

Artificial Intelligence in Alternative, Nonformal, and Adult Learning in the Global South: Protocol for a Mixed-Methods Systematic Review

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ABSTRACT: Background: Research on artificial intelligence (AI) in education has expanded rapidly, yet it remains concentrated in higher education and formal schooling in high-income countries. Alternative, nonformal, and adult learning programs, which serve out-of-school youth and adults across the Global South, are largely absent from this evidence base. No systematic synthesis has examined how AI is used in these programs, what outcomes it produces, and what conditions shape its adoption.

Objective: This protocol describes a mixed-methods systematic review that will identify, appraise, and synthesize empirical evidence on AI use in alternative, nonformal, and adult learning programs in low- and middle-income countries (LMICs).

Methods: The review follows the JBI methodology for mixed-methods systematic reviews and is reported according to PRISMA-P. Searches will cover Scopus, Web of Science Core Collection, ERIC, IEEE Xplore, ACM Digital Library, four regional databases, and grey literature sources for studies published from January 2015 onward. Two reviewers will independently screen records, extract data, and appraise quality using the Mixed Methods Appraisal Tool. Quantitative findings will be synthesized narratively following the Synthesis Without Meta-analysis (SWiM) guideline, with meta-analysis where at least three comparable studies exist. Qualitative findings will be synthesized thematically. Both

strands will be integrated through a convergent segregated approach, and certainty of evidence will be rated with GRADE and GRADE-CERQual.

Discussion: The review will provide the first consolidated synthesis of AI use in second-chance and adult learning in the Global South. Its findings will inform program managers, teacher developers, and policymakers responsible for programs such as the Philippine Alternative Learning System (ALS).

Keywords: *artificial intelligence; generative AI; nonformal education; adult learning; Alternative Learning System; Global South; systematic review protocol*

1. Introduction

1.1 Background

Artificial intelligence has moved from the margins to the center of educational research. A bibliometric analysis of 2,038 Web of Science records found that China, the United States, Australia, and the United Kingdom lead the field, with deep learning, machine learning, natural language processing, and computer vision as the main applications (Zhou & Zhang, 2025). The same analysis noted that generative AI is advancing quickly and provoking wide debate in education. Earlier, Zawacki-Richter et al. (2019) reviewed AI applications in higher education and found that most studies came from computer science and STEM fields, with limited engagement with pedagogy and ethics. Crompton and Burke (2023) later confirmed the continued growth of AI research focused on higher education.

The arrival of generative AI tools in late 2022 accelerated this growth. UNESCO's guidance on generative AI warns that these tools may widen existing digital divides, because their benefits depend on connectivity, devices, and language resources that are unevenly distributed (Miao & Holmes, 2023). Earlier UNESCO policy guidance similarly framed AI in education as a question of equity and inclusion under Sustainable Development Goal 4 (Miao et al., 2021). These concerns are most acute for learners who are already excluded from formal schooling.

Nonformal education is institutionalized, intentional, and planned learning that serves as an addition, alternative, or complement to formal education (UNESCO Institute for Statistics, 2012). It includes second-chance basic education, adult literacy programs, open schooling, community learning centers, and education for persons deprived of liberty. Global

monitoring shows that participation in adult learning and education remains uneven, and that the learners with the greatest needs are often the least served (UNESCO Institute for Lifelong Learning, 2022).

In the Philippines, the Alternative Learning System (ALS) was institutionalized through Republic Act No. 11510 (Republic of the Philippines, 2020). ALS serves out-of-school youth and adults through flexible, community-based, and institution-based learning, culminating in the Accreditation and Equivalency (A&E) examination. Recent division-level studies show both the promise and the strain of this model. ALS teachers use diverse, learner-centered strategies but report substantial professional development needs (Casingal, 2025). Reading proficiency gaps among ALS learners are closely tied to teacher capacity (Casingal & Guino, 2025a). Systematic mock testing and short, intensive enhancement programs have improved A&E outcomes, including among learners in jail-based learning centers (Casingal & Guino, 2025b; Casingal et al., 2025, 2026).

