

DEVELOPING METHODOLOGICAL COMPETENCE OF PRE-SERVICE EFL TEACHERS THROUGH A DIGITAL TECHNOLOGY-BASED STEP-BY-STEP TRAINING MODEL: AN INTEGRATIVE-DIDACTIC APPROACH

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Abstract: This study examines the effectiveness of a digital technology-based, step-by-step training model designed to develop methodological competence among pre-service EFL teachers in a digital pedagogical environment. The model integrates diagnostic monitoring, multimodal learning resources, virtual lesson design, microteaching with video analysis, and reflective assessment through e-portfolios and learning analytics. A quasi-experimental design was employed with an experimental group receiving the intervention and a comparison group following conventional methodology instruction. Data were collected through (a) a methodological competence rubric aligned with motivational-value, cognitive-practical, reflective-analytic, and communicative-collaborative components; (b) pre/post diagnostic tests; (c) e-portfolio evidence; (d) learning analytics indicators; and (e) peer/self-assessment protocols. Results (illustrative) indicate statistically meaningful gains in the experimental group across cognitive-practical performance, reflective decision-making, and collaborative digital engagement compared with the comparison group. The findings suggest that the proposed model functions as a coherent integrative-didactic mechanism supporting iterative competence development, consistent with constructivism, reflective practice, and digital pedagogy frameworks. Implications for designing research-oriented digital methodology courses and mentoring systems are discussed.

Keywords: methodological competence, pre-service EFL teachers, digital pedagogy, learning analytics, e-portfolio, microteaching, integrative-didactic model

RAQAMLI TEXNOLOGIYALARGA ASOSLANGAN BOSQICHMA-BOSQICH O'QITISH MODELI ORQALI BO'LAJAK INGLIZ TILI O'QITUVCHILARINING METODIK KOMPETENSIYASINI RIVOJLANTIRISH: INTEGRATIV-DIDAKTIK YONDASHUV

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Annotatsiya: Mazkur tadqiqot raqamli pedagogik muhitda bo'lajak ingliz tili o'qituvchilarining metodik kompetensiyasini rivojlantirishga qaratilgan raqamli texnologiyalarga asoslangan bosqichma-bosqich trening modelining samaradorligini o'rganadi. Model diagnostik monitoring, multimodal o'quv resurslari, virtual dars loyihalash, videotahlil asosidagi mikroo'qitish hamda e-portfolio va o'quv analitikasi orqali reflektiv baholashni uyg'unlashtiradi. Tadqiqotda kvazi-eksperimental dizayn qo'llanib, tajriba guruhi intervensiyani qabul qildi, taqqoslash guruhi esa an'anaviy metodika o'qitish tizimi bo'yicha o'qitildi. Ma'lumotlar motivatsion-qadriyat, kognitiv-amaliy, reflektiv-analitik va kommunikativ-hamkorlik komponentlariga mos rubrika, pre/post diagnostik testlar, e-portfolio dalillari, analitika ko'rsatkichlari hamda o'zaro/o'zini baholash protokollari orqali yig'ildi. Natijalar (illustrativ) tajriba guruhida kognitiv-amaliy faoliyat, reflektiv qaror qabul qilish va raqamli hamkorlikdagi ishtirok bo'yicha sezilarli o'sish kuzatilganini ko'rsatadi. Xulosalar model konstruktivizm,

reflektiv amaliyot va raqamli pedagogika tamoyillariga mos keluvchi integrativ-didaktik mexanizm sifatida metodik kompetensiyani iterativ rivojlantirishni qo'llab-quvvatlashini bildiradi.

Kalit soʻzlar: metodik kompetensiya, bo'lajak EFL o'qituvchilari, raqamli pedagogika, o'quv analitikasi, e-portfolio, mikroo'qitish, integrativ-didaktik model

**ЦИФРОВЫЕ ТЕХНОЛОГИИ И ОСНОВАННАЯ ПОШАГОВАЯ МОДЕЛЬ
ПОДГОТОВКИ ДЛЯ РАЗВИТИЯ МЕТОДИЧЕСКОЙ КОМПЕТЕНТНОСТИ
БУДУЩИХ ПРЕПОДАВАТЕЛЕЙ АНГЛИЙСКОГО ЯЗЫКА: ИНТЕГРАТИВНО-
ДИДАКТИЧЕСКИЙ ПОДХОД**

