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Research Article

Evaluation of AI competency development training program for teaching and learning management in quality schools under the 1 district 1 quality school policy of the secondary educational service srea office Samut Sakhon Samut Songkhram engagement in higher education

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Abstract: This study examined the effectiveness of a professional development program aimed at enhancing teachers' competencies in integrating artificial intelligence (AI) into teaching and learning within quality schools under the "One District, One Quality School" policy of the Secondary Educational Service Area Office Samut Sakhon–Samut Songkhram. The evaluation encompassed four dimensions—reaction, learning, behavior, and results—using a mixed-methods approach with 303 participating teachers. Data were collected through questionnaires, achievement tests, behavioral observation forms, and semi-structured interviews, and analyzed using descriptive statistics, paired t-tests, and qualitative content analysis. Results indicated that participants' reactions to the program were overwhelmingly positive, with the strongest endorsement for its alignment with the policy. Knowledge acquisition improved significantly ($p < .001$), with mean scores increasing from 12.45 (62.25%) pre-training to 16.78 (83.90%) post-training. Behavioral engagement was consistently high, particularly in sustained participation throughout activities. In terms of workplace application, teachers reported adopting AI tools in lesson planning, which fostered greater student engagement and improved academic outcomes, although limitations related to infrastructure and time constraints persisted. Overall, the program demonstrated substantial effectiveness in advancing teachers' knowledge, skills, and attitudes toward AI integration, contributing to measurable improvements in instructional quality and student learning.

Keywords: Program evaluation; Artificial intelligence in education; Teacher competency development; Teaching and learning management

1. Introduction

The rapid advancement of artificial intelligence (AI) has transformed various sectors, including education, where AI-powered tools and applications have the potential to enhance instructional design, personalize learning experiences, and improve student outcomes. Integrating AI into teaching and learning processes requires teachers to possess not only technical knowledge but also pedagogical competencies to effectively leverage such technologies in diverse classroom contexts. In Thailand, the "One District, One Quality School" policy seeks to elevate educational quality by fostering innovation and evidence-based practices across schools. However, despite the growing global discourse on AI in education, limited empirical research has investigated the effectiveness of professional development programs specifically designed to equip teachers with AI integration skills in alignment with national educational policies. Addressing this gap, the present study evaluates a professional development program implemented under the Secondary Educational Service Area Office Samut Sakhon–Samut Songkhram, aimed at enhancing teachers' competencies in integrating AI into their instructional practices. The evaluation focuses on four dimensions—reaction, learning, behavior, and results—following

a mixed-methods approach involving 303 teachers. By systematically examining teachers' responses, knowledge gains, behavioral engagement, and workplace applications, this research contributes evidence-based insights into the role of targeted professional development in advancing AI competencies among educators, thereby informing policy and practice to improve instructional quality and student learning outcomes.

The rapid advancement of artificial intelligence (AI) has significantly influenced the educational landscape. Integrating AI into teaching and learning processes is essential for enhancing instructional efficiency and preparing students for future competencies. The One District One Quality School (ODoQS) policy of the Office of the Basic Education Commission (OBEC) serves as a strategic initiative to reduce educational disparities and to establish at least one model school in each district. These schools act as community education hubs that provide equal opportunities for all learners [17].

2. Research Objectives

Based on the study on the influence of transformational leadership and organizational justice on faculty work engagement, with job satisfaction as a mediating variable, in universities in Liaoning Province, China, the new knowledge gained emphasizes the importance of:

1. To evaluate the reaction of training participants (Reaction Evaluation)
2. To evaluate the learning of training participants (Learning Evaluation)
3. To evaluate the behavior of training participants (Behavior Evaluation)
4. To evaluate the results that occur in the workplace of training participants (Results Evaluation)

