

STRENGTHENING ECONOMICS TEACHERS' COMPETENCE IN DESIGNING AI-BASED INSTRUCTIONAL MATERIALS AND MEDIA: A CONCEPTUAL COMMUNITY SERVICE MODEL FOR THE MERDEKA CURRICULUM ERA

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Abstract

The Merdeka Curriculum requires Indonesian economics teachers to design instructional materials and media that are innovative, contextual, and technology-responsive, yet their capacity to use artificial intelligence (AI) critically for this purpose remains under-examined compared with general or STEM subjects. This article presents a narrative literature review and conceptual model addressing how community service (Pengabdian kepada Masyarakat) programs can strengthen economics teachers' AI-based instructional design competence. Applying a narrative-review method to studies published between 2019 and 2026, the review synthesizes teacher AI-competency frameworks, including TPACK, Intelligent-TPACK, GenAI-TPACK, and the UNESCO AI Competency Framework for Teachers, with evidence from Indonesian teacher-training programs. Based on this synthesis, the article proposes the AI-Integrated Participatory Training model, a six-stage framework covering needs analysis, curriculum mapping, guided AI literacy training, collaborative product development with mentoring, evaluation, and sustainability planning, tailored to economics topics such as market structure, national income, inflation, and financial literacy. A companion evaluation instrument, implementation timeline, and stakeholder-role map are proposed for future teams, including at the Faculty of Economics and Business, Universitas Negeri Jakarta, to adopt and empirically validate. The model offers a subject-specific, mentoring-intensive alternative to generic AI-training programs and a replicable roadmap for strengthening teacher professionalism under the Merdeka Curriculum.

1. INTRODUCTION

Digital transformation has reshaped the way education systems design, deliver, and evaluate learning across all levels, and artificial intelligence is increasingly positioned at the center of this shift. Systematic reviews of AI applications in education report a rapid expansion of AI-supported functions, from adaptive content delivery to automated feedback, that extend well beyond earlier generations of educational technology (Zawacki-Richter, et al., 2019; Chiu, et al., 2023). Rather than being a peripheral tool, AI is now discussed as an instrument that can support teachers in designing instructional materials, developing learning media, constructing assessments, and personalizing feedback for learners (Chiu, et al., 2023; Moorhouse, et al., 2023).

In Indonesia, this global trend intersects with a major domestic policy shift, namely the implementation of the Merdeka Curriculum, which repositions teachers from information transmitters into learning designers who develop instructional materials aligned with *capaian pembelajaran* (learning outcomes), *tujuan pembelajaran* (learning objectives), and *alur tujuan pembelajaran* (learning progressions), while remaining responsive to the characteristics of their students and local context (Kemendikbudristek, 2022). Achieving this vision requires teachers to master a

broad set of competencies, including digital and technological competence, which literature-based studies identify as one of the harder dimensions of professional development to institutionalize because it requires sustained practice rather than one-off exposure (Purwati, 2024).

Survey evidence from several countries indicates that teachers' adoption of AI tools for instructional purposes is accelerating but remains uneven. A RAND Corporation survey found that approximately 18 percent of K-12 teachers in the United States, particularly those teaching English and social studies, had used AI to adapt instructional materials or generate learning content, and a majority of school districts intended to expand AI-related training for their staff (Diliberti, et al., 2024). Comparable studies in higher-education settings report that generative AI positively influences teaching performance when educators receive adequate guidance, but that this benefit depends heavily on structured professional development rather than self-directed exploration (Mulyani, et al., 2025). These findings suggest that the opportunity AI presents for teachers is conditional: without deliberate, well-designed training, the gap between AI's potential and teachers' actual practice is likely to persist.

Within Indonesia, community service programs conducted by universities have become one of the primary vehicles for closing this gap at the school level. Recent reports document AI-based training for teachers across a range of subjects, including a multi-subject training model for junior high school teachers that combined material delivery, AI demonstration, guided practice, and mentoring to produce teaching modules, handouts, worksheets, and interactive media (Silitonga, et al., 2026); a ChatGPT-focused competency training for vocational high school teachers developing learning media (Aji, et al., 2024); an experiential-learning-based module-writing training for a physics teacher working group (Ermawati, et al., 2024); and a mentoring-intensive program for rural elementary school teachers to strengthen digital-platform and interactive-content competencies (Mustamin, et al., 2025). A closely related precedent focusing specifically on economics teachers has also been reported in East Java, where a one-session AI training on deep-learning pedagogy was found to strengthen economics teachers' readiness to apply AI-based instructional approaches (Wulandari, et al., 2026).

Despite this growing body of practice, subject-specific models for economics and business education remain scarce relative to general or STEM-oriented training. Economics instruction has distinctive pedagogical demands: abstract concepts such as market equilibrium, national income, inflation, and monetary policy must be translated into contextual, activity-based materials that connect theory to learners' everyday economic experience (Arsyad, 2020). A generic AI-literacy workshop, however well designed, does not automatically address how AI can be used to build economics-specific products such as case-based modules, financial-literacy worksheets, or business-simulation media aligned with the Merdeka Curriculum's emphasis on contextual and project-based learning. This gap motivates the present article.

