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# "From Technological Scarcity to Human Capability: A Conceptual, Culturally Responsive Action-Research Framework for AI-Supported Life Skills in Arab-Bedouin Education"

**Researchers:**
**Jalila Mohammed Abu Qweder**
**Naameh Gweder Abu Qweder**
Teaching and Learning, AL-najah University

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**Abstract:**

students for changing social and occupational environments. However, such claims frequently presume reliable internet connectivity, adequate devices, high levels of digital literacy, and sustained professional support. These conditions cannot be taken for granted in schools serving unrecognized Arab-Bedouin villages in southern Israel, where infrastructural, socioeconomic, linguistic, and institutional inequalities shape everyday teaching. This conceptual article develops a culturally responsive action-research framework for integrating generative AI into these schools while prioritizing life skills rather than technology adoption as an end in itself. Drawing on scholarship concerning Arab-Bedouin education, digital inequality, AI-supported pedagogy, and action research—and particularly on Abu-Gweder's research on education, language, digital participation, and professional agency in Arab-Bedouin society—the article proposes a four-phase iterative cycle comprising contextual diagnosis, collaborative pedagogical design, guided classroom enactment, and reflective evaluation. The framework links AI-supported learning to critical thinking, problem-solving, self-regulation, collaboration, communication, adaptability, and responsible digital judgment. It also introduces the principles of minimum viable connectivity, teacher-mediated AI access, bilingual and culturally relevant design, and offline continuity. The article argues that sustainable innovation in structurally marginalized schools must be developed with teachers and communities rather than transferred to them as a standardized technological package.

**Keywords:** Action research; Generative artificial intelligence; Arab-Bedouin education; Unrecognized villages; Life skills; Culturally responsive pedagogy; Digital inequality; Teacher professional learning.

**How to Cite This Article**

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## Introduction:

Generative artificial intelligence has entered educational discourse with unusual speed. Teachers can now use AI systems to generate instructional materials, simplify texts, propose questions, design differentiated tasks, provide alternative explanations, and create preliminary forms of feedback. Students may use the same systems to request explanations, explore unfamiliar topics, test ideas, and receive support outside conventional classroom hours. These possibilities have led to claims that AI can make teaching more responsive, personalized, and efficient (Baidoo-Anu & Owusu Ansah, 2023). Nevertheless, the educational value of AI does not reside automatically in the technology. It depends on the goals for which it is used, the pedagogical design surrounding it, the quality of teacher mediation, and the social and infrastructural conditions governing access. Human-AI learning should therefore be designed as a complementary relationship in which human judgment retains responsibility for educational purposes and decisions (Molenaar, 2022).

This qualification is especially important in structurally marginalized educational settings. Most visions of AI-supported learning assume that students possess personal devices, continuous connectivity, sufficient digital literacy, and access to platforms in languages they understand. They also assume that teachers have time to experiment, professional guidance,

and institutional protection when addressing ethical concerns. When these conditions are absent, the same technology may produce unequal educational opportunities. Some students learn to formulate prompts, compare responses, identify errors, and use AI as a cognitive partner, while others receive only printed products that their teachers have generated. Innovation may therefore be visible in lesson preparation while remaining inaccessible as a direct learning experience.

Schools serving unrecognized Arab-Bedouin villages in the Negev provide a particularly important context for examining this problem. These villages have historically experienced limited recognition, inadequate public infrastructure, unstable internet connectivity, transportation difficulties, poverty, and unequal access to institutional resources. The digital divide among Negev Bedouin communities encompasses more than the ownership of technological devices. It also concerns the quality of connectivity, control over access, digital skills, and the ability to convert technology into meaningful educational and social opportunities (Abu-Kaf et al., 2019; Marciano et al., 2024; Mendels & Abu-Kishk, 2024). Consequently, introducing AI into these schools without confronting structural inequality may deepen the very disparities that the technology is expected to reduce.