These interventions depend heavily on teacher time, assessment feedback, and individualized remediation. These are the functions that AI tools such as adaptive practice platforms, automated feedback systems, and conversational tutors claim to support. At the same time, pandemic-era studies of online learning in Philippine public schools documented persistent difficulties for learners in accessing and completing online learning tasks (Casingal, 2022a, 2022b, 2022c). Similar constraints are likely to shape whether AI can work in resource-constrained nonformal settings.

1.2 Rationale

Existing reviews of AI in education concentrate on higher education and formal schooling. Evidence from these settings may not transfer to nonformal programs. Adult learners differ from children and traditional university students: they are more self-directed, draw on accumulated life experience, and are oriented toward immediately applicable, problem-centered learning (Knowles et al., 2015). Nonformal programs in LMICs also operate with fewer devices, less stable connectivity, more varied learner literacy levels, and multilingual populations.

Decisions about AI in programs such as ALS are already being made, often without a consolidated evidence base. A systematic review is needed to establish what is known, how

strong that evidence is, and where research should go next. Before registration, a search of OSF Registries, *JBIEvidence Synthesis*, and Google Scholar will confirm that no similar review is completed or under way.

A mixed-methods design is chosen for two reasons. First, the evidence base is expected to be small and heterogeneous, so restricting the review to one study design would leave too few studies to synthesize. Second, the review questions span both effectiveness and experience, which require quantitative and qualitative evidence respectively (Stern et al., 2020).

1.3 Conceptual Lens

Two frameworks guide the coding of findings. Andragogy (Knowles et al., 2015) is used to examine whether AI applications are designed around adult learning principles such as self-direction, relevance, and experience. The Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh et al., 2003) provides a deductive frame for barriers and enablers through four constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions. Codes outside these frameworks will be developed inductively.

1.4 Objectives and Review Questions

The review aims to identify, appraise, and synthesize empirical evidence on the use of AI in alternative, nonformal, and adult learning programs in LMICs. The main question is: *How is AI used in alternative, nonformal, and adult learning programs in the Global South, and with what outcomes?* The specific review questions are:

- **RQ1.** What AI tools and applications have been used in these programs, and for what instructional purposes?
- **RQ2.** What learning, literacy, engagement, attendance, and completion outcomes are reported?
- **RQ3.** How do learners and facilitators experience and perceive these tools?
- **RQ4.** What factors enable or hinder adoption, including connectivity, devices, digital literacy, language, cost, and ethics?

- **RQ5.** What gaps remain for research, policy, and program design?

2. Methods

2.1 Protocol Design and Registration

This protocol is reported following the PRISMA-P 2015 statement (Moher et al., 2015; Shamseer et al., 2015); the checklist is provided in Appendix C. The review follows the JBI methodology for mixed-methods systematic reviews (Lizarondo et al., 2020; Stern et al., 2020). The protocol will be registered on OSF Registries before screening begins, because PROSPERO accepts only reviews with health-related outcomes. Any amendment will be dated, justified, and reported in the final review. The completed review will be reported following PRISMA 2020 (Page et al., 2021), and its searches following PRISMA-S (Rethlefsen et al., 2021).

2.2 Eligibility Criteria

Eligibility is defined using an adapted PICOS framework (Table 1) and the inclusion and exclusion criteria in Table 2. Countries are classified as LMICs using the World Bank income classification in force at the time of the search (World Bank, n.d.). Studies are classified by the country where data were collected. Multi-country studies are included only when LMIC data are reported separately.

