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Integrating Generative AI to in National Education System : Framework Work For Implementation Ethics in Developing Countries

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Abstract

The rapid advancement of Generative Artificial Intelligence (Generative AI) has opened significant opportunities for transforming educational systems, particularly in developing countries. However, its integration also presents pressing challenges, including ethical dilemmas, infrastructural gaps, and disparities in digital literacy. This study aims to formulate an ethical working framework for the inclusive and responsible implementation of Generative AI within national education systems. A qualitative multi-case study approach was employed, focusing on three countries: Indonesia, Kenya, and Bangladesh. Data were collected through in-depth interviews with key educational stakeholders, policy document analysis, and field observations from pilot projects involving AI integration in schools. The findings highlight that the successful implementation of Generative AI in education depends on three critical pillars: (1) clearly defined ethical policies on AI usage, (2) adequate digital infrastructure and educator readiness, and (3) robust student data protection and rights assurance. Based on these pillars, the proposed framework offers practical guidelines grounded in the principles of fairness, transparency, and inclusiveness. This study contributes a policy-relevant reference for developing countries aiming to build an adaptive educational ecosystem that embraces technological innovation without compromising ethical values and social justice.

Keywords : Generative AI, educational ethics, inclusive technology, digital infrastructure, developing countries, policy framework

1. Introduction

The rapid development of Generative Artificial Intelligence (Generative AI) has brought significant impacts across multiple sectors, including education. This technology enables the creation of innovative learning content, supports personalized instruction, and enhances the efficiency of educational processes (Holmes, Bialik, & Fadel, 2019; Luckin et al., 2016; Selwyn, 2019). However, the integration of Generative AI into national education systems—particularly in developing countries—presents serious challenges, including ethical concerns, infrastructural gaps, and unequal levels of digital literacy (Alimardani & Hashemi, 2023; Floridi & Cowls, 2019; Williamson & Eynon, 2020).

The urgency of this research lies in the growing need for an ethical working framework that can be utilized by education policymakers to guide the inclusive and responsible implementation of Generative AI. Without such a framework, technological advancements may risk exacerbating existing social and economic disparities instead of reducing them (Binns, 2018; UNESCO, 2021). A thoughtful ethical approach is essential to ensure that AI adoption in education not only improves quality but also upholds values of justice and equity.

While previous studies have explored AI applications in education, most have focused on human–AI interaction or the technical aspects of implementation (Sharples, 2023; Zawacki-Richter et al., 2019). However, few have specifically addressed the formulation of an ethical framework tailored for developing countries integrating Generative AI into their educational systems.

This study aims to address that gap by developing a working ethical framework based on key principles such as data privacy, transparency, accountability, and equitable access. The proposed framework is intended to serve as a practical guide for developing nations in responsibly integrating Generative AI into education policy and practice (Floridi & Cowls, 2019; Alimardani & Hashemi, 2023).

To achieve this, a qualitative multi-case study design was adopted, focusing on three representative developing countries: Indonesia, Kenya, and Bangladesh. Data were collected through in-depth interviews with key educational stakeholders, policy document analysis, and field observations in pilot schools implementing AI-based learning initiatives (Holmes et al., 2019; Selwyn, 2019).

The findings reveal that the success of Generative AI integration in education hinges on three critical pillars: (1) clear and enforceable ethical policy frameworks, (2) adequate digital infrastructure and professional development for teachers, and (3) strong data protection mechanisms that safeguard student rights. The ethical framework proposed in this study incorporates practical guidelines grounded in the principles of fairness, transparency, and inclusiveness (Binns, 2018; Floridi & Cowls, 2019; Alimardani & Hashemi, 2023).

In conclusion, this research provides a timely and actionable reference for developing countries seeking to build adaptive, technology-enabled education ecosystems without compromising ethical values or social justice. Through responsible and inclusive integration, Generative AI has the potential to deliver transformative educational benefits for all stakeholders (UNESCO, 2021; Zawacki-Richter et al., 2019; Williamson & Eynon, 2020).

2. Method

Type of Study

This study employed a qualitative exploratory approach to investigate the dynamics, challenges, and opportunities of integrating Generative AI into national education systems in developing countries. A multi-case study design was used to capture the sociocultural and policy-specific contexts of three countries: Indonesia, Kenya, and Bangladesh. This approach allowed for an in-depth comparative understanding of ethical, infrastructural, and policy variations related to AI adoption.

Population and Sampling

The research population consisted of key educational stakeholders in developing countries, including:

- Policymakers (e.g., Ministry of Education officials, regulators)
- Educational practitioners (e.g., teachers, school principals, university lecturers)
- Local educational technology developers

Purposive sampling was applied to select individuals with direct involvement in AI adoption initiatives in the education sector. A total of 35 informants were selected across the three countries, with 10–12 participants per country. This sample size was deemed sufficient based on saturation principles, ensuring diverse yet focused insights into the research problem.

Research Instruments

The following instruments were used:

- Semi-structured interview guides, designed to elicit stakeholder perceptions, experiences, and ethical considerations regarding Generative AI.
- Observation checklists, used to assess infrastructural readiness and educator training within institutions implementing AI tools.
- Policy documents, including national AI strategies and regulations on education and data protection.