Research on Arab-Bedouin education also shows that educational practice is embedded in relationships among language, family, community, institutional expectations, and social mobility. Abu-Gweder's work is especially helpful in illustrating these interconnections. His studies portray education and digital participation not simply as technical or academic processes but as spaces in which Arab-Bedouin learners negotiate identity, belonging, linguistic legitimacy, cultural expectations, and access to future opportunities. Research on Arab-Bedouin students' pursuit of education has shown that learning may represent both individual advancement and responsibility toward family and community (Abu-Gweder, 2024a, 2024b). His studies of digital communication further demonstrate that technology can open new spaces of expression and participation while remaining shaped by cultural boundaries and unequal social conditions (Abu-Gweder, 2022, 2024c). More recently, his research on AI-supported second-language development has indicated that generative tools may contribute to language practice and confidence when incorporated through purposeful pedagogical mediation (Abu-Gweder, 2026).

These studies suggest that AI integration in Arab-Bedouin schools should not be reduced to the distribution of software or brief technical training. It must be understood as a locally situated pedagogical change involving teachers, students, families, school leaders, and institutional authorities. It must also respond to the purposes that the community considers educationally meaningful. One such purpose is the development of life skills: critical thinking, communication, collaboration, problem-solving, adaptability, self-regulation, responsible decision-making, and the ability to continue learning under changing circumstances.

This article therefore proposes a conceptual action-research framework for integrating generative AI into schools serving unrecognized Arab-Bedouin villages. It does not claim that a standardized intervention has already been tested across these schools. It does not report participants, interviews, classroom observations, or empirical findings. Instead, it synthesizes concerns and practices documented in prior research and organizes them into an ethically and methodologically structured framework for future, locally led investigation and improvement. The central question is: *How can teachers in schools serving unrecognized Arab-Bedouin villages use participatory action research to integrate generative AI in ways that develop students' life skills and teachers' professional learning while responding to infrastructural, linguistic, cultural, and ethical constraints?

**Arab-Bedouin Education as a Structurally Situated Context**

The Arab-Bedouin population of southern Israel is an Indigenous minority community experiencing rapid social change alongside persistent structural inequality. Its educational system operates within a complex relationship between state institutions, local communities, cultural traditions, and unequal resource allocation. Although Arab-Bedouin education has long been shaped by rapid social change, minority status, and unequal access to institutional resources (Abu-Saad, 1991, 1995, 2016). Arab-Bedouin society is internally diverse, yet public discourse has often represented it as a homogeneous and deficient population. Such representations obscure differences among recognized towns, recognized villages, and unrecognized villages, as well as variations in family resources, gender expectations, mobility, employment, educational experience, and access to public services.

Schools serving unrecognized villages frequently operate within conditions that cannot be explained as ordinary school-level difficulties. Limited transportation, inadequate physical infrastructure, unstable electricity or internet access, and restricted availability of appropriate digital devices affect attendance, homework completion, communication, and continuity of learning. These conditions are not external background variables. They shape what teachers can plan, what students can practise, and which forms of pedagogical innovation are feasible.

The concept of the digital divide is useful but insufficient if understood solely as a difference between those who possess technology and those who do not. Abu-Kaf et al. (2019) documented inequalities in broadband access among Negev Bedouin communities. Marciano et al. (2024) subsequently framed the problem as capabilities divide, emphasizing that access becomes meaningful only when people can convert technological resources into valued forms of participation. In

education, such capabilities include the ability to search for information, evaluate its credibility, write and revise texts, communicate with teachers, receive feedback, participate in simulations, and use technological tools independently. A shared family smartphone with limited data cannot necessarily support these activities.

Mendels and Abu-Kishk (2024) showed how Bedouin students' limited access to devices and reliable connectivity affected their participation in remote learning during the COVID-19 crisis. Frei-Landau and Avidov-Ungar (2022) similarly found unequal online-learning pathways among Bedouin and Jewish women preparing to become teachers. Although these studies developed during an emergency, their significance extends beyond emergency education. AI-supported instruction is predominantly cloud based and may reproduce the same assumptions about uninterrupted connectivity, individual devices, and private study spaces.

