginalized learners face. Evidence from Senegal and Uganda demonstrates this powerfully. In these countries, structured cooperation among the education, health, and social protection sectors has enabled a more unified approach to data collection. For instance, by linking health data (e.g., adolescent pregnancy rates, malnutrition), social protection data (e.g., household poverty levels, orphan status), and educational data (e.g., attendance, dropout rates), governments can identify intersecting

vulnerabilities with far greater precision (APHRC, 2021). This integrated approach moves beyond counting who is out of school to diagnose why, thereby enabling the design of multi-faceted policies—such as combining school feeding programs with conditional cash transfers and sexual health education—that address the root causes of exclusion.

Capacity building for data collectors and data users is a crucial factor for success. Targeted training programs in Burkina Faso and Niger have enhanced the skills of education personnel in gathering and analyzing GESI-sensitive data. By equipping frontline staff with these essential skills, these initiatives promote more consistent and accurate collection of disaggregated data ((APHRC 2021);(APHRC 2023))

Technology enables transforming how education data is gathered and expanding the indicators that are collected. Countries like Kenya and Zambia are using mobile apps and cloud platforms to enhance data accuracy, timeliness, and accessibility. These digital tools boost efficiency and enable real-time tracking of GESI-related indicators (World Bank 2021).

Aligning policies with global frameworks like the Sustainable Development Goals (SDGs) and the African Union's Agenda 2063 has strengthened the integration of GESI (UNESCO 2020). Countries that incorporate international commitments into their national policies, such as Senegal and Uganda, are more capable of maintaining consistency, accountability, and comparability in tracking progress on equity and inclusion.

At the local level, involving communities in data collection and use has become essential. In Uganda and Niger, participatory methods with teachers, parents, and community groups have improved the accuracy and relevance of education data. This engagement fosters trust and helps to accurately reflect the experiences of marginalized populations (UNICEF 2024)

Finally, ongoing financial investment in digital enhancement, capacity building etc continues to be crucial for success. For instance, Senegal and Burkina Faso have received dedicated government funding and donor support that have enhanced data infrastructure and capacity building. These funding approaches show that sustained investment is vital for developing resilient and GESI-sensitive education data systems (UNESCO 2020).

7.0 Case Study: KIX-SEEDS project-Strengthening Education Data

The main goal of the KIX-SEEDS project was to develop innovative and scalable approaches to education data systems. In this project, we addressed several challenges identified in the scoping review findings. These included a lack of comprehensive GESI data, so data collection tools were designed to capture GESI indicators; the absence of digital tools and infrastructure at the subnational level, which led to the creation of a digital infrastructure for data collection; and limited capacity among teachers, headteachers, and district officials, which we targeted through sustained training.

7.1 Uganda

Uganda's education sector has historically faced fragmented data systems, hindering efforts to address disparities in access and learning outcomes. The GPE KIX-SEEDS project, carried out in partnership with the Ministry of Education and Sports (MoES) and the Health Information System Programme (HISP)-Uganda, piloted the use of the District Health Information System (DHIS2) for education in 100 schools. Schools were purposively selected to represent diverse geographic and socio-economic conditions: Entebbe (peri-urban, relatively well-connected), Gulu City and Gulu District (post-conflict, hardship area with high poverty and internal displacement), and Mayuge District (rural, with low literacy and high child marriage rates). This selection allows comparison between stable and fragile contexts.

DHIS2 was chosen because it is open-source, customizable, already used for health data in Uganda (enabling cross-sector linkages) and has a strong user community. DHIS2 is a free licensing, offline data entry via mobile apps, real-time dashboards, and interoperability with other systems. In addition, it requires initial technical setup, stable electricity/internet for synchronization, and sustained training to avoid user errors. Alternative platforms considered included proprietary school management systems (e.g., SchoolTool, OpenSIS), but they lacked DHIS2's government-backed infrastructure and GESI-specific modules.

In Gulu, intermittent electricity and poor network coverage disrupted real-time data uploads. The project mitigated this by using DHIS2's web-based with an offline-first capability: schools collected data on Android tablets, syncing data to the server. In Mayuge, low digital literacy among headteachers and teachers required extended mentorship – the project introduced peer-learning clusters where more experienced school headteachers and teachers trained others. Another challenge was initial reluctance to report sensitive GESI data (e.g., disability, pregnancy); mitigation included community sensitisation meetings and anonymous reporting options.

