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Research Competence of a Modern Teacher as a Factor in Improving the Quality of Education and Supporting Sustainable Development Goals (SDGs)

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ABSTRACT

This study examines teacher research competence as a factor in improving educational quality and supporting the Sustainable Development Goals (SDGs). Using theoretical analysis, survey data, and economic-mathematical modeling, the study clarifies the structure, conditions, and impact of research competence in modern teaching. Data from 10 secondary school teachers were collected through a questionnaire assessing professional competencies, temperament, motivation, stress resistance, and burnout. Communicative and methodological competencies were strongest, while research, managerial, digital, and inclusive competencies need further development. Research competence was positively related to intrinsic motivation and methodological competence. The study proposes a three-component model integrating research practice, professional communities, and motivational support to strengthen evidence-based teaching and sustainable educational improvement.

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1. INTRODUCTION

The transformation of contemporary education requires teachers who are able to adapt to social, technological, institutional, and pedagogical changes. In Ukraine, educational modernization is shaped by internal reform needs, integration into the European educational space, digitalization, wartime challenges, and increasing expectations for the quality of educational outcomes. These challenges are closely related to the global agenda of the Sustainable Development Goals (SDGs), especially SDG 4, which emphasizes inclusive and equitable quality education and lifelong learning opportunities for all. In this context, the teacher remains a central actor in ensuring the effectiveness, resilience, and competitiveness of the education system. The quality of teaching depends not only on knowledge transmission but also on teachers' ability to analyze educational situations, design learning environments, innovate, and make evidence-based pedagogical decisions [1].

A modern teacher is increasingly expected to act not only as an instructor but also as a researcher, analyst, and designer of educational practice. This shift reflects the growing importance of research competence in professional teaching. Research competence enables teachers to identify classroom problems, formulate research questions, collect and interpret educational data, evaluate the effectiveness of teaching strategies, and improve learning based on evidence. In this sense, research competence becomes a key element of teacher professionalism and a factor in improving the quality of education. It also supports the SDG agenda because teachers who use evidence-based practices are better prepared to promote inclusive learning, reduce educational gaps, and improve student outcomes. Modern educational contexts require interactive methods, scientific thinking, design-oriented activities, digital responsiveness, and sensitivity to broader social changes in learning environments [2-5].

The importance of teacher research competence is especially relevant to the implementation of the Concept of the New Ukrainian School (see Ministry of Education and Science of Ukraine in 2016 regarding Conceptual framework for reforming general secondary education "New Ukrainian School" until 2029. <https://lnk.ua/YN3a9aReJ>). This reform emphasizes critical thinking, innovation, student-centered learning, reflective practice, and evidence-based educational decision-making. These priorities are consistent with SDG 4 because quality education requires teachers who can design meaningful learning, monitor student progress, respond to diverse needs, and improve instruction through reflection and data analysis. Previous studies have also emphasized the relevance of SDGs in education through various perspectives, including the use of modern pedagogical technologies in historical geography learning [6], the development of professional readiness in vocational education [7], the relationship between school feeding programs and learning outcomes [8], and the role of learning analytics in supporting quality education and digital competence among science educators [9]. Under this framework, teachers are expected to move beyond the routine implementation of ready-made methodological materials. They need to develop the ability to test educational approaches, analyze learning outcomes, reflect on teaching decisions, and adapt practices to students' needs. However, the development of research competence among teachers remains uneven. Many teachers still rely mainly on traditional methods or externally provided materials without systematically analyzing the effectiveness of their own pedagogical solutions.

Another challenge is the insufficient integration of research training into teacher education and professional development. In many cases, research activity in higher education is limited

to course papers, qualification works, or formal academic tasks that are weakly connected to real classroom practice. As a result, future teachers may enter the profession without a strong research culture, limited experience in educational data analysis, and insufficient preparation for evidence-based innovation. This gap reduces teachers' potential for professional autonomy, reflective learning, and continuous improvement. From an SDG perspective, this issue is important because teacher competence directly affects the sustainability, inclusiveness, and quality of education systems.

At the same time, postgraduate teacher education and in-service professional development offer new opportunities for developing research competence. Participation in school-based research, pedagogical experiments, grants, educational projects, professional communities, digital platforms, and methodological laboratories can help teachers connect research with everyday teaching practice. Such activities support a culture of evidence-based education in which pedagogical decisions are grounded in data, reflection, and collaborative analysis rather than intuition or tradition. Countries with stronger teacher research cultures tend to support higher professional autonomy, innovation, and instructional quality (see OECD in 2025 regarding *Teaching and Learning International Survey (TALIS) 2024 Conceptual Framework*. OECD Publishing. <https://doi.org/10.1787/7b8f85d4-en>; European Commission in 2025 regarding *Teacher Education in Europe: Erasmus+ Teacher Academies Policy Background*. European Commission. <https://lnk.ua/PeRl0lANY>; UNESCO Institute for Statistics in 2024 regarding *World Education Statistics 2024*. UNESCO Publishing. <https://unesdoc.unesco.org/ark:/48223/pf0000391221>).

Research competence is also connected to broader dimensions of teacher competence, including digital competence, inclusive competence, methodological competence, communication, classroom management, and professional reflection. In the era of digital transformation, teachers need to design learning content, use educational technologies, apply formative assessment, and respond to diverse learner needs. These abilities are relevant not only to SDG 4 but also to SDG 9 on innovation and SDG 10 on reducing inequalities, because teachers who combine research, digital tools, and inclusive pedagogy can support more adaptive and equitable learning environments. Teacher competence is a multidimensional construct that includes the ability to design digital learning content, particularly in distance learning contexts [10], apply formative evaluation strategies to support student achievement [11], and prepare future teachers through problem-based learning technology [12]. In addition, teacher competence is also reflected in the development of socio-pedagogical competence in response to globalization [13], and the mastery of technological pedagogical content knowledge (TPACK), especially for improving subject-specific instruction such as genetics learning [14]. The inclusion of Table 5 in the main text is important because it makes the empirical basis of the study transparent. Therefore, teacher research competence should be understood as both an individual professional quality and a systemic condition for educational improvement. For Ukraine, this competence is especially important because schools must respond to reform demands, social disruption, digital transformation, and European integration through evidence-based and sustainable practices.