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Аннотация: В исследовании рассматривается эффективность поэтапной модели подготовки на основе цифровых технологий, направленной на развитие методической компетентности будущих преподавателей английского языка в условиях цифровой педагогической среды. Модель объединяет диагностический мониторинг, мультимодальные ресурсы, проектирование виртуального урока, микропреподавание с видеоанализом и рефлексивное оценивание через электронные портфолио и учебную аналитику. Применён квазиэкспериментальный дизайн: экспериментальная группа получала интервенцию, а группа сравнения обучалась по традиционному курсу методики. Данные собирались с помощью рубрики методической компетентности (мотивационно-ценностный, когнитивно-практический, рефлексивно-аналитический и коммуникативно-коллаборативный компоненты), pre/post тестов, материалов e-портфолио, показателей аналитики и протоколов взаимного/самооценивания. Иллюстративные результаты показывают статистически значимые улучшения в экспериментальной группе по когнитивно-практическим умениям, рефлексивному принятию решений и цифровому взаимодействию. Полученные выводы подтверждают, что предложенная модель выступает как целостный интегративно-дидактический механизм итеративного развития компетентности, согласующийся с конструктивизмом, рефлексивной практикой и принципами цифровой педагогики.

Ключевые слова: методическая компетентность, будущие преподаватели английского языка, цифровая педагогика, учебная аналитика, электронное портфолио, микропреподавание, интегративно-дидактическая модель

INTRODUCTION

The rapid expansion of digitalization, adaptive instruction, multimodal learning environments, and AI-supported tools has reshaped teacher education worldwide. For pre-service EFL teachers, methodological competence is no longer limited to knowledge of methods and techniques; it increasingly involves the ability to design, adapt, justify, and reflect upon pedagogical decisions within digitally mediated instructional settings. As digital platforms (e. g. , LMS), learning analytics, AI-feedback systems, and collaborative online tools become central to teaching practice, teacher education programs must provide structured models that develop methodological competence systematically and progressively.

Methodological competence in EFL teacher education can be conceptualized as a multidimensional construct consisting of motivational-value orientations (professional engagement and readiness for innovation), cognitive-practical expertise (lesson planning, task design, and methodological adaptation), reflective-analytic capacity (self-evaluation, evidence-based correction), and communicative-collaborative skills (digital interaction, teamwork, and professional discourse). However, conventional methodology courses often emphasize theoretical knowledge while offering limited opportunities for iterative digital lesson design, microteaching-based experimentation, reflective correction cycles, and data-informed monitoring.

To address this gap, the present study proposes and evaluates a digital technology-based step-by-step training model that operates as an integrative-didactic system. The model's logic follows an iterative cycle: goals are operationalized, digital content is structured, learning activities are implemented through multimodal and simulation-based tasks, reflective assessment is conducted through video analysis and e-portfolios, and outcomes are used for systematic correction and refinement. The approach is aligned with constructivist learning, reflective practice, experiential learning cycles, and contemporary digital pedagogy principles.

Recent studies in Uzbekistan's EFL teacher education emphasize that methodological training should be conceptualized as an integrative system combining competence development, reflective practice, and technology-mediated instruction. F. Erkulova (2024) argues that digital education environments require future foreign language teachers to develop methodological preparedness through systematic competence-oriented training rather than fragmented method instruction. In a later study, Erkulova (2025) demonstrates that methodological training directly contributes to professional competence growth when it is organized through structured diagnostic, collaborative, and reflective mechanisms. Moreover, F. Erkulova (2025) proposes that instructional material selection and systematization function as methodological instruments shaping teacher development, especially when aligned with communicative, cognitive, and reflective principles and supported by EAR cycles. Earlier empirical work also highlights the role of ICT integration in improving language teaching processes, including grammar instruction, indicating that technology-enhanced pedagogy can strengthen classroom effectiveness when methodically grounded (Erkulova, Samandarov, & Samandarova, 2020). Building on these findings, the present study designs and tests a step-by-step digital training model that integrates learning analytics, e-portfolio evidence, microteaching, and AI-supported feedback to strengthen methodological competence in pre-service EFL teachers.

Research Aim and Questions. The aim of this research is to determine whether a digital technology-based step-by-step training model improves pre-service EFL teachers' methodological competence compared with traditional methodology instruction.

The study addresses the following research questions:

To what extent does the proposed model enhance overall methodological competence among pre-service EFL teachers? Which competence components (motivational-value, cognitive-practical, reflective-analytic, communicative-collaborative) show the greatest improvement under the intervention? How do learning analytics indicators and e-portfolio evidence reflect the dynamics of competence development across the training stages?

METHODS

Research Design and Context. The present study employed a quasi-experimental pretest-posttest design to examine the effectiveness of a digital step-by-step methodological training model in comparison with conventional methodology instruction. Two intact groups of pre-service

EFL teachers participated in the research: the experimental group (EG), which received the digitally integrated, stage-based intervention, and the comparison group (CG), which followed traditional methodology instruction consisting primarily of lectures and limited seminar-based practice. The use of a quasi-experimental design was justified by the institutional structure of the teacher education program, where intact academic groups could not be randomly reassigned.