Structural inequality also intersects with language. Arab-Bedouin students generally learn in Arabic while encountering Hebrew as the dominant language of wider Israeli institutions and English in many digital interfaces. Teachers may consequently move among Arabic, Hebrew, and English when explaining AI outputs or adapting instructional materials. Abu-Gweder's research has repeatedly emphasized that language learning is closely connected to equality, professional identity, and educational confidence. His studies of Hebrew as a second language among Arab-Bedouin learners reveal that linguistic difficulty can become an institutional barrier when students' knowledge is evaluated through a language they have not yet mastered fully (Abu-Gweder, 2023, 2026). AI may support translation, simplification, vocabulary development, and rehearsal, but it may also produce culturally inappropriate language, inaccurate translations, or dependence on automated formulations.

Social and cultural relations likewise influence technological participation. Abu-Gweder (2024c) found that online environments can provide Arab-Bedouin youth with spaces for expression and interaction not always available in their immediate physical environments. Yet access to such spaces remains negotiated within family and community expectations. Technology is therefore neither culturally neutral nor inherently liberating. It can expand agency, but the form of agency it enables depends on privacy, language, gender, trust, and the perceived legitimacy of particular uses.

A culturally responsive model must avoid two problematic assumptions. The first is technological determinism: the belief that providing AI will automatically improve teaching and learning. The second is cultural deficit thinking: the belief that difficulties arise mainly from community attitudes rather than material inequality and institutional arrangements. Teachers' adaptations should instead be understood as professional responses to interacting structural, cultural, linguistic, and pedagogical conditions.

**Generative AI and the Development of Life Skills**

Life skills are broadly understood as capacities that enable individuals to respond constructively to academic, interpersonal, professional, and everyday challenges. In schools, they commonly include critical thinking, problem-solving, communication, collaboration, adaptability, self-regulation, creativity, and responsible decision-making. These skills are not separate from disciplinary learning. Students develop them when they explain reasoning, compare alternatives, cooperate with peers, revise unsuccessful strategies, and reflect on their learning. This article draws particularly on UNICEF's Life Skills and Citizenship Education framework for the Middle East and North Africa. That framework organizes life skills across four interconnected dimensions—learning to know, learning to do, learning to be, and learning to live together—and treats cognitive, instrumental, individual, and social capabilities as mutually reinforcing responsibilities of education systems rather than isolated personal traits (UNICEF, 2017).

Generative AI may contribute to these skills, but only when students are required to think with and about its outputs. If students simply request a completed answer and reproduce it, AI can reduce intellectual engagement. If, however, they compare an AI response with evidence, identify omissions, revise inaccurate explanations, formulate improved prompts, or defend an alternative conclusion, the same technology can become a resource for critical inquiry.

Critical thinking requires students to evaluate claims rather than accept fluent language as evidence of truth. Generative systems may produce plausible but inaccurate information. This limitation creates a pedagogical opportunity: teachers can ask students to locate unsupported statements, compare responses from different prompts, and verify information using trustworthy sources. AI literacy research emphasizes that students should understand both the possibilities and limitations of AI, including bias, opacity, privacy, authorship, and the need for human judgment (Casal-Otero et al., 2023; Miao & Cukurova, 2024).

Problem-solving can be supported when AI offers multiple approaches rather than a final answer. In mathematics, for example, students can compare two solution strategies and determine which is more efficient or accurate. In science, they can examine a proposed explanation, identify variables, or revise an experimental plan. In language lessons, they can compare alternative formulations and explain which is more appropriate for a particular audience. The purpose is not to replace struggle but to structure productive struggle.