This study examines the research competence of modern teachers as a factor in improving the quality of education and supporting the SDGs. It aims to clarify the structure of teacher research competence, analyze its relationship with other professional and psychological characteristics, and propose a model for its development. The study contributes to teacher

education by showing how research competence can support evidence-based teaching, educational analytics, professional development, inclusive practice, and the modernization of education. The novelty of this study lies in integrating three perspectives that are often examined separately: teacher research competence, educational quality improvement, and the SDG agenda. Unlike studies that discuss research competence only as a professional skill, this study positions it as a strategic mechanism for evidence-based teaching, educational analytics, innovation, and SDGs. In addition, the study combines theoretical analysis, empirical survey data, psychological characteristics of teachers, and economic-mathematical modeling to explain how research competence can be structured, measured, and developed.

2. LITERATURE REVIEW

2.1. Teacher Research Competence as a Dimension of Professional Competence

Research competence is an important component of teacher professionalism because it enables teachers to investigate classroom problems, analyze learning evidence, and improve pedagogical decisions. In the literature, teacher research competence is usually defined as an integrative professional ability that includes knowledge of research methodology, skills in collecting and interpreting data, reflective thinking, ethical awareness, and readiness to apply findings in teaching practice [15-18]. This competence allows teachers to move beyond routine implementation of existing materials and become active producers of pedagogical knowledge.

Research competence is closely related to the broader concept of professional competence. A competent teacher is not only able to deliver curriculum content but also to diagnose learning needs, evaluate instructional strategies, and adapt teaching based on evidence. Professional development requires a combination of pedagogical knowledge, methodological skills, reflective practice, communication, and personal responsibility [16, 19, 20]. Therefore, research competence should be viewed as a system-forming element that connects pedagogical knowledge with innovation, evaluation, and continuous improvement.

Several approaches have been used to explain the structure of teacher research competence. The cognitive-activity approach emphasizes knowledge of research procedures and the ability to apply research methods in practice [21, 22]. The personal-value approach focuses on teachers' motivation, self-development, and intellectual readiness for inquiry [23-25]. The systemic approach views research competence as part of the teacher's holistic professional profile, integrating motivational, cognitive, operational, communicative, and reflective components [26, 27]. Research competence is not a single technical skill but a multidimensional professional quality.

2.2. Teacher as Researcher and Evidence-Based Pedagogical Practice

The idea of the teacher as researcher has become an important direction in contemporary teacher education. In this perspective, teachers are not only users of educational theories but also investigators of their own practice. They observe classroom processes, formulate questions, test instructional strategies, analyze student learning, and use findings to improve teaching. This approach supports evidence-based practice because pedagogical decisions are grounded in data, reflection, and systematic inquiry rather than habit or intuition [28-30].

Research-oriented teacher preparation can strengthen professional autonomy, critical thinking, and instructional innovation. Teacher education systems that integrate research practices, micro-research, pedagogical laboratories, and collaborative inquiry tend to support

deeper professional learning [31-33]. In such systems, teachers are encouraged to connect academic knowledge with real classroom challenges. This helps teachers become reflective practitioners who are able to evaluate the effectiveness of educational methods and adapt them to learner needs.

Research competence also supports the development of educational analytics. Teachers who are able to collect and interpret evidence can monitor student progress, identify learning gaps, compare instructional outcomes, and design targeted interventions. This is important for quality assurance because schools increasingly need data-informed decisions to improve learning outcomes and institutional effectiveness. In this sense, teacher research competence contributes not only to individual professional growth but also to the internal quality assurance system of schools.

2.3. Research Competence, Innovation, and Quality of Education

The quality of education depends strongly on teachers' ability to innovate and respond to changing educational contexts. Research competence provides the methodological foundation for innovation because it enables teachers to test new ideas, evaluate their effectiveness, and revise practice based on findings. Without research competence, innovation may remain intuitive, fragmented, or dependent on external models. With research competence, innovation becomes more systematic, evidence-based, and context-sensitive.

In Ukrainian educational discourse, research competence is increasingly discussed as a condition for improving educational quality and developing an innovative school environment [34-36]. The New Ukrainian School reform requires teachers who can think critically, use evidence, reflect on practice, and design student-centered learning (see <https://lnk.ua/YN3a9aReJ>). This makes research competence especially important for educational modernization. It supports the transition from reproductive teaching to creative, analytical, and learner-oriented pedagogy.

Research competence also contributes to the SDG agenda, especially SDG 4 on quality education. Teachers with strong research competence are better prepared to identify barriers to learning, improve instructional strategies, and support inclusive participation. This is also connected to SDG 9 on innovation and SDG 10 on reducing inequalities because research-oriented teachers can use evidence to design more adaptive, inclusive, and technology-supported learning environments. Therefore, teacher research competence should be understood as both a professional development priority and a strategic condition for sustainable educational improvement.

2.4. Digital, Inclusive, and Reflective Dimensions of Research Competence

Modern teacher research competence is closely connected to digital competence. Digital tools allow teachers to collect learning data, design online materials, conduct formative assessment, analyze classroom evidence, and participate in professional communities. Teachers need both technical and analytical skills to respond to contemporary educational demands [10, 14, 37, 38]. Digital competence, therefore, strengthens research competence by expanding teachers' access to data, resources, collaboration, and innovation.