This article does not report the results of an already-conducted training activity. Instead, it undertakes a structured narrative review of the literature on teacher AI competency and Indonesian community-service training practice, and it uses that synthesis to propose a conceptual model, the AI-Integrated Participatory Training model, designed specifically to strengthen economics teachers' competence in developing AI-assisted teaching materials and instructional media. The specific objectives of this article are: (1) to synthesize existing teacher AI-competency frameworks and recent community-service training practices relevant to economics education; (2) to formulate a subject-specific, product-oriented training model together with an economics-topic-to-AI-tool mapping; and (3) to propose an evaluation instrument framework, implementation timeline, and stakeholder-role map that can be empirically tested by future community-service teams, including at the Faculty of Economics and Business, Universitas Negeri Jakarta. The remainder of the article is organized as follows: Section 2 reviews the relevant literature, Section 3 describes the review method, Section 4 presents the proposed model together with its anticipated benefits, challenges, and implementation considerations, and Section 5 concludes with recommendations.

2. LITERATURE REVIEW

2.1 The Merdeka Curriculum and the Changing Role of Economics Teachers

The Merdeka Curriculum grants schools and teachers considerable autonomy to design learning that is suited to students' needs, interests, and developmental stages, replacing a more rigid, content-driven approach with outcome-based planning centered on *capaian pembelajaran* and *alur tujuan pembelajaran* (Kemendikbudristek, 2022). This policy shift repositions the teacher as a learning designer who must translate broad learning outcomes into concrete instructional materials, activities, and assessments. A literature study on teacher competence development under the Merdeka Curriculum concludes that effective strategies for building this competence include structured training, peer collaboration, and the purposeful use of technology, rather than technology adoption alone (Purwati, 2024).

For economics teachers specifically, this design responsibility is compounded by the abstract and quantitative nature of much of the subject matter. Instructional-media theory holds that teaching materials function as a systematic guide toward learning objectives, while instructional media serve to present that content in ways that are more engaging, contextual, and comprehensible (Arsyad, 2020). Economics concepts such as elasticity, market structure, inflation, and fiscal or monetary policy are often taught through static, formula-driven exposition; translating them

into activity-based, real-world-anchored materials, such as simulations of household budgeting, market role-play, or case studies grounded in local economic conditions, requires both subject mastery and media-development skill. This is precisely the intersection at which AI tools are argued to offer the most leverage, reducing the time cost of producing contextual materials while leaving pedagogical judgment to the teacher (Moorhouse, et al., 2023).

2.2 Artificial Intelligence in Education: Opportunities and Constraints

Systematic reviews of AI in education identify a broad set of opportunities, including personalized content delivery, automated feedback, and support for teachers in generating and adapting instructional materials, alongside recurring challenges such as data privacy, algorithmic bias, over-reliance, and unequal access to infrastructure (Chiu, et al., 2023; Zawacki-Richter, et al., 2019). A widely cited SWOT-style analysis of ChatGPT in education similarly concludes that generative AI can meaningfully support lesson preparation and differentiation, but that its benefits are conditional on teachers' ability to critically evaluate and adapt AI output rather than adopt it uncritically (Farrokhnia, et al., 2024).

Empirical work on generative AI and teaching performance reinforces this conditionality. A study examining the influence of generative AI on teachers' instructional practice found that AI use was associated with improved teaching performance primarily when accompanied by structured guidance on how to integrate the tool into lesson design, rather than unassisted experimentation (Mulyani, et al., 2025). This is consistent with adoption data showing that even where teachers express strong interest in using AI, a substantial proportion do not feel adequately prepared to do so without training (Diliberti, et al., 2024), underscoring the centrality of professional development, and by extension community-service-style training, in translating AI's potential into classroom practice.

2.3 Teacher AI Competency Frameworks

A useful starting point for defining what AI competence means for teachers is the long-standing Technological Pedagogical Content Knowledge framework, which conceptualizes effective technology integration as the intersection of technological, pedagogical, and content knowledge (Mishra & Koehler, 2006). As generative AI introduced tools that behave differently from earlier educational technologies, particularly in their capacity to generate rather than merely deliver content, several extensions of this framework have been proposed. The Intelligent-TPACK framework adds a distinct AI-knowledge dimension encompassing teachers' understanding of how AI systems function and how to use them ethically (Celik, 2023), while a further extension explicitly incorporating generative AI argues that the discourse around tools such as ChatGPT should center on how teaching and learning themselves are changing, rather than narrower concerns such as plagiarism detection (Mishra, Warr, & Islam, 2023).