Through the School Report Card (SRC) tool, headteachers, teachers, and district officials now collect and utilize real-time data on enrolment, absenteeism, gender parity, sanitation, and accessibility for persons with disabilities. The feedback mechanism strengthens accountability by producing visual dashboards and summary reports that are shared and discussed in quarterly meetings: parents and school management committees receive simplified one-page bulletins, district policymakers receive trend analyses and equity heatmaps, and national MoES officials receive aggregated indicator dashboards. This structured consumption of analysis ensures that each stakeholder sees actionable insights at their level.

Concrete GESI impacts have emerged**.** For example, Oguru Primary School had an 80:1 latrine-to-student ratio for girls (twice the national target), affecting girls' attendance. Using aggregated data, the school successfully advocated for gender-sensitive sanitation facilities, including incinerators and sanitary kits. Similarly, Gulu Public School used disaggregated data to link low female enrollment and high absenteeism to hunger, leading to community feeding programmes. Disability indicators led to ramp construction and inclusive

infrastructure. Ongoing training in data capture, quality, visualisation, and utilisation has transformed decision-making at the subnational level.

7.2 Burkina Faso

Burkina Faso's education sector has made progress in overall access, but significant inequalities persist, especially for girls, learners in rural or insecure regions, and children displaced by conflict. The KIX-SEEDS project, implemented by the Institut Supérieur des Sciences de la Population (ISSP), selected 55 pilot schools across Ouagadougou (urban), Manga (urban), and Bingo, rural commune. This mix captures contrasts in connectivity, security, and infrastructure.

In Burkina Faso, the project introduced digital tools including computers, smartphones, and a web/mobile application called "**A Classroom in One Hand**". Unlike DHIS2 (which is more ministry-oriented), this platform was designed for low-literacy teachers, with voice-assisted data entry and offline storage. This platform requires very low bandwidth, automatic backup to cloud when online. On the contrary with DHIS2, its less interoperable with national health/social protection databases than DHIS2 and limited to education data.

In rural communes of Burkina Faso, electricity connectivity is a major challenge – many schools have no grid access. The KIX SEEDS project through ISSP supplied solar-charged tablets and used offline data collection. Internet connectivity also posed significant challenges in transmitting data to central servers thus necessitating design of the system to operate entirely offline, with data synchronisation only when data collectors travel to areas with internet (e.g., district headquarters). A second challenge was teacher turnover; mitigation included creating video tutorials stored on devices for self-training.

Unlike Uganda's Gulu (which has post-conflict instability but relatively better mobile network coverage), rural Burkina Faso schools often have no electricity at all – a more severe constraint. Similarly, in rural Senegal (informed by the broader project experience), network blackouts lasting weeks meant that even offline-capable systems required data collectors to travel long distances to find connectivity. These contrasts highlight that no single technical solution fits all; mitigation must be context-specific (e.g., solar power, offline-first design, and community-based data aggregation points).

A key major achievement in Burkina Faso was creating a unique identifier for each student, allowing smooth tracking across the primary cycle even during school transfers. This enabled calculation of disaggregated transition rates (e.g., girls vs. boys, children with disabilities) and longitudinal monitoring of learner progress. Digital tools have streamlined routine administrative tasks (attendance, assessment records), reduced teachers' workload and enhancing data accuracy. These innovations helped education stakeholders monitor learner performance, absenteeism, and gender disparities more effectively, informing targeted interventions and resource distribution.

In conclusion, without government commitment to invest in basic infrastructure (electricity, internet), most learners in rural and conflict-affected areas will continue to face exclusion,

regardless of digital tools. The project's mitigation measures are temporary; sustainability requires national electrification and connectivity strategies.

8.0 Call to Action

To enhance equity and inclusion in education data systems, several key recommendations have surfaced.

Firstly, there is an urgent need to create and standardize GESI indicators in education. Defining a clear set of standardized GESI indicators across sectors and other education data sources will promote consistency in data collection and analysis. These indicators should be aligned with international frameworks like the SDGs and integrated into national policies. Learning from best practices in regions that have successfully adopted standardized GESI measures can also help improve comparability across countries (UNESCO 2020); (World Bank 2021).