Inclusive competence is also an important dimension of teacher research competence. Teachers need to understand learner diversity, identify barriers to participation, and evaluate

whether instructional strategies support all students. Research-oriented teachers are better able to examine classroom behavior, learning difficulties, accessibility, and the effectiveness of inclusive practices. Teachers require practical knowledge and reflective skills to support learners with diverse needs [39-42]. In this context, research competence helps teachers make inclusive education more evidence-based and responsive.

Reflective competence is another core dimension. Reflection allows teachers to analyze their own actions, identify strengths and weaknesses, and transform experience into professional knowledge. Research competence strengthens reflection by giving teachers tools for systematic observation, data analysis, and evaluation. At the same time, reflection strengthens research competence by encouraging teachers to ask practice questions and seek evidence-based answers. This relationship between research and reflection is essential for sustainable teacher development.

2.5. Conditions for Developing Teacher Research Competence

The development of teacher research competence requires supportive institutional and professional conditions. These include research-based teacher education, mentoring, methodological support, professional communities, access to educational analytics, school laboratories, grants, and recognition for teacher inquiry. Practice-oriented teacher education and research-based learning management strategies are important because they help teachers connect theoretical knowledge with classroom implementation [43, 44].

Motivation is also a key condition. Teachers are more likely to engage in research when they see inquiry as meaningful for professional growth, student learning, and school improvement. Teacher growth is influenced by internal motivation, professional identity, and opportunities for self-realization [23, 24]. Therefore, research competence cannot be developed only through formal training; it also requires motivational support, autonomy, and a culture that values inquiry.

Teacher research competence is a multidimensional professional quality that integrates knowledge, inquiry skills, motivation, reflection, communication, digital readiness, and inclusive awareness. It supports evidence-based teaching, educational innovation, and school quality improvement. However, research competence remains unevenly developed and often insufficiently integrated into teacher education and professional development. This gap provides the basis for the present study, which examines the structure, indicators, psychological factors, and developmental model of teacher research competence in relation to educational quality and the SDGs.

3. METHODS

This study used a theoretical and empirical research design to examine teacher research competence as a factor in improving the quality of education and supporting the SDGs. The research combined literature analysis, document analysis, questionnaire survey, comparative analysis, descriptive statistics, correlation analysis, cluster analysis, and economic-mathematical modeling. This combination of methods was used to clarify the concept and structure of teacher research competence, identify its developmental conditions, and explain its relationship with professional and psychological characteristics.

The theoretical component was based on the analysis of scientific literature related to teacher research competence, professional competence, evidence-based pedagogy, educational analytics, teacher education, pedagogical reflection, and quality education. The

study also analyzed official and analytical documents related to Ukrainian and international education, including documents from the Ministry of Education and Science of Ukraine, the State Service of Education Quality of Ukraine, the National Agency for Higher Education Quality Assurance, the UNESCO Institute for Statistics, the OECD, and the European Commission. Detailed information on this matter is in the following:

- (i) Ministry of Education and Science of Ukraine in 2016 regarding the Conceptual framework for reforming general secondary education “New Ukrainian School” until 2029. <https://lnk.ua/YN3a9aReJ>;
- (ii) OECD in 2025 regarding the *Teaching and Learning International Survey (TALIS) 2024 Conceptual Framework*. OECD Publishing. <https://doi.org/10.1787/7b8f85d4-en>;
- (iii) European Commission in 2025 regarding *Teacher Education in Europe: Erasmus+ Teacher Academies Policy Background*. European Commission. <https://lnk.ua/PeRlolanY>;
- (iv) UNESCO Institute for Statistics in 2024 regarding *World Education Statistics 2024*. UNESCO Publishing. <https://unesdoc.unesco.org/ark:/48223/pf0000391221>;
- (v) State Service of Education Quality of Ukraine in 2024 regarding the *Annual public report of the Head of the Service*. State Service of Education Quality of Ukraine. <https://sqe.gov.ua/publichniy-zvit-sqe-2024/>;
- (vi) National Agency for Higher Education Quality Assurance in 2025, regarding the *Annual report of the National Agency for Quality Assurance in Higher Education for 2024*. National Agency for Higher Education Quality Assurance. <https://en.naqa.gov.ua/?p=5311>;
- (vii) Ministry of Education and Science of Ukraine in 2024 regarding *Statistical data on inclusive and general secondary education*. Ministry of Education and Science of Ukraine. <https://mon.gov.ua/osvita-2/inklyuzivne-navchannya/statistichni-dani>

These sources were selected because they provide relevant information on teacher professional development, educational reform, quality assurance, and international trends in teacher education.

The chronological scope of the study covered the period from 2016 to 2025. This period corresponds to the active implementation of the Concept of the New Ukrainian School and the increasing emphasis on evidence-based approaches in Ukrainian education. The selected period made it possible to trace the transition from traditional methodological models of teacher preparation toward research-oriented professional development, reflective practice, and educational analytics.

The methodological framework of the study was based on systemic, competency-based, comparative, and analytical-statistical approaches. The systemic approach made it possible to view research competence as a holistic professional formation that includes cognitive, operational-activity, motivational-value, reflective-analytical, and communicative components. The competency-based approach focused on measurable indicators of teacher professional development, including the ability to formulate research problems, collect data, interpret results, and apply findings to pedagogical practice. The comparative approach was used to relate the Ukrainian experience to international teacher education practices, particularly in countries where the idea of the teacher as researcher is more developed. The analytical-statistical approach supported the processing and interpretation of empirical data.