3. Review of the Literature

3.1 Application of Artificial Intelligence in Education

The integration of artificial intelligence (AI) into education has been widely recognized for its potential to enhance instructional quality, streamline administrative processes, and promote learner-centered approaches. Pakdee [1] investigated AI applications in educational management under the Secondary Educational Service Area Office Bangkok Metropolis Zone 2, reporting improvements in teaching efficiency, instructional processes, and learner engagement, with applications spanning both pedagogy and school administration. Similarly, Siritharo [2] examined AI-enabled adaptive learning, highlighting its effectiveness in personalizing instruction to individual learner needs. Expanding this perspective, Ketsiri et al. [3] explored AI's role in 21st-century teaching and learning management, focusing on personalized learning, virtual assistant systems, automated assessment, and learning analytics. At the international level, Chen et al. [4] demonstrated AI's capacity to significantly enhance teaching and learning efficiency, particularly in personalized learning, a finding consistent with Holmes et al. [5], who underscored AI's transformative potential for traditional education models. While these studies collectively indicate a growing emphasis on AI adoption in Thailand's education system, most remain conceptual or tool-development-focused, lacking comprehensive empirical evaluations using standardized international frameworks to assess AI training effectiveness for teachers.

3.2 Training Evaluation Model According to Kirkpatrick's Concept

Kirkpatrick [6] developed a widely adopted four-level training evaluation model encompassing reaction, learning, behavior, and results. This framework has been validated as a systematic approach for assessing training impact, with Bates [7] confirming its effectiveness in organizational contexts. Tamkin et al. [8], in a comparative analysis of evaluation models, identified the Kirkpatrick Model as particularly suitable for technology-related training, a conclusion further supported by Smidt et al. [9] in their evaluation of teacher technology training programs. Despite its proven applicability in technology-based capacity building, its use in evaluating AI training for educators, particularly in Thailand, remains limited.

3.3 Thai Education Policy and School Quality Development

The Quality School Project, a core policy of the Ministry of Education, aims to elevate schools to meet quality standards appropriate to their contexts, reduce disparities, and promote equity nationwide. The initiative fosters readiness in teaching and learning management, ensures access to learning-conducive facilities, and encourages stakeholder participation, in line with the "Learning Well, Being Happy" policy [10]. The Office of the Basic Education Commission designates at least one model quality school per district, providing infrastructure, learning resources, and continuous budget support. Within this

framework, the Secondary Educational Service Area Office of Samut Sakhon–Samut Songkhram prioritizes quality school development under the "One District, One Quality School" policy, with a vision of leveraging digital technology for education, grounded in the sufficiency economy philosophy. Six schools have been designated as quality schools in this jurisdiction: Samut Sakhon Wutthichai School, Krathum Baen "Wiset Samut Khun" School, Wat Lak Si Phiphat Ratuppatham School, Thaihat School, Amphawan Wittayalai School, and Sakon Wisutthi School. These schools operationalize the Minister of Education's policies through collaborative efforts among administrators, teachers, educational personnel, parents, and communities.

3.4 Research Gap and Significance

The literature reveals three notable gaps: (1) the absence of empirical studies assessing the effectiveness of AI training for teachers within the Thai context, (2) the lack of application of the Kirkpatrick Model in evaluating AI training programs in schools, and (3) the scarcity of research linking AI training outcomes to the achievement of quality school policy goals. Although each dimension has been studied independently, systematic integration of these aspects is lacking. This study addresses these gaps by applying Kirkpatrick's evaluation framework as the primary conceptual model for assessing AI training effectiveness, while concurrently examining its alignment with and contribution to quality school policy objectives. The findings will provide evidence-based guidance for designing teacher technology training programs and inform education policy development to promote the effective and sustainable integration of AI into teaching and learning management.