Self-regulated learning may be strengthened when students use AI to establish goals, request staged hints, monitor understanding, and reflect on progress. However, technology-supported self-regulation is not automatic. Students require explicit routines that teach them when to seek assistance, how to evaluate feedback, and when to continue working independently (Prasse et al., 2024). A student who requests a complete response immediately may become less autonomous, whereas one who requests a hint and then attempts the task may become more capable of managing learning.

Communication and collaboration can also be developed through shared AI activities. In low-resource schools, group access may be necessary because not every student has a device. Although such scarcity represents an inequality, carefully structured collaborative use can prevent one student from controlling the device while others remain passive. Roles such as prompt designer, evidence checker, recorder, presenter, and ethical reviewer can distribute participation. Students then learn that effective AI use is a social practice involving negotiation and accountability.

Adaptability is especially important in settings characterized by unstable infrastructure. Students and teachers may need to shift between online and offline resources, work with incomplete access, and revise plans when systems fail. Nevertheless, adaptability should not be romanticized. The ability to improvise is valuable, but it must not excuse the failure of institutions to provide adequate infrastructure. Action research should therefore document both the professional creativity that sustains learning and the structural conditions that make continual improvisation necessary.

For teachers, AI may develop life and professional skills through lesson planning, differentiation, reflection, and collaborative inquiry. Abu-Gweder's research on dialogic learning in Arab-Bedouin teacher education demonstrates the importance of reflection, peer interaction, feedback, and clinically situated learning for connecting theory with classroom practice (Abu-Gweder, 2025a). His research with teachers and parents during wartime similarly shows that professional roles change when educators respond to uncertainty and community needs (Abu-Gweder & Solomovich, 2025). These studies support an understanding of teachers as adaptive professionals rather than passive users of externally designed programs.

**Approach to Conceptual Framework Development**

This is a conceptual article rather than a report of a completed intervention. No participants were recruited, and no interviews, observations, questionnaires, or classroom products were collected for the present article. The framework was developed through an interpretive synthesis of four intersecting bodies of scholarship: Arab-Bedouin education and structural digital inequality; generative AI and AI literacy in education; life-skills education; and participatory, culturally responsive action research. Sources were selected for their direct relevance to the educational context and the design problem addressed by the article. Particular attention was given to research examining Arab-Bedouin language learning, digital participation, professional agency, family-school relations, and access to educational opportunity.

The synthesis identified recurring design requirements across these bodies of literature. Structural research foregrounded reliable access, devices, connectivity, and institutional support. AI scholarship highlighted verification, privacy, bias, teacher mediation, and the relationship between human and machine agency. Life-skills frameworks emphasized critical thinking, problem-solving, communication, collaboration, self-management, and responsible participation. Culturally responsive scholarship directed attention to language, identity, community knowledge, high academic expectations, and the distribution of authority in classroom participation. These requirements were then organized into a proposed four-phase iterative action-research cycle.

The resulting framework is theoretically informed but not empirically validated. It is intended to guide future locally led action research and to generate propositions that can be examined, revised, or rejected through systematic classroom inquiry. It should not be interpreted as evidence that a particular AI intervention has already improved students' life skills.

**Why Action Research?**

Action research is particularly appropriate when the purpose is not merely to describe a problem but to improve practice through systematic inquiry conducted with practitioners. It typically involves iterative cycles of planning, action, observation, and reflection (Kemmis et al., 2014; Stringer & Aragón, 2020). Teachers identify a locally meaningful concern, design an intervention, collect evidence, evaluate what occurred, and revise subsequent practice accordingly. Knowledge is generated through the relationship between action and reflection rather than through detached observation alone. In critical participatory action research, practitioners and community members are not merely sources of data; they participate in defining the concern, examining practice, and judging whether change is educationally and ethically worthwhile (Kemmis et al., 2014).

This approach is well suited to AI integration in schools serving unrecognized villages for four reasons. First, the educational environment is too context dependent for a standardized model to be transferred without adaptation. Connectivity, device access, language, family expectations, and school leadership differ across communities and even across classes within the same school. Action research allows each school to begin from its actual conditions.