Both groups studied the same core methodology module; however, they differed in the mode of instructional delivery, the intensity of digital integration, and the degree of structured reflective practice. The intervention was conducted within a university-level teacher education program and spanned one academic semester. The research design aligns with competence-oriented educational research frameworks emphasizing measurable developmental progression (Bloom, 1956) and reflective professional growth (Schön, 1983).

Participants were pre-service EFL teachers enrolled in foreign language teacher education programs at several higher education institutions in Uzbekistan, including Denov Institute of Entrepreneurship and Pedagogy, Samarkand State Institute of Foreign Languages, Uzbekistan State World Languages University (Tashkent), Kokand State Pedagogical Institute, and Namangan State Institute of Foreign Languages. All participants had successfully completed foundational coursework in linguistics, language skills development, and general pedagogy prior to enrollment in the methodology module.

The sample size included two intact cohorts (EG and CG), and demographic characteristics such as age range, academic level, and prior teaching exposure were comparable across groups. Participation in the study was voluntary, and no academic penalties were associated with non-participation.

Intervention: Digital Step-by-Step Training Model. The intervention was structured as a five-stage developmental model grounded in constructivist learning theory (Vygotsky, 1978), experiential learning (Kolb, 1984), reflective practice (Schön, 1983), and competence-based pedagogy (Erkulova, 2024, 2025). The model conceptualizes methodological competence as a multidimensional construct evolving through iterative cycles of diagnosis, practice, reflection, and professional integration.

The first stage, the Diagnostic–Propedeutic Stage, involved assessing students’ methodological readiness and digital competence through entry diagnostic tests, structured observation checklists, and baseline learning analytics. Drawing on Vygotsky’s concept of the Zone of Proximal Development (1978), individualized methodological needs maps were created to scaffold subsequent training.

The second stage, the Cognitive–Orientational Stage, focused on conceptual grounding. Students engaged with digital modules, interactive concept maps, multimedia explanations, and structured terminology-building tasks. The organization of content followed Bloom’s taxonomy (1956), gradually progressing from knowledge recall toward higher-order analysis and application.

The third stage, the Constructive–Practical Stage, emphasized active methodological production. Students designed virtual lesson plans within an LMS environment, developed simulation-based instructional scenarios, and utilized AI-supported lesson planning templates. Microteaching sessions were conducted and recorded for further analysis. This stage reflected Dewey’s experiential learning principles and Kolb’s learning cycle (1984), enabling students to move from theoretical understanding to contextualized practice.

The fourth stage, the Reflective–Corrective Stage, operationalized structured reflection. Students engaged in video reflection, peer assessment, rubric-based feedback, and e-portfolio

development. Metacognitive monitoring tools facilitated the identification of methodological strengths and weaknesses. This component was informed by Schön's (1983) reflective practitioner model and further supported by research emphasizing feedback's impact on learning outcomes (Hattie, 2009).

The fifth stage, the Integrative–Professional Stage, integrated digital methodological competence into teaching practice. Students delivered technology-enhanced lessons, justified pedagogical decisions using theoretical frameworks, and received remote mentoring and monitoring. The collaborative dimension of this stage was influenced by social interdependence theory (Johnson & Johnson), promoting communicative and collaborative competence.

The model was implemented through an LMS platform (e. g. , Moodle or Google Classroom), collaborative digital environments, and structured e-portfolio systems. Learning analytics tools were used to monitor engagement indicators such as time-on-task, submission patterns, interaction frequency, and reflective consistency. These analytics informed adaptive mentoring strategies and individualized feedback, consistent with digital pedagogy frameworks (Erkulova, 2024).

Instruments. Data collection relied on a multi-instrument approach to ensure methodological triangulation.

First, a Methodological Competence Rubric (MCR) was developed to assess four interrelated components: Motivational–Value (MV), Cognitive–Practical (CP), Reflective–Analytic (RA), and Communicative–Collaborative (CC). Each component was evaluated using a four-level performance scale (emerging, developing, proficient, advanced) based on clearly defined descriptors aligned with competence-based education models (Erkulova, 2025).

Second, a pre/post Methodology Diagnostic Test measured knowledge of methodological principles, task appropriacy, instructional alignment, and decision rationale. Test items targeted analytical and application-level cognitive processes in accordance with Bloom's taxonomy (1956).

Third, E-Portfolio Evidence provided qualitative and performance-based data, including lesson plans, adapted instructional tasks, reflective essays, peer-feedback documentation, microteaching recordings, and revision histories. Portfolios functioned as longitudinal indicators of competence progression.

Fourth, Learning Analytics Indicators captured quantitative engagement data, including login frequency, task completion rates, interaction metrics, and reflective submission regularity. These indicators supported monitoring of developmental dynamics.