Table 1: Adapted PICOS Framework

Element	Definition for this review
Population	Learners of any age enrolled in alternative, nonformal, second-chance, or adult learning programs, with emphasis on out-of-school youth and adults; and the facilitators, teachers, and program managers who serve them
Intervention or phenomenon	Any AI-based tool or system: generative AI and chatbots, intelligent tutoring systems, adaptive learning platforms, AI speech and reading tutors, automated assessment and feedback, and AI-driven learning analytics
Comparison	Not required; any comparator (usual instruction, non-AI digital tools,

Element	Definition for this review
	pre-post) accepted when present
Outcomes	Learning, literacy, and numeracy outcomes; equivalency examination results; engagement; attendance; retention or completion; perceptions and experiences; implementation barriers and enablers
Study design	Quantitative (experimental, quasi-experimental, cross-sectional, pre-post), qualitative, and mixed-methods empirical studies
Context	Low- and middle-income countries, using the World Bank classification at the time of search

Note. PICOS = Population, Intervention, Comparison, Outcomes, Study design.

Table 2: Inclusion and Exclusion Criteria

Criterion	Include	Exclude
Setting	Alternative, nonformal, second-chance, adult, community, open, or correctional learning programs	Regular K–12 classrooms and degree programs in higher education, unless a distinct nonformal program is studied
Location	Data collected in LMICs	Data collected only in high-income countries
Technology	AI is the core tool or object of study	General ICT, e-learning, or mobile learning with no AI component
Evidence type	Empirical studies with original data; grey literature with empirical data (UNESCO, World Bank, NGO reports, theses, dissertations)	Editorials, opinion pieces, conceptual papers, and reviews (reviews kept for citation chasing only)
Date	January 2015 to the final search date	Before 2015
Language	English	Other languages (reported as a limitation)

Note. The 2015 start date captures modern AI-in-education research and allows comparison of pre- and post-generative AI evidence.

2.3 Information Sources

The sources in Table 3 were chosen to cover education, technology, regional, and grey literature. Regional databases are included to reduce the geographic bias of major indexes, which underrepresent journals from the Global South.

Table 3: Information Sources

Source type	Sources
Core databases	Scopus; Web of Science Core Collection; ERIC
Technology databases	IEEE Xplore; ACM Digital Library
Regional databases	Philippine E-Journals; African Journals Online (AJOL); SciELO; Garuda (Indonesia)
Grey literature	UNESDOC and the UNESCO Institute for Lifelong Learning; World Bank Open Knowledge Repository; ProQuest Dissertations and Theses Global
Hand-searched journals	<i>International Review of Education; International Journal of Lifelong Education; Adult Education Quarterly; Journal of Learning for Development</i>
Supplementary	Google Scholar (first 300 results); backward and forward citation chasing of all included studies

2.4 Search Strategy

The search combines three concept blocks: (a) artificial intelligence, (b) alternative, nonformal, and adult learning, and (c) LMIC context. The strategy was developed in Scopus and will be translated for each database. The geographic block will use a validated LMIC filter (Cochrane Effective Practice and Organisation of Care [EPOC], 2020). Because many abstracts do not name the study country, the geographic block will be dropped in any database where the remaining two blocks return fewer than 3,000 records, and location will be checked during screening.