Complementing these pedagogically grounded frameworks, AI literacy has been defined more broadly as the set of competencies needed to critically evaluate AI technologies, communicate and collaborate effectively with them, and use them as tools online, at home, and in the workplace (Long & Magerko, 2020). At the policy level, the UNESCO AI Competency Framework for Teachers consolidates these strands into a structured set of competencies spanning teachers' knowledge, skills, and values for the AI era, explicitly framed around protecting teachers' professional agency rather than displacing it (UNESCO, 2024). A recent systematic literature review comparing multiple teacher AI-competency frameworks concludes that despite differences in terminology, most converge on three recurring dimensions: technical or operational knowledge of AI tools, pedagogical knowledge of how to integrate them into instructional design, and ethical or critical-evaluation knowledge concerning accuracy, bias, and appropriate use (Mahmud, et al., 2026). Table 1 summarizes how these frameworks relate to one another and to the design of the model proposed later in this article.

Table 1. Overview of Teacher AI-Competency Frameworks Informing the Proposed Model

Framework		Core Focus	Key Source	Relevance to This Model
TPACK		Intersection of technological, pedagogical, and content knowledge	Mishra & Koehler, 2006	Baseline structure for aligning AI-tool use with economics content and pedagogy
Intelligent-TPACK		Adds explicit AI knowledge and ethical-integration dimension	Celik, 2023	Basis for the ethics and verification component in Stage 4 of the model
GenAI-TPACK		Generative-AI-specific reframing of TPACK for content creation	Mishra, Warr, & Islam, 2023	Basis for treating AI as a co-drafting tool rather than a content source
AI Literacy		Understanding, using, monitoring, and evaluating AI critically	Long & Magerko, 2020	Basis for the prompt-literacy and critical-evaluation training sessions
UNESCO AI Competency Framework for Teachers		Knowledge, skills, and values for responsible AI use in teaching	UNESCO, 2024	Basis for the values and ethics strand across all six training stages

Source: synthesized by the author from the cited studies (2026).

2.4 Generative AI for Teaching Material and Media Development

Generative AI tools have been reported to assist teachers in drafting syllabi, lesson plans, worksheets, quizzes, and instructional narratives, substantially reducing the time required to prepare a first draft of teaching materials (Moorhouse, et al., 2023). Beyond text generation, design-oriented AI tools such as Canva AI support the rapid production of visual media, including infographics and presentation slides, while AI-assisted presentation platforms such as Gamma support the creation of interactive, narrative-driven slide decks. Evidence from higher-education settings indicates that when generative AI is embedded in teacher-led activities rather than used informally by students alone, it can improve learners' confidence, creativity, and engagement with subject content such as business planning (Mulyani, et al., 2025). Collectively, this literature suggests that AI's comparative advantage lies not in replacing teachers' pedagogical decisions but in accelerating the production of first drafts, visual assets, and interactive formats that teachers then verify, adapt, and contextualize for their own classrooms (Farrokhnia, et al., 2024; Akgun & Greenhow, 2022).

2.5 Community Service Training Models: Lessons from Prior Practice

Several recently reported community-service programs provide direct precedent for the model proposed in this article. Table 2 summarizes five such programs, drawn from published articles between 2024 and 2026, in terms of their target teachers, training design, and reported outcomes.

Table 2. Comparative Overview of Recent Indonesian Community-Service Programs on AI-Based Teacher Training

Study	Participants / Subject	Training Design	Reported Outcome
Silitonga, et al., 2026	35 junior high school teachers, various subjects, SMPN 6 Pematangsiantar	Six-stage participatory model: needs analysis, planning, training, guided practice, presentation, evaluation	Competency mean rose from 69.50 (pre-test) to 90.50 (post-test); product quality averaged 91.60, categorized Very Good
Wulandari, et al., 2026	Economics teachers, Sidoarjo, East Java	One-session AI-in-deep-learning training	Measurable improvement in teachers' readiness to apply AI-based instructional approaches
Aji, et al., 2024	Vocational high school teachers	ChatGPT-focused workshop for learning-media development	Reported improvement in teacher competence using ChatGPT for media creation
Ermawati, et al., 2024	Physics teacher working group (MGMP)	Experiential Learning Cycle applied to Merdeka Curriculum module writing	Improved module-writing competence within the subject working group
Mustamin, et al., 2025	Elementary school teachers, rural areas	Intensive mentoring for digital platforms and interactive content	Competency gains across multiple digital-platform dimensions despite infrastructure limitations

Source: compiled by the author from the cited studies (2024-2026).

Read together, these programs converge on a common structural logic: combining theoretical input, live demonstration of AI tools, guided hands-on practice, and intensive mentoring produces stronger and more durable competency gains than lecture-only formats, a pattern also observed at the level of general educational-technology training (Chiu, et al., 2023). At the same time, the table reveals a gap this article seeks to address: only one of the five programs targets economics teachers specifically (Wulandari, et al., 2026), and that program was limited to a single training session focused on pedagogical approach rather than a full product-development cycle spanning teaching-material design, guided practice, mentoring, and evaluation, as implemented for general subjects in Silitonga, et al. (2026).