Second, teachers possess essential contextual knowledge. They know which students share devices, which platforms are accessible, which linguistic explanations are necessary, and which activities families are likely to accept. Treating teachers only as implementers would overlook this expertise. In action research, they become co-designers and knowledge producers.
Third, generative AI changes rapidly. A fixed program may become outdated before it is fully evaluated. Iterative cycles enable teachers to revise practices as tools, policies, and student behaviors change. The aim is not loyalty to a particular platform but the development of durable pedagogical principles.
Fourth, action research can connect professional development directly to classroom problems. Teachers often receive short workshops demonstrating technological functions without showing how to incorporate them under realistic conditions. In contrast, action research begins with a problem of practice, supports experimentation, and uses evidence from the participating classroom.
Abu-Gweder's work provides a relevant precedent. His action-oriented and reflective research in Arab-Bedouin teacher education emphasizes collaborative dialogue, reflection journals, observation, mentorship, and movement between academic knowledge and classroom enactment (Abu-Gweder, 2025a, 2026). These elements can be adapted to AI integration by creating a professional inquiry community in which teachers examine both student learning and their own changing practice.

**A Four-Phase Iterative Action-Research Framework**

**Phase 1: Contextual Diagnosis and Community Mapping**

The first phase should begin before any AI intervention. Its purpose is to understand the material, linguistic, pedagogical, and ethical conditions in which the initiative will operate. Teachers should map device availability, connectivity, digital literacy, preferred languages, accessibility needs, and students' prior experiences with AI. The mapping should distinguish between having theoretical access and having dependable educational access.
Data collection can include teacher interviews, student questionnaires, small focus groups, infrastructure logs, observations, and discussions with families. The school should identify when connectivity is strongest, which applications function on low-cost smartphones, whether students can download materials at school, and which families share devices. It should also determine whether school computers permit access to AI systems and whether privacy policies allow student accounts.
The diagnostic phase should address language and culture. Teachers can ask which language students use when formulating questions, whether automated translations are understandable, and whether the examples generated by AI reflect local experiences. They should identify culturally sensitive topics and consider how family expectations influence digital participation. This process should not be used to label the community as resistant. Its purpose is to ensure that participation requirements do not inadvertently exclude students.
The diagnostic phase should conclude with a clearly defined problem of practice. Examples might include:
Students reproduce AI-generated answers without evaluating them.
Teachers can use AI at school, but students cannot access it at home.
AI-generated Hebrew texts are linguistically inappropriate for Arabic-speaking learners.
A shortage of devices prevents equitable student participation.
Teachers lack shared criteria for ethical and pedagogically appropriate AI use.
Rather than attempting to solve every issue at once, the research team should select one or two manageable priorities. A suitable first-cycle question might be: How can a structured group-based AI activity improve students' ability to evaluate explanations when only a small number of connected devices are available?

**Phase 2: Collaborative Pedagogical Design**

The second phase involves designing an intervention that responds to the diagnosed problem. Teachers should collaborate across subjects where possible because life skills extend beyond a single discipline. A science teacher, mathematics teacher, language teacher, and digital-learning coordinator might jointly develop a common protocol for responsible AI-supported inquiry.
Each activity should define both a disciplinary objective and a life-skill objective. For example:
Disciplinary objective: explain the stages of the water cycle.
Life-skill objective: evaluate the accuracy of an AI-generated explanation.
AI function: generate an initial explanation containing one deliberately introduced weakness.
Student action: identify the weakness, consult another source, and revise the explanation.
Evidence: students' annotations, revised texts, and reflective comments.
In mathematics, students might compare an AI-generated solution with their own and explain where the reasoning diverges.
In Arabic or Hebrew instruction, they might evaluate alternative translations and discuss how word choice changes meaning.
In social studies, they might examine whether an AI account includes local perspectives or reproduces stereotypes.