The empirical component involved a survey of 10 teachers from general secondary education institutions. The respondents completed an author-developed questionnaire designed to assess professional competencies and psychological factors related to research competence. The questionnaire included three main blocks: self-assessment of professional competencies, temperament assessment based on an adapted Eysenck scale, and assessment of psychological factors of professional development. The professional competence block covered methodological, communicative, digital, inclusive, managerial, and research competencies. The psychological block included intrinsic professional motivation, stress resistance, and professional burnout.

The questionnaire used a five-point scale for assessing professional competencies and psychological factors. The temperament block classified respondents as extroverted or introverted based on their answers to four items related to interaction, decision-making, social contact, and preference for attention. The instrument was used to identify both the level of professional competence and the psychological conditions that may support or limit teachers' readiness for research activity. The questionnaire structure is presented in **Table 1**.

Table 1. Structure of the questionnaire for assessing teacher competencies and psychological factors.

BLOCK	FOCUS	INDICATORS / ITEMS	SCALE OR CLASSIFICATION
1	Professional competencies	Methodological competence, communicative competence, digital competence, inclusive competence, managerial competence, research competence	1 = very low; 2 = low; 3 = average; 4 = sufficient; 5 = high
2	Temperament	Speed of interaction, speed of decision-making, ease of establishing contacts, preference for being the center of attention	4-3 "Yes" answers = extraversion; 2-0 "Yes" answers = introversion
3	Psychological factors of professional development	Intrinsic professional motivation, stress resistance, and professional burnout	1 = very low; 2 = low; 3 = average; 4 = sufficient; 5 = high

Data analysis was conducted in several stages. First, descriptive statistics were used to calculate mean scores, medians, and standard deviations for each competence and psychological indicator. Second, group analysis was used to compare teachers according to temperament type and level of motivation. Third, correlation analysis was used to examine relationships among research competence, methodological competence, communication, motivation, and other professional indicators. Fourth, cluster analysis was used to identify differences in teacher profiles according to competence and psychological characteristics.

Economic-mathematical modeling was also used to formalize research competence as an integral indicator. The integral index of research competence was modeled through the weighted combination of theoretical readiness, practical research activity, reflexivity, and innovation. A multivariate regression model was used to describe the relationship between pedagogical effectiveness and research competence, methodological readiness, and professional communication. This modeling approach made it possible to interpret research competence not only as a qualitative professional attribute but also as a measurable factor that may influence educational outcomes.

The reliability of the findings was supported through the use of multiple data sources and analytical procedures, including literature review, official documents, questionnaire data, descriptive statistics, group comparison, correlation analysis, and modeling. Although the empirical sample was limited to 10 teachers, the study used this dataset as an exploratory basis for identifying tendencies in the relationship between teacher research competence, motivation, temperament, and professional development. Therefore, the empirical results are interpreted cautiously and connected with broader theoretical and policy perspectives on teacher education, educational quality, and SDGs.

4. RESULTS AND DISCUSSION

4.1. Structure of Teacher Research Competence

Research competence is an integrative component of teacher professionalism. It includes the knowledge, skills, values, and personal qualities needed to analyze educational processes, conduct pedagogical inquiry, interpret evidence, and make informed teaching decisions. In this study, teacher research competence is conceptualized through five main components: cognitive, operational-activity, motivational-value, reflective-analytical, and communicative. Research competence is not limited to technical research procedures but also includes motivation, reflection, ethical responsibility, and the ability to communicate research results. This understanding is consistent with previous studies that define teacher research competence as an integrative professional quality involving knowledge, skills, values, reflection, and the ability to apply inquiry in pedagogical practice [15-18]. As shown in **Table 2**, teacher research competence combines intellectual, methodological, motivational, reflective, and communicative dimensions. The cognitive and operational-activity components provide the methodological basis for conducting research. The motivational-value component supports teachers' willingness to engage in inquiry, while the reflective-analytical component enables teachers to transform experience into professional knowledge. Research findings can be shared, discussed, and applied within professional communities. As shown in **Figure 1**, the five components of teacher research competence are interconnected. A teacher cannot become an effective researcher only by knowing research methods. Research activity also requires motivation, the ability to analyze one's own teaching, and the capacity to communicate findings. Therefore, the development of research competence should be approached as a holistic process that combines knowledge, practice, values, reflection, and collaboration. This holistic view is also consistent with systemic approaches to teacher competence, which emphasize the integration of cognitive, motivational, operational, and communicative dimensions in professional development [26, 27].

4.2. Research Competence and Educational Quality

Research competence contributes to educational quality by helping teachers make evidence-based decisions. Teachers with developed research competence are able to observe learning problems, collect data, analyze results, test methods, and improve instruction. This changes teaching from routine implementation into a cycle of inquiry, reflection, correction, and innovation. Such a cycle supports SDG 4 because quality education requires teachers who can improve learning through evidence, inclusion, and continuous professional development. Research-oriented teaching strengthens evidence-based educational practice and contributes to quality assurance in schools [28-30].

Table 2. Structure of teacher research competence.

COMPONENT	CONTENT DESCRIPTION	EXPECTED DEVELOPMENT RESULTS
Cognitive	Knowledge of the essence, logic, and methodology of pedagogical research; understanding of data collection, analysis, and ethical norms of scientific activity.	Ability to apply pedagogical diagnostics, process results, and interpret data for pedagogical decisions.
Operational-activity	Ability to formulate a problem, goal, and hypothesis; select methods; conduct an experiment; and summarize results.	Ability to conduct micro-research, implement a pedagogical experiment, and apply conclusions in practice.
Motivational-value	Internal readiness for research activity and a positive attitude toward science as a means of professional development.	Stable cognitive motivation, responsibility for reliability of results, openness to new ideas, and desire for self-improvement.
Reflective-analytical	Ability to analyze one’s own activity, draw conclusions, and adjust pedagogical actions based on data.	Formation of pedagogical reflection, self-assessment, self-development, and transformation of experience into knowledge.
Communicative	Ability to present research results, collaborate in a team, and participate in professional communities.	Effective scientific communication, dissemination of pedagogical innovations, and participation in conferences and methodological associations.