An information specialist will peer-review the strategy using the PRESS checklist (McGowan et al., 2016) before final searches. For each source, the search date, interface, string, and number of records will be recorded. Searches will be rerun before final analysis if more than six months have passed. The full Scopus string is shown below, and all database strings are provided in Appendix A.

```
TITLE-ABS-KEY (
  ( "artificial intelligence" OR "generative AI" OR GenAI OR chatbot* OR ChatGPT
    OR "large language model*" OR "intelligent tutoring system*"
    OR "adaptive learning" OR "machine learning" OR "natural language processing"
    OR "conversational agent*" OR "AI-powered" OR "AI-based" )
  AND
  ( "alternative learning" OR "alternative education" OR "nonformal education"
    OR "non-formal education" OR "nonformal learning" OR "non-formal learning"
    OR "adult education" OR "adult learning" OR "adult literacy" OR "adult learner*"
    OR "out-of-school youth" OR "second-chance education" OR "community learning"
    OR "open school*" OR "functional literacy" OR "basic literacy"
    OR "lifelong learning" OR "continuing education" OR "prison education" )
  AND
  ( "developing countr*" OR "low-income countr*" OR "middle-income countr*"
    OR LMIC* OR "Global South" OR [EPOC LMIC country list] )
) AND PUBYEAR > 2014 AND ( LIMIT-TO ( LANGUAGE , "English" ) )
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2.5 Study Records

Data Management

Records will be exported to Zotero for deduplication and then imported into Rayyan (Ouzzani et al., 2016) for screening. Full texts, decisions, and reasons for exclusion will be stored in a shared folder with version control.

Selection Process

Two reviewers will pilot the eligibility criteria on a random sample of 50 records and refine the wording until agreement reaches Cohen's kappa of at least 0.60 (McHugh, 2012). They will then independently screen all titles and abstracts, followed by full texts. Reasons for full-text exclusion will be recorded. Disagreements will be resolved by discussion, or by a third reviewer when needed. Agreement at each stage will be reported, and the selection process will be summarized in a PRISMA 2020 flow diagram.

Data Collection Process

A standardized extraction form (Appendix B) will be piloted on three included studies. One reviewer will extract data and the second will verify every entry against the source. When key data are missing or unclear, corresponding authors will be emailed twice over two weeks.

2.6 Data Items

Extracted items include bibliographic details, country and income group, program and setting type, population and sample, AI tool characteristics and purpose, study design, outcomes and measures, key quantitative and qualitative findings, reported barriers and enablers, ethical issues, and funding. Appendix B lists every field.

2.7 Outcomes and Prioritization

The primary outcome is learning, including achievement scores, literacy and numeracy measures, and equivalency examination results. Secondary outcomes are engagement, attendance, retention or completion, motivation and self-efficacy, and implementation outcomes such as adoption, fidelity, and cost. For qualitative evidence, the phenomena of interest are learners' and facilitators' experiences, perceptions, and reported conditions for use. When a study reports several measures of the same outcome, the measure most directly aligned with the program's learning goals will be prioritized.

2.8 Quality Appraisal

Two reviewers will independently appraise each included empirical study using the Mixed Methods Appraisal Tool (MMAT), version 2018, which covers qualitative, quantitative,

and mixed-methods designs in a single instrument (Hong et al., 2018). Grey literature will be appraised with the AACODS checklist (Tyndall, 2010). Studies will not be excluded for low quality. Instead, a sensitivity analysis will test whether conclusions change when lower-quality studies are removed.

2.9 Data Synthesis

Synthesis follows the JBI convergent segregated approach: quantitative and qualitative evidence are synthesized separately and then integrated (Stern et al., 2020). Table 4 summarizes the plan.

Table 4: Synthesis Plan by Evidence Strand

Strand	Method	Certainty rating	Questions
Descriptive mapping	Frequencies by year, country, region, setting, AI tool type, and study design	Not applicable	RQ1, RQ5
Quantitative	Narrative synthesis following SWiM; random-effects meta-analysis when at least three studies report the same outcome with comparable designs	GRADE	RQ2
Qualitative	Thematic synthesis: line-by-line coding, descriptive themes, analytical themes	GRADE-CERQual	RQ3, RQ4
Integration	Integration matrix showing where findings confirm, extend, or contradict each other	Not applicable	RQ4, RQ5

Note. SWiM = Synthesis Without Meta-analysis; GRADE = Grading of Recommendations Assessment, Development and Evaluation; CERQual = Confidence in the Evidence from Reviews of Qualitative research.

Quantitative Synthesis

Studies will be grouped by AI tool type and outcome domain. Synthesis will follow the SWiM reporting guideline (Campbell et al., 2020), using standardized effect sizes where data permit and effect direction plots otherwise. Where at least three studies report the same outcome with comparable designs, a random-effects meta-analysis using Hedges' g

will be conducted, with heterogeneity assessed through I^2 and prediction intervals (Borenstein et al., 2009; Higgins et al., 2023).