2.6 Digital Divide, Equity, and Sustaining Professional Development

A recurring concern in the professional-development literature is that technology-focused training does not automatically translate into sustained classroom practice, particularly where infrastructure or peer support is limited. A systematic review of early-career teachers' digital-competence development found that structured mentoring and continued institutional support were more consistent predictors of sustained digital-competence growth than the training format itself (Masoumi & Noroozi, 2023). This concern is echoed directly in the Indonesian community-service literature, where a mentoring program for rural elementary school teachers reported measurable competency gains despite acknowledged infrastructure and connectivity limitations, attributing the result to the intensity of one-on-one mentoring rather than to reliance on high-bandwidth tools alone (Mustamin, et al., 2025).

Sustaining any competency gain also appears to depend on continued engagement through subject-based professional communities. A large-scale study of digital professional development linked to instructional integration found that teachers embedded in active professional learning communities were substantially more likely to translate training into sustained classroom practice than those trained in isolation (Liu, et al., 2024). This finding, together with the equity considerations above, informs both the mentoring intensity and the sustainability component of the model proposed in Section 4.

2.7 Synthesis and Research Gap

Taken together, the literature reviewed above supports four propositions that ground the remainder of this article. First, teacher AI competence is best understood as a multidimensional construct spanning technical, pedagogical, and ethical knowledge, rather than mere familiarity with a tool (Mishra & Koehler, 2006; Celik, 2023; UNESCO, 2024). Second, community-service training that combines instruction, demonstration, guided practice, and mentoring produces stronger outcomes than one-off exposure, a pattern replicated across several Indonesian programs (Silitonga, et al., 2026; Aji, et al., 2024; Ermawati, et al., 2024). Third, sustaining competency gains requires deliberate linkage to ongoing professional communities and continued institutional support, not simply the training event itself (Liu, et al., 2024; Masoumi & Noroozi, 2023). Fourth, despite this evidence base, a subject-specific, product-oriented, and fully staged training model for economics teachers, one that maps AI tools directly onto recurring economics topics and instructional products, has not yet been documented in the Indonesian community-service literature; the closest precedent remains a single-session training rather than a full development cycle (Wulandari, et al., 2026). This gap defines the contribution of the model proposed in Section 4.

2.8 Comparative International Practices in AI-Based Teacher Training

Placing the Indonesian evidence base in international context helps clarify both the urgency and the design logic of the proposed model. In the United States, the RAND survey noted above found substantial variation by subject area, with English and social-studies teachers more likely than mathematics or science teachers to report using AI for instructional-material adaptation, and found that district-level investment in AI training was rising even though only a minority of teachers had received formal guidance at the time of the survey (Diliberti, et al., 2024). Broader international reviews of AI in education similarly report that opportunities are recognized faster than institutional capacity to train teachers to use them responsibly, producing a persistent implementation lag between policy enthusiasm and classroom-level readiness across multiple education systems (Chiu, et al., 2023; Zawacki-Richter, et al., 2019).

Table 10 summarizes these cross-context observations alongside the Indonesian community-service evidence reviewed in Section 2.5, to illustrate that the subject-specific, mentoring-intensive design proposed in this article addresses a gap that is not unique to Indonesia, even though the model itself is designed around the Merdeka Curriculum's specific structure.

Table 10. Cross-Context Observations on AI Adoption and Teacher Training

Context	Key Observation	Source
United States (K-12)	About 18 percent of teachers had used AI to adapt materials; adoption varied strongly by subject area and district investment in training was rising	Diliberti, et al., 2024
Cross-country, general education	AI opportunities in education are recognized faster than institutional capacity to train teachers to use them responsibly	Chiu, et al., 2023; Zawacki-Richter, et al., 2019
Indonesia, junior secondary, multi-subject	Structured, mentoring-intensive training produced large measured competency gains across a 35-teacher cohort	Silitonga, et al., 2026
Indonesia, economics teachers	A single AI-pedagogy session improved readiness, but did not extend to a full product-development cycle	Wulandari, et al., 2026

Source: compiled by the author from the cited studies (2024-2026).

3. RESEARCH METHODOLOGY

This article is conceptual rather than empirical: it does not report data collected from an implemented training activity, but instead develops a training model through a structured narrative literature review and synthesis, an approach broadly consistent with the early, design-oriented phase of research-and-development methodology, in which a conceptual model is formulated prior to field testing and validation (Sugiyono, 2022).

Literature was identified through academic databases and journal platforms, including ScienceDirect, Frontiers, SpringerLink, Taylor and Francis Online, and Indonesian community-service and education journals indexed through Google Scholar, using combinations of the keywords "AI competency teacher," "generative AI teaching material," "TPACK generative AI," "Kurikulum Merdeka guru," and "pelatihan AI guru ekonomi," restricted to publications between 2019 and 2026. Table 3 summarizes the inclusion and exclusion criteria applied to the search results.