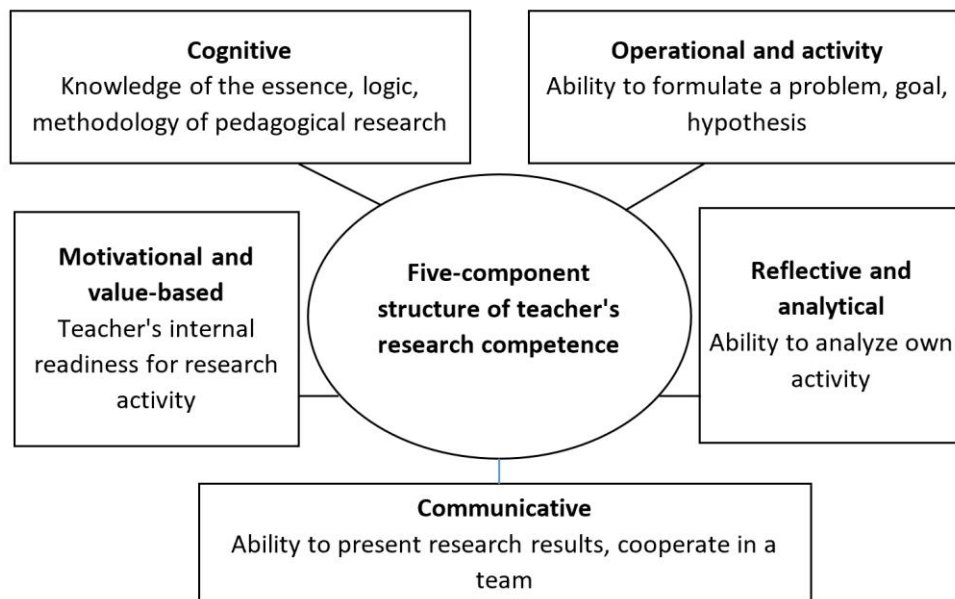


Figure 1. Five-component structure of teacher research competence.

As shown in **Table 3**, research competence has a systemic influence on educational quality. It supports not only individual teaching practice but also school-level quality assurance. When teachers use pedagogical analytics and internal monitoring, educational decisions become more accurate and responsive to real classroom needs. Research competence also strengthens innovation because teachers can evaluate whether new methods are effective before applying them more broadly.

Table 3. The impact of teacher research competence on key parameters of educational quality.

EDUCATION QUALITY PARAMETER	DEMONSTRATION OF RESEARCH COMPETENCE	EXPECTED EFFECT
Educational process management	Use of pedagogical analytics, monitoring of results, and evidence-based planning.	Increased effectiveness of decisions and reduced pedagogical errors.
Professional culture of a teacher	Introspection, reflection, and exploratory thinking.	Growth of professional autonomy and critical thinking.
Innovative activities of the school	Conducting pedagogical experiments and analyzing the effectiveness of innovations.	Development of an innovative environment and increased competitiveness of the school.
Student learning outcomes	Focus on research methods and the development of knowledge application skills.	Increased motivation, academic achievement, and creative activity.
Education quality management system	Using data for self-assessment and internal monitoring.	Sustainable educational development and increased trust in school.

This finding is relevant to the SDGs because evidence-based teaching can help schools improve learning outcomes, reduce ineffective practices, and support more equitable educational participation. Research-oriented teachers are better able to identify student needs, monitor progress, and adjust instruction. In this way, research competence contributes not only to teacher professional development but also to sustainable improvement in educational quality. This is aligned with the broader idea that teacher competence, instructional innovation, and reflective practice are central to improving learning systems and achieving quality education [10-14].

4.3. Conditions and Ways of Developing Research Competence

The formation of teacher research competence requires psychological, pedagogical, organizational, institutional, and motivational conditions. It cannot develop through isolated training alone. Teachers need supportive professional environments, opportunities to conduct inquiry, access to methodological assistance, and recognition for research-based work. Similar findings have been reported in studies emphasizing the role of practice-oriented teacher education, research-based learning management, professional communities, and institutional support in developing teacher competence [31-33,43,44].

As shown in **Table 4**, teacher research competence develops when professional training, school culture, institutional policy, and motivation work together. Psychological support helps teachers become open to inquiry and experimentation. Organizational support provides space for research activity, while institutional support connects schools with universities, programs, and grants. Motivational support is also essential because teachers are more likely to conduct research when inquiry is recognized as part of professional growth.

Table 4. Conditions and ways of forming teacher research competence.

CONDITION GROUP	CONTENT AND CHARACTERISTICS	MAIN WAYS OF IMPLEMENTATION
Psychological and pedagogical	Formation of positive motivation, development of research values, and stimulation of creative thinking.	Mentoring, training, support for self-education, and creation of trust within the team.
Organizational and methodological	Conditions for conducting research, experiments, and data analysis.	School research laboratories, pedagogical projects, and methodological associations.
Educational and professional	Integration of the research component into teacher education.	Courses on pedagogical research methodology, student and teacher conferences, and projects.
Institutional	State support, scientific-methodological support, and grant policy.	Partnership with universities, participation in national programs, and international research.
Motivational-value	Understanding research as a component of professional growth.	Encouragement for publications, competitions, certification, and grant participation.