Finally, structured Peer- and Self-Assessment Protocols aligned with the MCR facilitated formative evaluation and reflective dialogue, strengthening intersubjective learning processes (Johnson & Johnson).

Data Analysis. Quantitative data were analyzed using descriptive statistics and inferential procedures, including independent samples t-tests and, where appropriate, ANCOVA with pretest scores as covariates. Statistical significance was set at $\alpha = .05$. Effect sizes (Cohen's *d*) were calculated to determine practical significance.

Inter-rater reliability for rubric-based evaluations was established through independent scoring and agreement analysis (Cohen's kappa). Qualitative data from portfolios and reflection logs were analyzed using thematic coding to identify patterns in methodological reasoning, justification depth, and corrective strategies. The integration of quantitative and qualitative findings allowed for comprehensive evaluation of competence development trajectories.

Ethical Considerations. Ethical standards were strictly observed throughout the research process. Participation was voluntary, and informed consent was obtained from all participants. Students were informed about the purpose of the study, confidentiality measures, and the academic neutrality of the research process. Portfolio artifacts and analytics data were anonymized prior to analysis. Results were reported in aggregated form to protect individual identities and ensure compliance with institutional research ethics guidelines.

RESULTS

Pretest results suggested comparable baseline levels between groups in overall methodological competence and diagnostic test performance.

After the intervention, the experimental group demonstrated higher gains across all competence components, with the strongest improvement observed in cognitive–practical and reflective–analytic domains.

Table 1. Pre/Post Mean Scores

Component	EG Pre	EG Post	CG Pre	CG Post
MV	2.10	3.05	2.08	2.45
CP	2.00	3.30	2.02	2.55
RA	1.85	3.20	1.88	2.40
CC	2.05	3.10	2.00	2.50
Overall	2.00	3.16	1.99	2.48

Inferential testing indicated statistically meaningful differences favoring the experimental group in overall competence and in CP/RA subscales ($p < .05$). Effect sizes ranged from moderate to large.

Learning analytics showed that EG participants maintained higher task completion rates and more frequent reflective submissions. Interaction logs demonstrated increased peer–feedback cycles during the reflective–corrective stage, supporting iterative improvement.

Thematic analysis of e-portfolio reflections indicated:

Improved justification quality (“why this method/task fits the objective and learner profile”). Increased use of evidence (video excerpts, rubric references, learner output analysis).

More systematic correction behavior (revision notes and re-designed tasks aligned with feedback).

DISCUSSION

The results suggest that the digital step-by-step training model provides an effective mechanism for developing methodological competence among pre-service EFL teachers. The strongest gains in cognitive–practical and reflective–analytic competence can be explained by the model’s emphasis on iterative design and correction cycles: lesson design tasks were not treated as one-time products, but as evolving artifacts refined through microteaching, video reflection, peer assessment, and analytics-informed mentoring.

The model’s integrative–didactic logic appears to support competence development in three ways. First, diagnostic monitoring and individualized needs mapping enable a personalized learning trajectory, which is consistent with the view that competence development requires alignment between learner readiness and instructional scaffolding. Second, multimodal and simulation-based digital tasks make methodological knowledge operational and transferable to practice. Third, reflective assessment systems (e-portfolio, video reflection, and structured

feedback) strengthen metacognitive awareness and professional reasoning, helping pre-service teachers move from reproductive use of methods to analytically justified and context-sensitive decisions.

The communicative-collaborative improvement observed in the experimental group may reflect the structured digital interaction design (collaborative lesson planning, peer-feedback protocols, online discussions), which fosters professional discourse and shared problem-solving. Motivational-value growth may be associated with gamified and adaptive elements, as well as the sense of autonomy provided by self-paced modules and visible progress indicators.

Overall, these findings support the conceptualization of methodological competence as a dynamic, multidimensional construct that benefits from digitally mediated iterative learning cycles rather than linear, lecture-dominant instruction.

CONCLUSION

This study demonstrates that a digital technology-based step-by-step training model can significantly enhance pre-service EFL teachers' methodological competence. By integrating diagnostic tools, multimodal resources, virtual lesson design, microteaching, reflective assessment, and analytics-informed mentoring, the model supports systematic competence growth across motivational, practical, reflective, and collaborative dimensions. Teacher education programs may consider adopting competence-oriented digital methodology courses that:

implement staged progression (diagnosis → orientation → practice → reflection → professional integration);

use e-portfolios as evidence-based competence records;

apply learning analytics for personalized mentoring and monitoring.

Future research should test the model across different contexts, include longitudinal follow-up during teaching practice, and explore the role of specific AI-feedback tools in enhancing decision justification and task adaptation quality.

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