Table 3. Inclusion and Exclusion Criteria for the Literature Review

Criterion	Included	Excluded
Publication type	Peer-reviewed journal articles, conference proceedings, and officially published community-service reports	Non-attributable blog posts, unverified social-media content, and opinion pieces without identifiable authorship

Topic relevance	Teacher competency, professional development, or training design in relation to AI or digital technology	General AI-technology articles with no bearing on teacher competency or training design
Time frame	Published 2019-2026	Published before 2019, unless foundational (for example, the original TPACK framework)
Language and access	English or Indonesian, with an accessible full text or substantive abstract	Sources with no accessible text or abstract sufficient for synthesis

Source: developed by the author (2026).

Retrieved sources were thematically coded into four categories: first, competency frameworks describing what teachers need to know and be able to do with AI; second, generative AI tools and their application to instructional material and media development; third, training and mentoring designs reported in community-service or professional-development programs; and fourth, evaluation instruments used to measure competency, product quality, and participant response. The synthesis of these four categories, together with the pedagogical demands of economics instruction under the Merdeka Curriculum described in Section 2.1, forms the basis for the conceptual model presented in Section 4.

This method carries an important limitation that should be stated explicitly. Because the review is narrative rather than systematic in the PRISMA sense, it does not report a full search-and-screening flow diagram or an exhaustive count of records identified, screened, and included; instead, sources were selected purposively for their direct relevance to teacher AI competency and community-service training design. Consequently, all figures and outcomes reported in Table 2 are drawn directly from the cited studies and describe those studies' own reported results; they are not claims about the effectiveness of the model proposed in this article, which remains to be empirically tested.

4. RESULTS AND DISCUSSION

Building on the frameworks and precedents reviewed in Section 2, this section presents the AI-Integrated Participatory Training model, a six-stage community service framework intended specifically for strengthening economics teachers' competence in designing AI-assisted teaching materials and instructional media within the Merdeka Curriculum. The model is intended as a design proposal to be piloted and empirically evaluated by future teams rather than a report of an activity already carried out.

4.1 Design Principles of the Proposed Model

The proposed model rests on four design principles derived from the literature review. First, it is participatory, positioning teachers as active co-designers throughout the process rather than passive recipients of a lecture, consistent with the participatory approach reported to improve engagement and sustained application in prior community-service work (Silitonga, et al., 2026; Sugiyono, 2022). Second, it is product-oriented, meaning every training stage is designed to culminate in a usable, classroom-ready instructional product rather than conceptual knowledge alone, echoing the product-oriented emphasis found in comparable community-service literature (Silitonga, et al., 2026). Third, it is subject-contextualized to economics and business content, deliberately mapping AI tools to recurring economics topics rather than treating AI literacy generically. Fourth, it is mentoring-intensive and ethics-anchored, embedding explicit verification and critical-evaluation steps drawn from the Intelligent-TPACK and UNESCO frameworks (Celik, 2023; UNESCO, 2024), so that AI output is treated as a draft requiring pedagogical judgment rather than a finished product.

4.2 The Six Stages of the Proposed Model

Table 4 outlines the six proposed stages, their core activities, and their intended outputs. The sequence deliberately mirrors the input-process-output logic found effective in prior community-service training (Silitonga, et al., 2026; Mustamin, et al., 2025), while Stages 3 and 4 are adapted specifically for economics content.

Table 4. Proposed Stages of the AI-Integrated Participatory Training Model

Stage	Core Activity	Intended Output
1. Needs Analysis	Classroom observation, interviews with school leadership, and a structured survey of participating economics teachers' existing AI use, teaching-material practices, and perceived barriers	A documented profile of teachers' baseline AI literacy and priority economics topics for material development
2. Competency and Curriculum Mapping	Mapping selected learning outcomes in economics to candidate AI-assisted products, such as modules, handouts, worksheets, presentations, and simulations	A training curriculum and product plan aligned to the Merdeka Curriculum's economics learning outcomes
3. Guided AI Literacy Workshop	Interactive sessions on AI concepts and ethical use, with live demonstrations of ChatGPT, Canva AI, and Gamma, and prompt-writing practice grounded in economics scenarios	Teachers demonstrate basic prompt literacy and can explain at least one ethical risk of unverified AI output

4. Collaborative Product Development and Mentoring	Teachers work individually or in subject clusters to draft an economics teaching product with AI assistance, followed by facilitator mentoring on verification, contextual adaptation, and pedagogical alignment	A draft economics instructional product incorporating AI-assisted content that has been teacher-reviewed
5. Product Presentation and Peer Review	Teachers present their products to facilitators and peers for structured feedback using a shared rubric	A revised, classroom-ready instructional product per participant or team
6. Evaluation and Sustainability Planning	Administration of the competency post-test and response questionnaire, joint reflection, and formation of a follow-up plan linked to the school's economics teacher working group	Evaluation data as described in Section 4.4 and a sustainability plan for continued AI-assisted material development

Source: developed by the author (2026), adapted from Silitonga, et al. (2026) and Mustamin, et al. (2025).