Figure 2 presents the proposed three-component model for developing teacher research competence. The model includes: (i) methodological and educational integration of research practices into the educational process; (ii) practical and environmental support through school laboratories and professional communities; and (iii) motivational stimulation through incentives for research activities. The interaction of these components creates a synergistic effect, where the educational institution becomes a center of innovation, and the teacher becomes an agent of educational change.

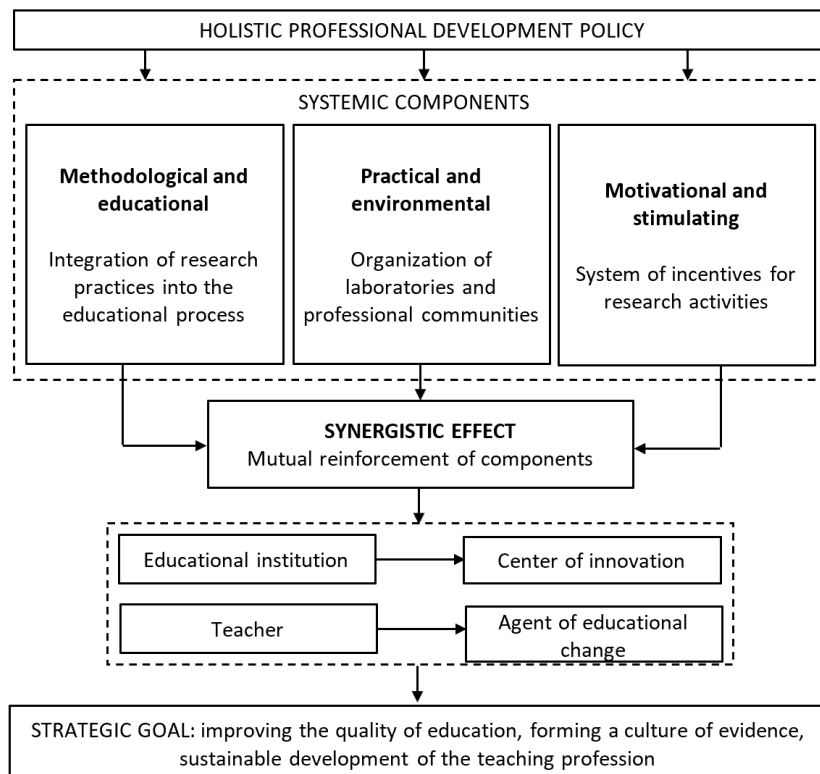


Figure 2. Three-component structural model for developing teacher research competence.

4.4. Empirical Data from the Teacher Questionnaire

The empirical part of the study involved 10 teachers from general secondary education institutions. The questionnaire assessed methodological, communicative, digital, inclusive, managerial, and research competencies, as well as temperament, intrinsic motivation, stress resistance, and professional burnout. The primary data are presented in **Table 5**. The respondents demonstrated different profiles of professional competence and psychological characteristics. Extroverted teachers tended to show higher communicative indicators, while introverted teachers tended to show stronger methodological and research indicators. Psychological characteristics may influence how teachers express and develop different dimensions of professional competence. Research competence was not evenly distributed among teachers. Teachers with introverted characteristics tended to have higher research scores, while teachers with extroverted characteristics tended to have stronger communication scores. The attention to psychological factors is relevant because teacher motivation, self-development, stress resistance, and reflective capacity can influence professional growth and readiness for inquiry [23-25].

Table 5. Primary data from the teacher questionnaire.

TEACHER	TEMPERAMENT	M	C	D	I	MAN	R	MOT	STR	B
1	E	4	5	4	3	4	3	5	4	2
2	I	5	3	4	4	3	4	4	3	2
3	E	4	5	3	4	4	3	4	4	3
4	I	5	4	4	4	3	4	5	4	2
5	E	3	5	4	3	4	2	4	3	3
6	I	4	3	4	4	3	4	3	4	2
7	I	5	4	3	4	3	4	4	3	2
8	E	4	5	4	3	4	3	5	4	3
9	I	5	3	4	4	3	4	4	3	2
10	E	4	5	4	3	4	3	5	4	3

Note: E = extrovert; I = introvert; M = methodological competence; C = communicative competence; D = digital competence; I = inclusive competence; Man = managerial competence; R = research competence; Mot = intrinsic motivation; Str = stress resistance; B = professional burnout; E = extrovert; I = introvert.

4.5. Descriptive Statistics of Teacher Competencies

The descriptive statistics provide a general picture of competency development among the respondents. Mean, median, and standard deviation were calculated for each indicator. As shown in **Table 6**, communicative competence obtained the highest mean score, followed by methodological competence. Teachers were relatively strong in communication and teaching-methodological preparation. However, research competence obtained the lowest mean score among the listed professional competencies. Managerial, inclusive, and digital competencies also showed moderate indicators. These areas require additional development. Research competence remains less developed than other teacher competencies. This is important because research competence is necessary for evidence-based teaching, educational analytics, and systematic quality improvement. The lower score suggests that teachers may need more structured opportunities to conduct micro-research, analyze classroom data, participate in professional inquiry groups, and apply findings to teaching

practice. This result is consistent with the argument that research competence requires structured methodological training, opportunities for inquiry, and institutional support rather than only general pedagogical experience [34-36].

Table 6. Descriptive statistics of teacher competencies and psychological indicators.

INDICATOR	MEAN	MEDIAN	SD
Methodological competence	4.3	4	0.64
Communicative competence	4.4	5	0.52
Digital competence	3.8	4	0.42
Inclusive competence	3.6	4	0.52
Managerial competence	3.7	4	0.47
Research competence	3.3	3	0.48
Intrinsic motivation	4.2	4	0.63
Stress resistance	3.6	4	0.52

Note: Mean = arithmetic mean; Median = middle value; SD = standard deviation.