4. Research Conceptual Framework

This research is evaluation research. The researcher established the research conceptual framework based on the concept/theory of Donald L. Kirkpatrick [10], dividing the evaluation into 4 levels: Reaction (satisfaction), Learning (increased knowledge and skills), Behavior (actual application of what was learned), and Results (impact on the organization), with details as follows

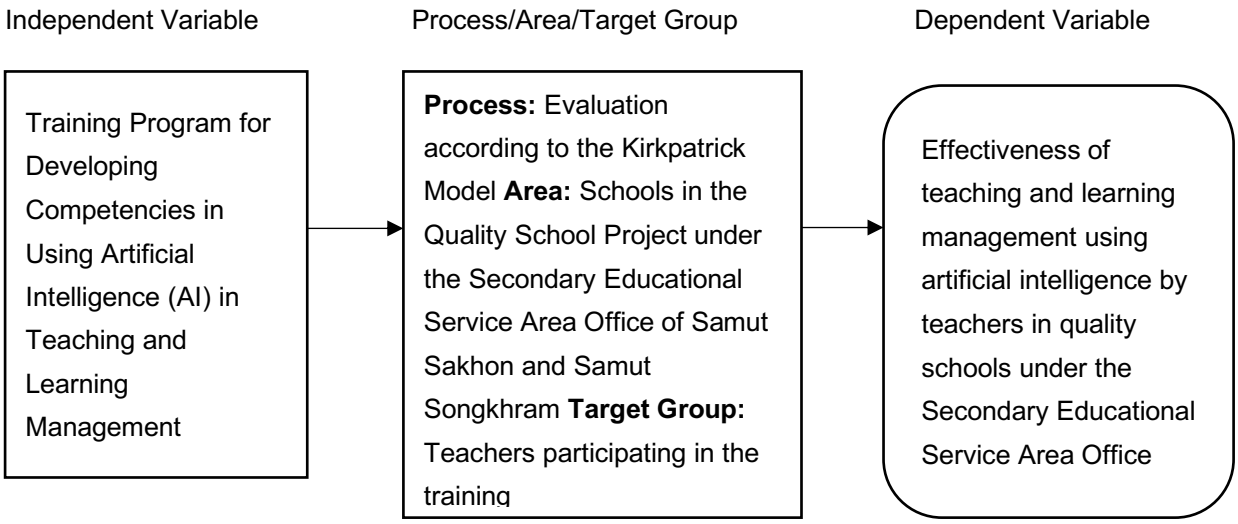

Figure 1. Research Framework

5. Research Methodology

This is evaluation research. The researcher defined the research area as schools in the Quality School Project under the Secondary Educational Service Area Office of Samut Sakhon and Samut Songkhram. The target group used for evaluation consists of teachers who participated in the training program for developing competencies in using artificial intelligence (AI) in teaching and learning management from schools in the Quality School Project under the Secondary Educational Service Area Office of Samut Sakhon and Samut Songkhram, totaling 303 people.

The evaluation tools used in the project were:

1. Reaction evaluation using opinion questionnaires, which divided opinion levels into 5 levels with scoring criteria of 5 levels
2. Learning evaluation using tests - multiple-choice tests with 4 options, totaling 20 items

3. Behavior evaluation using observation forms - observation forms showing opinions from statements predetermined by the researcher, dividing opinion levels into 5 levels, with instructors serving as observers and scorers

4. Results evaluation using interviews - open-ended interviews with predetermined interview questions from the researcher

All 4 instruments underwent quality verification by 3 experts, examining content validity using the Index of Item-Objective Congruence (IOC) assessment form. Items with IOC values of 0.60 or higher were selected, and all instruments had IOC values of 0.67.

After collecting data from all 4 levels of evaluation, the researcher analyzed the data as follows:

1. Analysis of reaction evaluation data from training participants by analyzing data to find the mean (μ) and standard deviation (σ)

2. Analysis of learning evaluation data from training participants by finding t-test values (Dependent Samples) and analyzing data using percentages

3. Analysis of behavior evaluation data from training participants by analyzing data to find the mean (μ) and standard deviation (σ)

4. Analysis of results evaluation data from training participants through qualitative content analysis summarized into key issues

6. Research Results

6.1 Results of Reaction Evaluation of Training Participants.

The reaction evaluation of the training program aimed at developing competencies in using artificial intelligence (AI) in teaching and learning management for schools in the Quality School Project under the “1 District 1 Quality School” policy of the Secondary Educational Service Area Office of Samut Sakhon and Samut Songkhram yielded overall results of highest satisfaction (μ = 4.52, σ = 0.58).