4.3 AI Application Mapping for Economics Instructional Products

A distinguishing feature of the proposed model is its explicit mapping between recurring economics topics, target instructional products, and suitable AI tools, intended to give facilitators a concrete starting point for Stage 3 and Stage 4 activities rather than a generic tool tutorial. Table 5 illustrates this mapping using representative topics commonly taught at the junior and senior secondary level under the Merdeka Curriculum's economics and entrepreneurship strands.

Table 5. Proposed Mapping of Economics Topics to AI-Assisted Instructional Products

Economics Topic	Target Product	Suggested AI Tool	Pedagogical Purpose
Market structure: perfect competition versus monopoly	Comparative handout and infographic	Canva AI	Visualize structural differences to aid conceptual comparison
National income and gross domestic product	Teaching module with localized case study	ChatGPT	Draft contextual Indonesian case narratives for abstract macroeconomic concepts
Inflation and monetary policy	Interactive presentation	Gamma	Present time-series and policy scenarios in an engaging, narrative format
Personal and household financial literacy	Student worksheet with budgeting simulation	ChatGPT and spreadsheet-based tools	Build scenario-based exercises linking theory to household decision-making
Entrepreneurship and business planning	Digital media and simplified business-plan simulation	Canva AI and ChatGPT	Support drafting and visualizing a business plan or pitch deck as a project-based task
International trade and comparative advantage	Case-based discussion module with data visualization	ChatGPT and Canva AI	Illustrate trade scenarios and comparative-advantage calculations with local commodity examples

Source: developed by the author (2026).

Facilitators are expected to adapt this mapping to local curriculum emphases and to introduce additional tools where locally available, for example spreadsheet-based AI assistants for statistics-heavy topics such as price elasticity or index-number calculation, while retaining the underlying principle that AI output functions as a draft to be verified and pedagogically adapted by the teacher, not a final deliverable (Akgun & Greenhow, 2022; Celik, 2023).

4.4 Proposed Evaluation Instrument Framework

Because the proposed model has not yet been implemented, this article does not report competency scores, product-quality scores, or participant-response data. Instead, Table 6 proposes an evaluation instrument framework, adapted from evaluation designs used in comparable community-service programs (Silitonga, et al., 2026; Mustamin, et al., 2025), that future implementing teams can adopt to generate genuine empirical evidence of the model's effectiveness.

Table 6. Proposed Evaluation Instrument Framework

Evaluation Aspect	Proposed Instrument	Indicators	Proposed Analysis
Teacher AI competency	Pre-test and post-test with conceptual and applied items	Understanding of AI concepts; prompt literacy; ethical and critical evaluation of AI output; ability to apply AI to an economics teaching task	Descriptive statistics and paired pre-post comparison
Instructional product quality	Facilitator and peer rubric across five aspects	Alignment with learning outcomes; completeness of components;	Mean score per aspect and overall category

			creativity; integration of material and media; presentation and language quality	
Participant response	Five-point questionnaire	Likert	Relevance of content; facilitator mastery; training method; quality of mentoring; perceived benefit; readiness to implement in class	Mean score, percentage, and category per aspect
Sustainability indicator	Follow-up survey two to three months post-training		Continued use of AI tools; products shared within the subject teacher working group; perceived barriers to continued use	Descriptive summary and qualitative thematic notes

Source: developed by the author (2026), adapted from Silitonga, et al. (2026).

4.5 Anticipated Benefits

Grounded in the literature reviewed above, the proposed model can reasonably be expected to yield several benefits similar to those reported in comparable programs. Combining direct instruction with hands-on AI practice and mentoring has consistently been associated with stronger competency gains than lecture-only formats (Chiu, et al., 2023; Silitonga, et al., 2026), and structured guidance has been shown to be a precondition, not merely an accelerant, for translating generative-AI use into improved teaching performance (Mulyani, et al., 2025). By explicitly contextualizing AI use to economics content, the model is also positioned to address a gap left by more generic AI-literacy training, namely the absence of concrete guidance on how AI tools map onto specific instructional products within a given subject. In addition, embedding the model within an existing teacher working group, as proposed in Stage 6, is expected to improve the odds that any competency gain persists beyond the training period, consistent with evidence that professional learning communities strengthen the link between training and sustained instructional integration (Liu, et al., 2024).