4.6. Comparison by Temperament and Motivation

The study also examined differences in competence indicators according to temperament and motivation. The comparison by temperament was recalculated from the primary data in **Table 5** to ensure internal consistency. The primary data show five extroverted teachers and five introverted teachers. As shown in **Table 7**, extroverted teachers demonstrated higher communicative competence, while introverted teachers demonstrated higher research and methodological competence. Extroverted teachers may be more active in interaction, communication, and presentation, while introverted teachers may be more focused on analytical and methodological work. These patterns are useful for designing differentiated professional development programs. For example, extroverted teachers may benefit from deeper training in data analysis and pedagogical inquiry, while introverted teachers may benefit from opportunities to strengthen communication and dissemination of research results. Professional development should be differentiated according to teachers’ personal and professional profiles, while still strengthening common competencies needed for evidence-based and inclusive practice [19, 20, 26, 27].

Table 7. Comparison of competence indicators by temperament.

GROUP	RESEARCH COMPETENCE	COMMUNICATIVE COMPETENCE	METHODOLOGICAL COMPETENCE
Extroverts (n = 5)	2.80	5.00	3.80
Introverts (n = 5)	4.00	3.40	4.80

The comparison by motivation level was also recalculated from the primary data in **Table 5**. Teachers were grouped according to their intrinsic motivation scores. As shown in **Table 8**, teachers with high motivation demonstrated the strongest communicative competence, while the single teacher in the average motivation group had high research competence but lower communication. Because the number of respondents in the average motivation group was very small, this result should be interpreted cautiously. Motivation is associated with stronger professional engagement, but the small sample size limits broad generalization.

Table 8. Comparison of competence indicators by level of motivation.

MOTIVATION GROUP	NUMBER OF TEACHERS	RESEARCH COMPETENCE	COMMUNICATIVE COMPETENCE
Average motivation	1	4.00	3.00
Sufficient motivation	5	3.40	4.00
High motivation	4	3.25	4.75

Motivation alone does not automatically produce the highest research competence. Research competence may depend not only on motivation but also on methodological preparation, opportunities for inquiry, access to mentoring, school research culture, and participation in professional communities. Therefore, teacher development programs should combine motivational support with practical research training and institutional conditions for pedagogical inquiry.

4.7. Correlation Matrix

Correlation analysis was used to examine the relationship between professional competencies and motivation. The correlation matrix is presented in **Table 9**. Research competence had a positive relationship with intrinsic motivation. The correlation between research competence and motivation was $r = 0.56$. Teachers with higher intrinsic motivation tended to demonstrate stronger research competence. Research competence also had a moderate relationship with methodological competence, with $r = 0.48$. Teachers who are methodologically prepared are more likely to engage in research-oriented professional practice. This relationship supports the personal-value approach to teacher competence, which emphasizes internal motivation, self-development, and professional identity as important conditions for inquiry-based professional growth [23-25]. Research competence is not isolated from other dimensions of teacher professionalism. It is connected to motivation, methodological competence, communication, digital readiness, inclusive awareness, and managerial capacity. Research competence should be developed as part of a holistic model of teacher professional development.

Table 9. Correlation matrix of professional competence indicators.

INDICATOR	M	C	D	I	MAN	R	MOT
Methodological competence	1.00	0.21	0.18	0.24	0.12	0.48	0.09
Communicative competence	0.21	1.00	0.31	0.22	0.44	0.38	0.41
Research competence	0.48	0.38	0.27	0.42	0.36	1.00	0.56
Motivation	0.09	0.41	0.22	0.33	0.28	0.56	1.00

Note: M = methodological competence; C = communicative competence; D = digital competence; I = inclusive competence; Man = managerial competence; R = research competence; Mot = intrinsic motivation.

4.8. Economic-Mathematical Modeling of Research Competence

Economic-mathematical modeling was used to formalize the level of teacher research competence and explain its possible influence on pedagogical effectiveness. For analytical purposes, research competence was represented as an integral indicator consisting of

theoretical readiness, practical research activity, reflexivity, and innovation. The general model of the integral index can be expressed in equation (1):

$$IR = \omega_r Tr + \omega_a Ra + \omega_f Rf + \omega_i I \quad (1)$$

where IR is the integral index of research competence; Tr is theoretical readiness; Ra is practical research activity; Rf is reflexivity; I is innovation; and ω_r , ω_a , ω_f , and ω_i are weighting coefficients determined through expert assessment or the entropy method.

To assess the influence of research competence on pedagogical effectiveness, a multivariate regression model was applied in equation (2):

$$Q = \alpha_0 + \alpha_1 IR + \alpha_2 M + \alpha_3 K + \varepsilon \quad (2)$$

where Q is the quality of pedagogical activity; IR is the research competence; M is the methodological readiness; K is the professional communication; ε is the random error; α_0 is the constant; and α_1 , α_2 , and α_3 are the regression coefficients. Research competence, methodological readiness, and communication can contribute to the overall quality of pedagogical activity.

The transition between different levels of professional effectiveness can also be described through the increase in the integral indicator, as shown in equation (3).

$$\Delta Q = k \cdot \Delta IR \quad (3)$$

where k is the coefficient of sensitivity of performance to changes in competence. An increase in the integral indicator of research competence by 0.1 conditional units can provide an increase in pedagogical results by approximately 8-12%. The development of research competence may contribute to improving educational quality.

Teacher research competence can be interpreted not only as a qualitative feature of professionalism but also as a measurable factor related to pedagogical effectiveness. This provides a basis for designing teacher development programs that target specific components of research competence and connect them with measurable educational outcomes. The use of modeling is consistent with the growing emphasis on educational analytics, data-informed decision-making, and measurable indicators of teacher professional development.