When analyzing each aspect, it was evident that alignment with the “1 District 1 Quality School” policy achieved the highest mean score (μ = 4.72, σ = 0.45), followed by content appropriateness (μ = 4.65, σ = 0.52), and instructor appropriateness (μ = 4.58, σ = 0.48), respectively. Venue appropriateness, however, stood out as the only component that scored at the high level (μ = 4.18, σ = 0.73), while it had the lowest mean score. with details shown in Table 1.

Table 1. Results of Participants' Reaction Evaluation

valuation Components	*μ*	σ	Level
Content appropriateness	4.65	0.52	Highest
Instructor appropriateness	4.58	0.48	Highest
Training duration appropriateness	4.52	0.61	Highest
Materials, equipment, and audiovisual aids appropriateness	4.45	0.67	Highest
Venue appropriateness	4.18	0.73	High
Alignment with "1 District 1 Quality School" policy	4.72	0.45	Highest
Overall	4.52	0.58	Highest

6.2 Results of learning Evaluation of Training Participants.

The learning evaluation results for the training program aimed at developing competencies in using artificial intelligence (AI) in teaching and learning management for schools in the Quality School Project, under the “1 District 1 Quality School” policy of the Secondary Educational Service Area Office of Samut Sakhon and Samut Songkhram, involving 303 participants, revealed an overall average pre-training score of 12.45 points (62.25%) and a post-training average score of 16.78 points (83.90%). A t-test comparison revealed that the post-training average score was significantly higher than the pre-training score, with a t-value of 15.42, which was statistically significant at the .001 level. with details shown in Table 2.

Table 2. Knowledge Test Scores of Participants Before and After Training

Test	Mean Score	Standard Deviation	t	p-value
Pre-training	12.45	2.85	15.42	0.001*
Post-training	16.78	2.12		

*Statistically significant at the .001 level

6.3 Results of behavior Evaluation of Training Participants

The behavior evaluation results for the training program aimed at developing competencies in using artificial intelligence (AI) in teaching and learning management for schools in the Quality School Project under the "1 District 1 Quality School" policy of the Secondary Educational Service Area Office of Samut Sakhon and Samut Songkhram revealed an overall level at the highest level ($\mu = 4.37$, $\sigma = 0.61$).

When considering individual components, the component with the highest mean score was continuity in activity participation ($\mu = 4.72$, $\sigma = 0.45$), followed by listening to and respecting others' opinions ($\mu = 4.68$, $\sigma = 0.48$), enthusiasm for learning ($\mu = 4.62$, $\sigma = 0.52$), and compliance with designated activities ($\mu = 4.58$, $\sigma = 0.55$), all at the highest level. Teamwork ($\mu = 4.55$, $\sigma = 0.58$) was also at the highest level.

Components at the high level included using AI tools in practice ($\mu = 4.22$, $\sigma = 0.65$), participation in learning activities ($\mu = 4.15$, $\sigma = 0.73$), ability to adapt knowledge ($\mu = 4.12$, $\sigma = 0.69$), and group presentation ($\mu = 4.08$, $\sigma = 0.68$).

On the other hand, the lowest mean score was exchanging opinions and asking questions ($\mu = 3.95$, $\sigma = 0.75$), which was also at the high level.

with details shown in Table 3.