The design should follow a minimum viable connectivity principle. The educational core of the activity must remain possible when live access is interrupted. Teachers can download AI-generated materials in advance, save screenshots, create low-data PDFs, or prepare printed prompt-and-response cards. If students cannot use AI directly at home, classroom time should provide protected access. Offline alternatives should preserve the cognitive goal rather than merely replace an interactive activity with passive copying.

The design should also prevent unequal participation within groups. Roles can rotate:

Prompt designer*—formulates the question.

AI operator*—enters the prompt.

Evidence checker*—verifies the response.

Language mediator*—explains unfamiliar language.

Recorder*—documents revisions.

Presenter*—explains the group's judgment.

These roles convert limited-device use into structured collaboration. However, the action-research record should distinguish pedagogically valuable collaboration from device sharing imposed by scarcity.

Teachers should create justified-use rules rather than blanket bans. Students might be permitted to use AI for brainstorming, requesting examples, receiving hints, comparing formulations, and revising language, but not for submitting unexamined generated work. Every use should require disclosure: what tool was used, for which purpose, what was changed, and how the output was verified.

**Phase 3: Guided Classroom Enactment**

The third phase moves from planning to action. Teachers implement the designed activities while observing how students actually participate. Implementation should begin with small, manageable tasks rather than whole-curriculum transformation. A two- or three-week pilot may be sufficient for the first enactment of the full cycle.

Teachers should model critical AI use openly. A useful routine is:

Ask a meaningful question.

Predict what a strong answer should contain.

generate or display the AI response.

Examine its evidence, language, assumptions, and omissions.

Compare it with another source.

Revise the response.

Reflect on what human judgment contributed.

This routine positions AI as an object of inquiry as well as a resource. Students learn that fluency does not guarantee accuracy and that technological output requires evaluation.

Classroom observation should focus on participation rather than enthusiasm alone. Students may appear engaged because the technology is novel, but novelty is not evidence of learning. Teachers should examine who formulates prompts, who controls the device, who remains silent, how disagreements are resolved, and whether students can explain why an output is acceptable or problematic.

Multiple forms of evidence can be collected:

initial and revised student responses;

prompt histories;

teacher field notes;

student reflection cards;

group discussion observations;

short interviews;

examples of verified and unverified AI outputs;

student self-assessments of critical thinking or collaboration;

teacher reflection journals.

The use of multiple sources does not automatically guarantee truth, but it allows the team to examine the intervention from several perspectives. Student voice is especially important. Teachers may interpret an activity as empowering while students experience it as confusing or inaccessible.

Classroom enactment should also protect students' privacy. Students should not enter personal, family, medical, or identifying information into public AI tools. Where age restrictions or platform policies apply, teachers must use institutionally approved systems or teacher-mediated demonstrations. The initiative should not require students to create personal accounts without appropriate authorization.

**Phase 4: Reflective Evaluation, Revision, and Institutional Learning**

The fourth phase asks not whether AI "worked" in a general sense but what changed, for whom, under which conditions, and at what cost. Evaluation should examine disciplinary learning, life skills, participation, teacher workload, ethical concerns, and infrastructure.

Critical thinking can be assessed through students' ability to identify unsupported claims and justify revisions. Problem-solving can be examined through the number and quality of strategies considered. Collaboration can be evaluated through observation of role distribution and mutual explanation. Self-regulation can be explored through students' decisions about when to seek AI assistance and how they monitor its usefulness. Adaptability can be examined through the ability to continue learning when access changes, while avoiding any suggestion that inadequate infrastructure is acceptable.

Teachers should also evaluate their own learning. Reflective questions might include:

Did AI reduce preparation time or create additional verification work?

Which students gained direct access, and which remained dependent on mediation?

Did the activity strengthen understanding or merely improve the appearance of completed work?

Were Arabic, Hebrew, and English used as resources or as barriers?

Which assumptions about students were challenged?