4.6 Anticipated Challenges and Mitigation Strategies

Several challenges documented in the literature are directly relevant to anticipate in implementation. First, prior evidence shows that even successful training programs can leave a residual weakness in the creativity dimension of product quality, with teachers tending to adopt AI-generated drafts with limited further modification rather than substantially reworking them (Silitonga, et al., 2026); Stage 4 of the proposed model addresses this directly by requiring mentoring focused on contextual adaptation rather than draft acceptance. Second, ethical and accuracy risks associated with unverified AI output, including factual errors and the potential for bias, are well documented (Akgun & Greenhow, 2022; Celik, 2023) and are addressed through the explicit verification requirement embedded across Stages 3 and 4. Third, infrastructure and connectivity constraints, particularly outside major urban centers, have been shown to limit but not preclude successful AI-related digital training when programs use intensive, hands-on mentoring rather than assuming uniform access (Mustamin, et al., 2025); the model's design principle of mentoring intensity is intended to accommodate this variation, though facilitators implementing the model in low-connectivity settings should plan offline-capable fallback activities. Fourth, readiness gaps are common even among motivated teachers, since survey evidence indicates that many teachers who are enthusiastic about AI do not yet feel adequately prepared to use it independently (Diliberti, et al., 2024), reinforcing the case for a structured, staged training design rather than a single workshop. Table 7 summarizes these challenges alongside the corresponding mitigation embedded in the model.

Table 7. Anticipated Challenges and Corresponding Mitigation Strategies

Anticipated Challenge	Supporting Evidence	Mitigation Embedded in the Model
Limited creative reworking of AI-generated drafts	Silitonga, et al., 2026	Stage 4 mentoring explicitly requires contextual adaptation, not draft acceptance
Accuracy and ethical risk of unverified AI output	Akgun & Greenhow, 2022; Celik, 2023	Explicit verification checkpoint embedded in Stages 3 and 4
Infrastructure and connectivity constraints	Mustamin, et al., 2025	Mentoring-intensive design with offline-capable fallback activities
Teacher readiness gap despite enthusiasm	Diliberti, et al., 2024	Staged, multi-session design rather than a single workshop
Competency gains not sustained after training	Liu, et al., 2024; Masoumi & Noroozi, 2023	Stage 6 formally links the program to the school's subject teacher working group

Source: developed by the author (2026).

4.7 Implications for Implementation at Universitas Negeri Jakarta

As a conceptual model developed from the Faculty of Economics and Business, Universitas Negeri Jakarta, the proposed model is intended to be directly actionable within the university's community-engagement activities. Several practical implications follow from the design proposed above. First, the faculty's economics education, accounting, and management study programs are well positioned to supply subject-matter facilitators, while pre-service teacher students can be engaged as co-facilitators or teaching assistants during Stage 3 and Stage 4 workshops,

simultaneously building their own AI-pedagogical competence ahead of their teaching practicum. Second, a phased rollout is recommended over a single large-scale activity, beginning with an initial pilot at one or two partner secondary schools in the Jakarta metropolitan area, potentially including schools on the Greater Jakarta fringe where prior literature suggests infrastructure variation is more likely to surface implementation lessons (Mustamin, et al., 2025). Third, because this article does not report field data, the immediate next step for any team adopting this model is an empirical validation study using the instruments proposed in Section 4.4, so that claims about the model's effectiveness are grounded in genuine measurement rather than assumed from the literature alone.

To support planning, Table 8 proposes an illustrative implementation timeline for a single pilot cohort, and Table 9 proposes a stakeholder-role map. Both are planning proposals rather than records of an activity that has taken place.

Table 8. Illustrative Implementation Timeline for a Pilot Cohort

Week	Activity	Responsible Party
Week 1-2	Needs analysis: school visits, teacher survey, interviews with school leadership	Community-service team and partner school coordinator
Week 3	Competency and curriculum mapping; finalize training curriculum and product plan	Community-service team with subject-matter facilitators
Week 4-5	Guided AI literacy workshops and tool demonstrations	Facilitators and pre-service teacher co-facilitators
Week 6-8	Collaborative product development with intensive mentoring	Facilitators, mentors, and participating teachers
Week 9	Product presentation and peer review	All participants and facilitators
Week 10	Evaluation, competency post-test, response questionnaire, and sustainability planning with the teacher working group	Community-service team and school coordinator

Source: developed by the author (2026).

Table 9. Proposed Stakeholder-Role Map

Stakeholder	Proposed Role
Faculty of Economics and Business, Universitas Negeri Jakarta	Program design, facilitation, mentoring, and instrument development
Partner school leadership	Access facilitation, scheduling, and endorsement of the sustainability plan
Participating economics teachers	Active co-design of products; primary beneficiaries and evaluators of the training
Pre-service teacher students	Co-facilitation of workshops and mentoring, as part of Tri Dharma-linked field experience
Economics subject teacher working group (MGMP)	Long-term sustainability mechanism for continued AI-assisted material development

Source: developed by the author (2026).

Fourth, partnerships with campus AI-literacy initiatives or external AI-tool providers could help subsidize application access, for example premium tiers of design or presentation tools, for partner schools with limited procurement budgets, addressing one of the practical barriers noted in Section 4.6.

4.8 Limitations of the Proposed Model

Three limitations should be acknowledged. First, the model is derived from a narrative rather than a systematic literature review, and its design choices, while grounded in cited evidence, involve interpretive judgment regarding how findings from different subjects and settings transfer to economics education specifically. Second, the model has not yet been piloted; consequently, statements about its expected benefits in Section 4.5 are hypotheses consistent with prior comparable programs, not demonstrated outcomes of this model itself. Third, the AI-tool mapping in Table 5 reflects tools that were widely available at the time of writing; given the pace of change in generative-AI products, implementing teams should verify tool availability, pricing, and functionality before each training cycle rather than treating the mapping as permanently fixed.