Secondly, establishing sustainable capacity for data collection and utilization is crucial. Education stakeholders including policymakers, data collectors, and analysts require targeted training in effective techniques for gathering, analyzing, and applying GESI-related data ((Nancy Birdsall 2016); (UNICEF 2024)). Enhancing data literacy, particularly at the subnational level, will enable local education offices to interpret and leverage data more effectively in decision-making. Additionally, investing in technical infrastructure for example digital data collection tools and real-time monitoring systems is vital for boosting the accuracy, timeliness, and efficiency of data processes (African Union 2016)

Third, enhancing interoperability and data-sharing frameworks will enable education systems to link insights across sectors such as health and social protection, leading to a more holistic understanding of GESI-related issues. Governments should adopt unified frameworks that facilitate safe, responsible, and transparent data sharing, along with open data policies that foster cross-sector collaboration (World Bank 2021); (UNESCO 2020). The following is a suggested GESI framework for a data system:

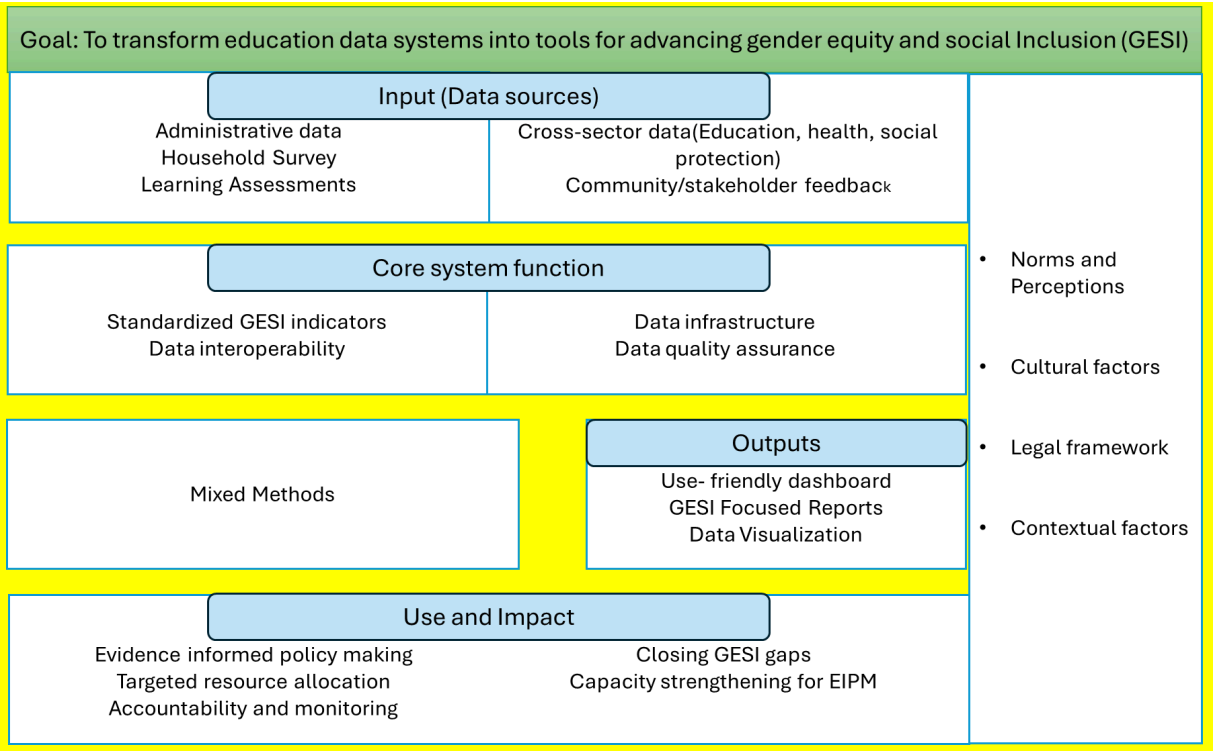

Figure1: Model framework for integrating GESI in education data systems.

Fourth, sustainable financing is essential to effectively embed GESI into education data systems. This requires dedicated funding sources, including higher allocations at both national and subnational levels, to enhance data collection, analysis, and dissemination (African Union 2016); (UNESCO 2020). Collaborations with international development agencies, private sector partners, and research institutions can help generate additional resources. Additionally, innovative methods like results-based financing or performance-linked grants can motivate efficient data use (Nancy Birdsall 2016). As many donors increasingly mandate GESI integration in their funding requirements, governments should align their strategies accordingly.

GESI-responsive education systems should be backed by a supportive policy environment. Policy must provide a framework within which education data systems will integrate and finance GESI. A supportive policy environment helps to institutionalize collection of granular data, standardize the data collection of granular data, standardize indicators and promote data use.

Fifth, it is essential to promote data-driven decision-making and accountability. Governments and education stakeholders should work together to develop strategies that use GESI indicators to guide policies and interventions (World Bank 2021). Tools like dashboards, data visualization platforms, and public reports can enhance transparency and ease of use (UNICEF 2024). Moreover, accountability frameworks such as independent monitoring bodies and civil society oversight are crucial for keeping GESI considerations at the forefront of education planning and implementation (UNESCO 2020).