What should be retained, revised, or discontinued?

The first enactment of the full cycle may reveal that students need more explicit instruction in verifying outputs. A second cycle might therefore add an evidence-checking rubric. Another cycle may show that group roles reduce domination but require more time. The team can then modify the activity length or simplify the roles. Action research is valuable precisely because unsuccessful elements become evidence for improvement rather than proof that teachers or students have failed. The conclusions reached in this reflective phase return the team to a revised contextual diagnosis, thereby initiating the next iteration of the four-phase cycle.

At the institutional level, findings should be shared through professional learning meetings. Teachers can develop a local repository containing bilingual prompts, evaluated examples, offline materials, consent procedures, and subject-specific activities. School leaders should use the evidence to advocate for infrastructure, devices, technical support, and scheduled collaborative planning time.

**A Culturally Responsive Model of AI-Supported Life-Skill Development**

The proposed framework is culturally responsive because it treats students' languages, community knowledge, and everyday experiences as educational resources. Culturally responsive practice does not mean replacing academic expectations with familiar content. It means designing access to rigorous learning in ways that recognize students' identities and circumstances. This understanding draws on culturally responsive and culturally relevant pedagogy, which connect academic rigor with learners' cultural knowledge, identities, relationships, and capacity to participate as competent meaning makers (Gay, 2018; Ladson-Billings, 1995). Cultural responsiveness therefore concerns not only which examples appear in a lesson, but also whose language and knowledge are legitimized, who controls technological activity, and who is recognized as capable of producing knowledge.

AI-generated materials should therefore be examined for cultural distance and stereotyping. Teachers can prompt systems to include examples related to desert ecology, water use, local geography, community change, multilingual communication, or familiar forms of social cooperation. However, local relevance should not become exoticization. Students should participate in deciding whether an example represents their lives accurately.

Language mediation should be similarly participatory. Students might generate an explanation in Arabic, compare it with a Hebrew version, and identify where meaning changes. Such work can develop language awareness and critical AI literacy simultaneously. Abu-Gweder's studies of second-language learning emphasize that language competence is linked to confidence, equality, and access to professional and academic spaces (Abu-Gweder, 2023, 2026). AI can support linguistic rehearsal, but the teacher must ensure that automated language does not silence students' own voices.

Family and community engagement can strengthen legitimacy and trust. Teachers should explain that AI-supported activities are designed to develop judgment rather than promote unrestricted screen use. Short workshops can demonstrate what students are doing, how privacy is protected, and why critical evaluation is necessary. Abu-Gweder and Solomovich (2025) show that relationships between Arab-Bedouin teachers and parents can shift from protective communication toward learning-oriented partnership when trust and clear educational purposes are established.

The framework also recognizes teachers as culturally situated professionals. Abu-Gweder's research on Arab-Bedouin teacher–principal relations highlight the importance of professional and social relationships within school leadership (Abu-Gweder, 2025b). AI initiatives are more likely to become sustainable when school leaders provide legitimacy, time, technical assistance, and permission for careful experimentation. Teachers should not be expected to absorb the financial, emotional, and practical costs of innovation individually.

**Discussion**

The proposed framework makes three theoretical contributions. First, it shifts the focus from AI adoption to AI-enabled human capability. The relevant question is not how frequently teachers or students use AI, but whether its use expands their capacity to reason, communicate, collaborate, adapt, and act responsibly. This distinction is essential in marginalized settings, where usage statistics may conceal unequal access and passive participation.

Second, the framework conceptualizes teacher adaptation as both professional agency and evidence of structural inequality. Teachers who download materials, translate outputs, prepare printed alternatives, and reorganize group access demonstrate creativity and commitment. Yet these practices also reveal the additional labor required to compensate for inadequate infrastructure. Innovation should not be declared successful merely because committed teachers prevent systems from failing visibly.