The interview guide was developed from existing literature and validated through expert review. It was piloted prior to use to ensure clarity and relevance.

Data Collection Techniques

Data were gathered through three main techniques:

1. In-depth interviews conducted online and offline.
2. Document analysis of national education policies and AI-related strategy documents.
3. Participant observation at educational institutions where AI tools were being implemented on a pilot basis.

All interviews were audio-recorded with consent and transcribed for further analysis.

Research Procedure

The research was conducted in six phases:

1. Literature review and country selection based on AI readiness and regional diversity.
2. Instrument development and pilot testing to refine data collection tools.
3. Field data collection, including interviews, observations, and document analysis.
4. Data triangulation across sources, methods, and sites to enhance validity.
5. Framework synthesis, where findings were structured into a proposed ethical framework.
6. Expert validation through consultation with specialists in AI and education ethics.

Data Analysis Techniques

Data were analyzed thematically using NVivo software, following three main stages:

1. Open coding to identify initial themes and patterns.
2. Axial coding to refine and organize themes into broader categories.
3. Thematic interpretation to develop the final structure of the ethical framework.

To ensure trustworthiness, source triangulation, method triangulation, and member checking were employed. Inter-coder reliability was enhanced through collaborative coding discussions among the research team.

3. Results & Discussion

Readiness Digital Infrastructure and Training Educator

Integration of Generative AI in system education national in developing countries very depends on readiness digital infrastructure and competencies educators . Studies in Indonesia, Kenya, and Bangladesh show that although there is effort improvement infrastructure , still there is gap significant in access and quality technology education .

In Indonesia, for example , only 60% of schools have adequate internet access , while in Kenya and Bangladesh the figures are more low , respectively 45% and 50 %. Limitations This hinder implementation AI technology in general effective .

Besides that , training educator in The use of AI is still minimal. Most teachers have not own required knowledge and skills For integrating AI

into the learning process . This confirm the need for training programs comprehensive which includes aspect technical and pedagogical .

Table 1. data infrastructure and training educators in the three countries :

Country	School Internet Access (%)	Educator AI Trained (%)
Indonesia	60	20
Kenya	45	15
Bangladesh	50	18

Source : Study Field , 2025

Ethical Challenges in Use of Generative AI

The use of Generative AI in education cause various challenge ethics , including data privacy , algorithmic bias , and transparency decision AI . In Bangladesh, for example , it was found that AI systems tend to reinforces existing gender bias , so that make things worse inequality in education .

Besides that , the lack of clear regulations about use of student data in AI systems give rise to concern about privacy and security information personal . This is show the need framework Work ethics that ensure transparency , accountability , and protection rights students .

The Impact of Generative AI on Quality Learning

The implementation of Generative AI has the potential increase quality learning through personalization materials and methods teaching . However , research show that without proper guidance , the use of AI can cause dependence overdoing technology and reducing interaction man in the teaching and learning process .

In Kenya, for example , students who use learning platforms AI -based shows improvement results Study by 15% compared to with method traditional . However , teachers reported decline involvement student in discussion class , shows the need balance between use technology and interaction human .

Development Framework Work Ethics for Generative AI Implementation

Based on the above findings , developed framework Work ethics For implementation of Generative AI in education in developing countries . Framework This emphasize principles transparency , fairness , accountability , and inclusivity .

Framework This consists of from three component main :

1. Policy and Regulation : Development clear regulations about use of AI, including data protection and standards ethics .
2. Education and Training : Training programs for educators and students For increase AI literacy and awareness ethics .
3. Evaluation and Supervision : Mechanism For monitor and evaluate AI implementation for ensure compliance to standard ethics .

4. Conclusion

Implementation framework Work This expected can maximize benefits of Generative AI in education while minimize risk ethics and social research This aim For formulate framework Work ethical in implementation *Generative AI* in systems education national in developing countries . Based on results multi- case analysis in Indonesia, Kenya, and Bangladesh, found that success Generative AI integration is very influenced by three factor main : readiness digital infrastructure , competency educators , as well as clarity policies and protection ethics . Findings This show that approach technology just No enough ; AI integration must be positioned in framework policy fair and responsive public to condition social , economic and cultural local .

As answer on objective research , study This produce A framework Work ethics consisting of from three main pillars : (1) policies and regulations that guarantee transparency and data protection , (2) education and training For increase AI literacy among educators and participants education , and (3) mechanisms evaluation and supervision For ensure accountability implementation . Framework This nature practical and contextual , so that can adapted by various developing countries in accordance individual needs and capacities . With Thus , research This contribute to development policy education based ethical , inclusive and sustainable technology .

Developing country governments need compile regulations special For the use of Generative AI in education , with focus on ethics , data privacy , and transparency algorithm . Institution education must also be strengthen teacher capacity through training AI literacy and digital pedagogy . In addition that , collaboration between government , sector technology and society very important for AI implementation to run smoothly inclusive , fair and appropriate context local .

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