Table 3. Results of Participants' Behavior Evaluation During Training

Behavior Evaluation Components	μ	σ	Level
Participation in learning activities	4.15	0.73	High
Group presentation	4.08	0.68	High
Using AI tools in practice	4.22	0.65	High
Exchanging opinions and asking questions	3.95	0.75	High
Ability to adapt knowledge	4.12	0.69	High
Teamwork	4.55	0.58	Highest
Enthusiasm for learning	4.62	0.52	Highest
Listening to and respecting others' opinions	4.68	0.48	Highest
Compliance with designated activities	4.58	0.55	Highest
Continuity in activity participation	4.72	0.45	Highest
Overall	4.37	0.61	Highest

6.4 Results Evaluation of Workplace Impact on Training Participants.

The results evaluation of workplace impact for participants in the competency development program for using artificial intelligence (AI) in teaching and learning management, based on interviews with training participants, can be summarized as follows:

- Changes in Teaching Methods Trained teachers applied AI knowledge concretely in teaching preparation, including creating diverse lesson plans, designing interesting learning activities, and developing modern learning media appropriate for the digital age. These changes provided teachers with more effective tools for teaching and learning management.

- Impact on Students The implementation of AI in classrooms resulted in noticeably increased student interest in learning. Students participated more in learning activities, showed enthusiasm for

learning, and academic achievement in various subjects showed positive trends, reflecting that AI technology truly enhances teaching and learning effectiveness.

- Teacher Self-Development Teachers gained increased confidence in using technology and became more willing to experiment with and implement new innovations in teaching. Additionally, there was increased knowledge exchange among teachers within schools, teachers developed positive attitudes toward using AI in education, and recognized the value of technology in elevating education.

- Obstacles and Limitations Significant obstacles were identified, including infrastructure problems, particularly unstable internet connections, time constraints in applying knowledge in classrooms, and the need for additional support from school administrators and relevant agencies to maximize the effectiveness of AI implementation in teaching and learning management.

7. Discussion

The results of the first objective show that participants were highly satisfied with the training, with an overall average satisfaction score of 4.52 (out of 5.0; SD = 0.58). The training's strongest rating was for its alignment with the "One District, One Quality School" policy (mean score: 4.72), highlighting its relevance to national education in driving positive reception. High satisfaction also resulted from appropriate content and the trainers' expertise. These outcomes align with findings by Holmes et al. [5], who reported that teachers who value AI in education perceive greater benefits. Similarly, AI-driven tutoring has been shown to boost teacher satisfaction. RAND Corporation [11] data show that half of U.S. districts now provide AI training for teachers—double the previous year's rate—indicating a growing policy trend.

The findings of the second objective demonstrate a statistically significant increase in participants' learning ($t = 15.42$, $p < 0.001$). The average test score rose from 62.25% to 83.90%, and the percentage of participants who met the passing criteria increased from 19.80% to 85.48%. This significant improvement can be attributed to the training's focus on practical, new AI technologies that teachers can directly apply in their classrooms, as well as a hands-on, practice-based learning approach. These results align with studies by Ahmad et al. [12] and Chen et al. [4], which found that AI technology can effectively promote adaptive learning and increase student motivation. Walter's [13] research further supports this, emphasizing that building comprehensive "AI literacy, "which includes foundational concepts, limitations, and ethical applications, is crucial for preparing teachers for the digital era.

The results of the third objective show that participants demonstrated excellent learning behavior, with a mean score of 4.37. Notably, continuous participation in activities scored a mean of 4.72, indicating strong engagement. Teachers were motivated by the novelty and challenges of AI, and they were eager to continue learning. This aligns with a Stanford study on the use of automated feedback to enhance teacher engagement and satisfaction, as well as research highlighting motivation and self-efficacy as key factors in AI adoption. Filiz et al. [14] also found that teachers value AI's efficiency and adaptability for supporting learning and lesson planning.