Third, the framework connects culturally responsive pedagogy with infrastructure-sensitive design. Cultural responsiveness is often discussed through identity, representation, and classroom relationships, while digital inclusion is discussed through devices and connectivity. In unrecognized Arab-Bedouin villages, these dimensions are inseparable. A technically accessible platform may remain linguistically inappropriate, culturally distant, or institutionally mistrusted. Conversely, a culturally relevant activity cannot be equitable if students lack reliable access.

The model also extends Abu-Gweder's scholarship by linking several strands of his work: technology as a space of expanded participation; education as a pathway negotiated through family and community meanings; language as a source of both opportunity and inequality; dialogic reflection as a form of professional learning; and AI as a potential pedagogical mediator. Together, these strands support a view of technological innovation as a relational and cultural process rather than a purely technical intervention.

Practically, the framework recommends beginning with small, evidence-based cycles. Schools should resist pressure to declare themselves "AI schools" after purchasing licenses or providing a single workshop. A more meaningful process would involve selecting a concrete problem, co-designing one intervention, examining participation and learning, and revising practice. This process may appear slower, but it is more likely to produce sustainable professional knowledge.

Policy must operate at two levels. Immediate measures should include low-bandwidth resources, downloadable materials, school-based access periods, bilingual guidance, and teacher-mediated AI use. Long-term measures must address reliable infrastructure, sufficient devices, professional development, privacy-compliant platforms, and technical support. Offline adaptation should reduce temporary exclusion, not become a permanent justification for unequal investment.

**Ethical and Methodological Considerations**

An action-research project in a small community requires careful protection against indirect identification. Reporting a participant's subject, years of experience, school level, and village may make a pseudonym ineffective. Researchers should therefore remove or generalize combinations of details that could reveal identities.

The dual role of teacher-researchers also requires attention. Students may feel obligated to participate because the researcher evaluates their schoolwork. Consent procedures should distinguish routine instruction from research participation, and alternative learning arrangements should be available where necessary. Student work used for research should be anonymized, and withdrawal should not influence assessment.

AI introduces additional ethical issues. Public platforms may retain user inputs, generate biased representations, or provide inaccurate information. Research protocols should specify approved tools, prohibited data, verification procedures, and the boundaries of acceptable use. Ethical AI literacy should be treated as part of the intervention rather than an administrative appendix. Future projects should also follow age-appropriate institutional policies and international guidance concerning privacy, transparency, human oversight, and responsible use of generative AI in education (Miao & Holmes, 2023).

Finally, the present article proposes a conceptual framework rather than reporting empirical findings. Its feasibility, cultural responsiveness, and educational consequences have not yet been tested in participating schools. Future action-research projects should therefore document their contexts, participants, procedures, divergent experiences, and unintended consequences carefully. Their purpose should be analytical transferability rather than statistical representation of all unrecognized villages or Arab-Bedouin education as a whole.

## Conclusion:

Generative AI may support life-skill development in schools serving unrecognized Arab-Bedouin villages, but only when it is embedded within culturally responsive, infrastructure-sensitive, and ethically guided pedagogy. The technology can provide explanations, alternatives, prompts, and feedback, yet it cannot determine educational purposes or resolve structural inequality.

Action research offers a suitable pathway because it positions teachers as investigators and designers of change. Through repeated iterations of a four-phase cycle—contextual diagnosis, collaborative design, classroom enactment, and reflective evaluation—schools can examine how AI affects critical thinking, problem-solving, collaboration, self-regulation,

communication, and adaptability. The framework proposed here emphasizes minimum viable connectivity, bilingual mediation, offline continuity, community trust, critical verification, and equitable participation.

The central conclusion is that responsible AI integration in marginalized education should not ask communities to adapt themselves to technologies designed elsewhere. Technologies and pedagogies must instead be reconstructed around the community's languages, material conditions, educational aspirations, and professional knowledge. In this sense, the most important innovation is not the AI system itself but the collective capacity of teachers, students, families, and schools to use it critically and purposefully.

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