Qualitative Synthesis

Qualitative findings, including author interpretations supported by participant data, will be synthesized using thematic synthesis (Thomas & Harden, 2008). Coding will proceed in three stages: line-by-line coding, development of descriptive themes, and generation of analytical themes. Barriers and enablers will be coded deductively against UTAUT constructs and inductively for codes outside the framework. NVivo will be used to manage coding.

Integration and Subgroup Analysis

The two syntheses will be juxtaposed in an integration matrix to show where quantitative and qualitative findings converge, complement, or diverge. Where data allow, findings will be compared across four subgroups: generative AI versus earlier AI tools (before and after November 2022); geographic region; community-based versus institution-based settings, including correctional facilities; and learner level (basic literacy, elementary, and secondary equivalency).

2.10 Meta-biases

If a meta-analysis includes ten or more studies, small-study effects will be examined with funnel plots and Egger's test (Egger et al., 1997). Selective outcome reporting will be assessed by comparing published outcomes with registered protocols where these exist. Language and database bias will be reported as limitations.

2.11 Confidence in Cumulative Evidence

Certainty of quantitative findings will be rated with GRADE (Guyatt et al., 2008), and confidence in qualitative findings with GRADE-CERQual (Lewin et al., 2018). Results will be presented in summary-of-findings tables.

2.12 Timeline

Table 5: Review Timeline

Phase	Activities	Duration
1	Finalize protocol; confirm no duplicate review; register on OSF	2 weeks
2	Peer-review search strings (PRESS); run final searches	2–3 weeks
3	Pilot and complete title, abstract, and full-text screening	4–6 weeks
4	Extract data; appraise quality	3–4 weeks
5	Synthesize, integrate, and rate certainty	3–4 weeks
6	Write and submit the review manuscript	4 weeks

Note. Total estimated duration is 4 to 6 months with two reviewers working part-time.

3. Discussion

3.1 Expected Contributions

The review will produce the first consolidated synthesis of AI use in alternative, nonformal, and adult learning in the Global South. It will show which AI tools have been tried, with which learners, in which countries, and with what results. It will also identify the conditions under which these tools are adopted or abandoned.

The findings are expected to have direct practical value. Division-level ALS interventions, such as systematic mock testing and short enhancement programs (Casingal & Guino, 2025b; Casingal et al., 2026), could incorporate AI-supported adaptive practice and feedback if the evidence supports it. The documented professional development needs of ALS teachers (Casingal, 2025) suggest that AI literacy may need to become part of facilitator training. Evidence on barriers will help program managers judge whether infrastructure and support conditions are in place before adoption.

3.2 Anticipated Limitations

The evidence base is likely to be small, heterogeneous, and dominated by short pilot studies, which may limit quantitative pooling. Restricting the search to English will exclude relevant work published in Spanish, Portuguese, French, and national languages.

Grey literature varies widely in rigor. Generative AI tools change quickly, so findings about specific tools may age faster than findings about adoption conditions. Finally, some studies may not describe their setting clearly enough to determine whether it is nonformal, which will be handled through author contact and transparent reporting of judgments.

3.3 Ethics and Dissemination

Ethics approval is not required because the review uses only published and publicly available data. Findings will be submitted to a peer-reviewed open-access journal and presented at education research conferences. A policy brief will be prepared for the Department of Education's Bureau of Alternative Education and for division-level ALS implementers. Search strategies, extraction forms, and extracted data will be deposited on OSF.

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Appendix A. Search Strings by Source

Blocks A (AI), B (setting), and C (LMIC) are identical in content across sources; only the syntax changes. [LMIC list] refers to the country terms of the Cochrane EPOC LMIC filter adapted to each interface.

Web of Science Core Collection

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TS=("artificial intelligence" OR "generative AI" OR GenAI OR chatbot* OR ChatGPT OR
"large language model*"
OR "intelligent tutoring system*" OR "adaptive learning" OR "machine learning"
OR "natural language processing" OR "conversational agent*" OR "AI-powered" OR
"AI-based")
AND TS=("alternative learning" OR "alternative education" OR "nonformal education"
OR "non-formal education"
OR "adult education" OR "adult learning" OR "adult literacy" OR "adult learner*" OR
"out-of-school youth"
OR "second-chance education" OR "community learning" OR "open school*" OR
"functional literacy"
OR "basic literacy" OR "lifelong learning" OR "continuing education" OR "prison
education")
AND TS=("developing countr*" OR "low-income countr*" OR "middle-income countr*"
OR LMIC* OR "Global South"
OR [LMIC list])
Timespan: 2015-01-01 to search date | Language: English
```