Finally, it is crucial to promote multi-stakeholder engagement with a specific focus on participatory data governance. Successful GESI integration requires collaboration among governments, civil society, academia, and international donors. However, collaboration alone is insufficient unless it extends to who governs the data—meaning who decides what is collected, who can access it, how it is interpreted, and how it is used. Participatory methods for data governance should therefore be emphasised, involving communities and marginalized groups not merely as data subjects but as active shapers of data initiatives. This ensures that their viewpoints, needs, and priorities are incorporated into education planning (African Union, 2016; UNESCO, 2023). For example, community-led data committees can co-design indicators, review findings before publication, and hold authorities accountable for acting on the evidence. Without such governance voice, stakeholder engagement risks becoming tokenistic, leaving power asymmetries unchanged.

9.0 Conclusion

Successful integration of GESI into education data systems requires a three-pronged approach that addresses the technology systems, supportive policy frameworks, capacity dimensions. First, there is a need to develop education systems that can collect granular GESI data while being interoperable with other sectors and drawing data from multiple sources. The second aspect focuses on building the capacity of stakeholders at all levels of the data value chain to enhance skills in data collection, management, analysis and use. This prong is particularly important since for data to be useful it must be used for policy, practice and decision making and for data to be used it must be transformed from data to information. Finally, the policy framework must be supportive to closing the GESI Gaps by explicitly prioritizing the Equity and inclusion.

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References

1. African_Union. 2016. *Continental Education Strategy For Africa 2016 – 2025.* https://ecosocc.au.int/sites/default/files/files/2021-09/continental-strategy-education-africa-english.pdf.
2. APHRC. 2021. *Scoping Review of the Legislative and Policy Environment on Sub-National and National Data Systems and Data Use.* https://aphrc.org/publication/senegal_kenya_zambia-data-scoping-report/.
3. APHRC. 2023. *Subnational data system: a case study in the communes of Manga and Ténado in Burkina Faso.* https://aphrc.org/publication/subnational-data-system-a-case-study-in-the-communes-of-manga-and-tenado-in-burkina-faso/.
4. Cassidy, Thomas. 2006. *<Education-Management-Information-Systems-(EMIS)-in-Latin-America-and-the-Caribbean-Lessons-and-Challenges (1).pdf>*.
5. Cubi-Molla, Patricia, David Mott, Nadine Henderson, Bernarda Zamora, Mendel Grobler, and Martina Garau. 2023. "Resource allocation in public sector programmes: does the value of a life differ between governmental departments?" *Cost Effectiveness and Resource Allocation* 21 (1): 96. https://doi.org/10.1186/s12962-023-00500-5. https://doi.org/10.1186/s12962-023-00500-5.
6. Kevin Namiiro, Kuteesa, Akpuokwe Chidiogo Uzoamaka, and Udeh Chioma Ann. 2024. "Gender Equity in Education: Addressing Challenges and Promoting Opportunities for Social Empowerment." *International Journal of Applied Research in Social Sciences* 6 (4): 631-641. https://doi.org/10.51594/ijarss.v6i4.1034.
7. Nancy Birdsall, Barbara Bruns, and Janeen Madan. 2016. "Learning Data for Better Policy: A Global Agenda." http://www.cgdev.org/publication/learning-data-better-policy.
8. OECD. 2023. *OECD Digital Education Outlook 2023: Towards an Effective Digital Education Ecosystem.* https://doi.org/10.1787/c74f03de-en.
9. UNESCO. 2020. *Global Education Monitoring Report-Inclusion and Education: All means all.* https://unesdoc.unesco.org/ark:/48223/pf0000373724.
10. *Global Monitoring Report, 2023:technology in education: a tool on whose terms?* https://unesdoc.unesco.org/ark:/48223/pf0000385723.
11. UNICEF. 2024. *The State of the World's Children Report.* https://www.unicef.org/reports/state-of-worlds-children/2024.
12. World_Bank. 2021. *World Development Report 2021: Data for Better Lives.* https://www.worldbank.org/en/publication/wdr2021.
13. UNESCO. (2017). *Global Education Monitoring Report 2017/8: Accountability in education*. Paris: UNESCO: https://gem-report-2017.unesco.org/en/chapter/target-4-6-literacy-and-numeracy-2/
14. UNESCO Institute for Statistics (UIS), 2017: https://www.unesco.org/en/articles/617-million-children-and-adolescents-not-getting-minimum-reading-and-math