The evaluation of the fourth objective revealed changes in the workplace across several dimensions, including teaching methods, student impact, and teachers' professional development. However, the study also identified obstacles, including a lack of infrastructure and organizational support. This suggests that integrating AI into education requires systemic changes beyond just teacher skills. These findings are supported by the Stanford AI+Education Summit, which noted that AI can assist teachers with real-time feedback and post-lesson reports. A literature review by Floridi et al. [15] and Holmes and Tuomi [16] highlights a shift in the teacher's role from a knowledge provider to a learning facilitator in the age of AI. The RAND Corporation also found that educational leaders are prioritizing training to reduce teachers' fear and discomfort with AI before immediately integrating it into instructional tools.

New Knowledge from the Research

This research has established a significant body of new knowledge concerning a "Model for Evaluating the Effectiveness of AI Training for Teachers in the Thai Context." This model adapts the Kirkpatrick framework to better suit the Thai education system. Key findings that differ from previous studies include

Policy as a Driving Force: The primary success factor for AI training for Thai teachers is not solely technical content. Instead, alignment with national policy is the strongest predictor of satisfaction, reflecting the Thai educational culture where teachers value support from national-level policies.

Systemic Impact Phenomenon: The research reveals a "systemic impact transfer phenomenon," where teachers' AI knowledge has a ripple effect on students, the broader community, and the education system as a whole.

Integrated Support Requirement: The study highlights an "integrated support requirement phenomenon," demonstrating that AI training necessitates multifaceted support, including robust infrastructure, administrative backing, and a comprehensive learning ecosystem.

The model derived from this research is the "Integrated Thai Context Model for Evaluating the Effectiveness of AI Training for Teachers." Its four distinct characteristics are: 1) connection to state policy, 2) continuous and practical learning, 3) building confidence for knowledge sharing, and 4) developing a holistic support system. This model can serve as a valuable guideline for designing and evaluating future technology training for Thai educators, as well as for the systemic and sustainable development of educational personnel in the digital age.

8. Summary

This study assessed the effectiveness of an AI competency development training program for teachers using the four-level Kirkpatrick Model. The results show that teachers were highly satisfied, particularly with the training's alignment with the "One District, One Quality School" policy. Participants also demonstrated a statistically significant increase in knowledge, high levels of engagement, and a positive impact on teaching methods and student outcomes. However, the study also identified obstacles related to infrastructure that need to be addressed. This research creates a new knowledge base regarding a model for evaluating the effectiveness of AI training for teachers in the Thai context, which can be applied to future digital teacher development.

9. Recommendations

Based on the research findings, the following recommendations are offered:

9.1 Recommendations for Practical Application

While satisfaction was very high, the training venue received the lowest score. Therefore, relevant agencies should:

1)improve training venues to meet standards suitable for AI technology learning,

2) enhance publicity to link AI training with state policies to boost motivation, and

3) establish standards for AI training for teachers that align with national education policies.

The significant increase in learning suggests success. Agencies should:

1) expand the training to cover teachers from all subjects and educational levels,

2) develop advanced AI courses for teachers who have completed the basic level,

3) create a continuous system for tracking and evaluating teachers' AI knowledge, and

4) build a network for knowledge sharing among trained teachers.

High participation was noted, but idea exchange and questioning were low. Agencies should: 1) promote a more participatory learning environment to stimulate interaction, 2) organize additional workshops and hands-on activities to build confidence in sharing ideas, and 3) develop diverse training formats (online and offline) to support continuous learning.

9.2 Recommendations for Future Research

This research yielded a key finding that the alignment of AI training with state policy is a crucial driver of success across all four Kirkpatrick levels. This can be applied to the development of teachers in other technologies and to the training of all educational personnel in the digital era. Future research should focus on:

1) Studying the long-term impact of AI training on student academic achievement over 1-2 years.

2) Developing and testing the effectiveness of online AI learning platforms for teachers.

3) Conducting a comparative study of the effectiveness of AI training between teachers in urban and rural schools.

4) Researching the factors that influence the adoption and use of AI technology by Thai teachers.

5) Developing a blended learning AI training model that is appropriate for the Thai educational context.

10. Patents

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