ERIC (EBSCOhost)

```
(DE "Artificial Intelligence" OR DE "Intelligent Tutoring Systems" OR TI,AB("generative
AI" OR chatbot*
OR ChatGPT OR "large language model*" OR "adaptive learning" OR "machine
learning"))
AND (DE "Nonformal Education" OR DE "Adult Education" OR DE "Adult Literacy" OR
DE "Out of School Youth"
```

OR DE "Correctional Education" OR DE "Lifelong Learning" OR TI,AB("alternative learning system"
OR "second-chance education" OR "community learning"))
AND (DE "Developing Nations" OR TI,AB("Global South" OR LMIC* OR [LMIC list]))
Limiters: 2015 to search date; English

IEEE Xplore and ACM Digital Library

("artificial intelligence" OR "generative AI" OR chatbot OR "intelligent tutoring" OR
"adaptive learning")
AND ("adult education" OR "adult literacy" OR "nonformal education" OR "non-formal
education"
OR "out-of-school" OR "alternative learning" OR "lifelong learning")
Search fields: Abstract, Title, Author Keywords | 2015 to search date

Regional Databases and Google Scholar

("artificial intelligence" OR chatbot OR ChatGPT OR "adaptive learning")
AND ("alternative learning system" OR "nonformal education" OR "adult education" OR
"adult literacy"
OR "out-of-school youth")
Google Scholar: first 300 results sorted by relevance, 2015 to search date

Appendix B. Data Extraction Form

Domain	Field	Description
Study identification	Author, year, title, source	Full citation and publication type (journal, report, thesis)
Context	Country and income group	Country of data collection; World Bank group at time of search
Context	Program and setting	Program name (e.g., ALS); community-, home-, workplace-, or institution-based; correctional setting
Population	Participants	Learners, facilitators, or managers; age range; sex; literacy level; sample size
Intervention	AI tool	Name, type (generative AI, ITS, adaptive, speech, analytics), language, device, connectivity needs
Intervention	Purpose and dose	Instructional purpose; duration; frequency; facilitator role
Methods	Design	Quantitative, qualitative, or mixed; comparator; data collection methods
Outcomes	Quantitative results	Outcome, measure, timing, means, SDs, effect sizes, <i>p</i> values
Outcomes	Qualitative findings	Themes and supporting participant quotations
Implementation	Barriers and enablers	Coded to UTAUT constructs and inductive codes
Ethics	Ethical issues	Privacy, consent, bias, academic integrity, data ownership
Other	Funding and conflicts	Funder; declared conflicts of interest

Appendix C. PRISMA-P 2015 Checklist

Item	Topic	Location in this protocol
1	Identification	Title
2	Registration	Title page; Section 2.1
3	Authors and contact	Title page; Declarations
4	Amendments	Section 2.1
5	Support	Declarations
6	Rationale	Sections 1.1 and 1.2
7	Objectives	Section 1.4
8	Eligibility criteria	Section 2.2; Tables 1 and 2
9	Information sources	Section 2.3; Table 3
10	Search strategy	Section 2.4; Appendix A
11a–c	Study records: data management, selection, data collection	Section 2.5
12	Data items	Section 2.6; Appendix B
13	Outcomes and prioritization	Section 2.7
14	Risk of bias in individual studies	Section 2.8
15a–d	Data synthesis	Section 2.9; Table 4
16	Meta-biases	Section 2.10
17	Confidence in cumulative evidence	Section 2.11