4.9 Alignment with the UNESCO AI Competency Framework Domains

To further ground the model in an internationally recognized reference point, Table 11 maps the six proposed training stages onto the three overarching domains of the UNESCO AI Competency Framework for Teachers, namely knowledge, skills, and values (UNESCO, 2024). This mapping is intended as a design-validation check rather than an additional evaluation instrument: it demonstrates that the staged structure proposed in Section 4.2 is not an ad hoc sequence but one that deliberately touches each domain the framework identifies as necessary for responsible AI use in teaching.

Table 11. Mapping of Proposed Training Stages to UNESCO Competency Domains

UNESCO Domain	Description	Corresponding Stage(s)
Knowledge	Understanding what AI is, how it functions, and its implications for teaching and learning	Stage 1 (baseline profiling) and Stage 3 (conceptual input on AI)
Skills	Practical ability to use, evaluate, and adapt AI tools for instructional purposes	Stage 3 (tool demonstration) and Stage 4 (guided product development)
Values	Ethical, human-centered, and responsible use of AI that protects teachers' professional agency	Stage 4 (verification and mentoring) and Stage 6 (reflective evaluation)

Source: developed by the author (2026), based on UNESCO (2024).

4.10 Resource and Cost Considerations

Because the proposed model is mentoring-intensive rather than a single lecture, implementing teams should plan for resource needs beyond a typical one-day seminar. Three categories of resources are relevant. First, personnel: the model requires a facilitator team large enough to provide close mentoring during Stage 4, which prior community-service programs have staffed using a combination of lecturers and postgraduate or advanced undergraduate assistants (Silitonga, et al., 2026); at Universitas Negeri Jakarta, pre-service teacher students represent a readily available and pedagogically appropriate source of such assistance, as noted in Section 4.7. Second, technology access: while ChatGPT and Canva AI offer functional free tiers sufficient for initial training, sustained use of premium features, such as higher-resolution export or extended generation limits, may require budget for institutional or discounted educational licenses, particularly for schools intending to continue product development after the formal training ends. Third, materials and logistics: printed or digital handbooks summarizing prompt-writing guidance and ethical-use checklists, referenced during Stage 3 and Stage 4, help sustain consistent practice once facilitators are no longer present, and should be budgeted as a low-cost but high-value component of the program.

These considerations are offered as planning guidance rather than a costed budget, since actual costs will vary by partner-school context, cohort size, and tool pricing at the time of implementation; teams adopting the model should conduct a context-specific resource assessment during Stage 1 rather than assume the figures reported for comparable programs elsewhere will transfer directly.

5. CONCLUSION AND RECOMMENDATIONS

This article synthesized literature on teacher AI-competency frameworks, including TPACK, Intelligent-TPACK, GenAI-TPACK, and the UNESCO AI Competency Framework for Teachers, together with evidence from recent Indonesian community-service training programs, to propose the AI-Integrated Participatory Training model, a six-stage, subject-contextualized framework for strengthening economics teachers' competence in developing AI-assisted instructional materials and media under the Merdeka Curriculum. The review identified a consistent pattern across prior practice, namely that combining instruction, demonstration, guided practice, mentoring, and evaluation produces stronger competency outcomes than lecture-only formats, while also identifying a gap in economics-specific, product-oriented training relative to general-subject and STEM-focused programs.

The model's contribution lies in mapping this general training logic onto concrete economics topics and instructional products, and in proposing a companion evaluation instrument framework, implementation timeline, and stakeholder-role map that allow the model's effectiveness to be tested empirically rather than assumed. As a conceptual, literature-based proposal, the model's central limitation is that it has not yet been piloted in the field; its competency, product-quality, and sustainability claims are therefore framed as hypotheses grounded in comparable prior programs rather than demonstrated results.

Based on this synthesis, four recommendations are offered. First, future community-service teams, including at the Faculty of Economics and Business, Universitas Negeri Jakarta, are encouraged to pilot the proposed model with a defined partner school and to collect data using the instruments proposed in Section 4.4, thereby generating the empirical evidence this conceptual article does not itself provide. Second, program designers should treat the AI-tool mapping in Table 5 as a living document to be updated as generative-AI products evolve. Third, school leadership and university partners should formalize the linkage between training completion and the subject teacher working group described in Stage 6, since the literature indicates that this linkage, rather than the training event alone, is what sustains competency gains over time (Liu, et al., 2024). Fourth, future research should extend this line of inquiry by adapting the same design logic, needs analysis, competency mapping, guided practice, mentoring, evaluation, and sustainability planning, to other subject areas beyond economics, so that AI-based teaching-material development can be strengthened across the wider set of subjects taught under the Merdeka Curriculum.

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