4.9. Integrated Discussion

Teacher research competence is a strategic factor in improving the quality of education and supporting the SDGs. The theoretical analysis shows that research competence consists of cognitive, operational-activity, motivational-value, reflective-analytical, and communicative components. The empirical data show that research competence was weaker than communicative and methodological competence, indicating the need for systematic teacher development in pedagogical inquiry, educational analytics, and evidence-based practice. These findings are consistent with studies showing that teacher research competence is connected to professional competence, innovation, reflective practice, and evidence-based school improvement [15-18, 28-30, 34-36]. Also, psychological characteristics are relevant to the development of teacher research competence. Introverted teachers in the sample demonstrated stronger methodological and research indicators, while extroverted teachers demonstrated stronger communicative indicators. This does not mean that one temperament type is better than another. Rather, it shows that professional development should recognize different teacher profiles and provide balanced opportunities for analytical work, collaboration, communication, and dissemination of findings. Intrinsic motivation was

positively related to research competence. Teachers are more likely to engage in inquiry when they see research as meaningful for professional growth and educational improvement. However, motivation must be supported by institutional conditions. Teachers need time, mentoring, methodological support, research communities, digital tools, and recognition for research-based work. Without these conditions, research competence may remain underdeveloped even when teachers show professional interest. The findings also have implications for SDGs. Research-oriented teachers are better prepared to identify learning problems, use data, design inclusive interventions, and improve teaching quality. This supports SDG 4 by strengthening quality education and lifelong learning. It also supports SDG 9 and SDG 10 because research competence can promote innovation, digital transformation, and more equitable learning environments. This view is supported by studies showing that digital competence, inclusive competence, technological pedagogical content knowledge, and universal learning design are increasingly important for quality education and SDGs [10, 14, 37-42]. The results support the proposed three-component model of research competence development. The integration of research practices into teacher education, the organization of school laboratories and professional communities, and motivational support for teacher inquiry can create a synergistic effect. Through this model, schools can become centers of pedagogical innovation, while teachers can become agents of educational change. This approach is especially relevant for Ukraine, where educational reform, digital transformation, and European integration require teachers who can act on the basis of evidence, reflection, and innovation.

5. CONCLUSION

Teacher research competence is an important factor in improving educational quality and supporting the SDGs, especially SDG 4. This study shows that research competence consists of cognitive, operational-activity, motivational-value, reflective-analytical, and communicative components. Empirical findings indicate that communicative and methodological competencies were stronger, while research, managerial, digital, and inclusive competencies still require development. Research competence was positively related to intrinsic motivation and methodological competence. The proposed three-component model emphasizes research practice, professional communities, and motivational support. Strengthening these areas can help teachers use evidence-based teaching, improve educational analytics, and support sustainable school improvement.

6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

7. REFERENCES

- [1] Orzhel, O., Petroye, O., Havryliuk, A., Otych, O., and Shofolova, N. (2026). Rethinking the third mission of Ukrainian universities in wartime: Innovation, social resilience, and postwar reconstruction. *ASEAN Journal of Educational Research and Technology*, 5(3), 329-342.
- [2] Rashid, T. L., and Khurshid, R. L. (2025). Ensuring the effectiveness of education through interactive methods in the modern pedagogical process. *ASEAN Journal of Educational Research and Technology*, 4(2), 147-152.

- [3] Bondarenko, N., Pasko, O., Shpak, O., Tymenko, V., and Kudra, A. (2026). Promoting students' scientific thinking through design-oriented activities in a modern educational environment. *ASEAN Journal of Educational Research and Technology*, 5(3), 279-298.
- [4] Azamkhulovna, P. D., Umarjon, K. Z., and Sherali, R. G. (2025). Modern interventions for aphasic speech recovery: Integrating speech therapy, neuroplasticity, and digital technologies. *ASEAN Journal of Community and Special Needs Education*, 4(1), 53-62.
- [5] Kamraju, M. (2025). The evolving role of religion in modern society: Influence, challenges, and paths toward coexistence. *ASEAN Journal of Religion, Education, and Society*, 4(1), 67-74.
- [6] Adashvoevich, K.R. (2025). Teaching methodology of historical geography based on modern pedagogical technologies in support of Sustainable Development Goals. *ASEAN Journal for Science Education*, 4(2), 131-142
- [7] Khamdamovna, K.S. (2025). Enhancing professional readiness in vocational education through an integrative approach aligned with the Sustainable Development Goals (SDGs). *ASEAN Journal for Science Education*, 4(2), 143-154
- [8] Ximenes, S.M. (2025). School feeding program and Sustainable Development Goals (SDGs) in education: Linking food security to learning outcomes in Timor-Leste. *ASEAN Journal for Science Education*, 4(2), 155-168
- [9] Ahmed, F. T., Ganiyu, A. A., and Ibrahim, A. (2026). Perceived usefulness and efficacy of learning analytics among science educators for advancing quality education and digital competence to support sustainable development goals (SDGs). *ASEAN Journal for Science Education*, 5(1), 95-102.
- [10] Nafsi, N. R. R., and Maryanti, M. (2022). Analysis of teacher skills in e-learning content development during distance learning during the COVID-19 pandemic. *ASEAN Journal for Science Education*, 1(1), 23-32.
- [11] Awofala, A. O. A., and Olaniyi, A. O. (2023). Assessing teachers' formative evaluation strategy as related to senior secondary school students' achievement in mathematics. *ASEAN Journal for Science Education*, 2(2), 77-86.
- [12] Saidirasilovna, U. N. (2025). Preparing future geography teachers through problem-based learning technology: A short review. *ASEAN Journal for Science Education*, 4(1), 39-44.
- [13] Rizomatovich, K. R. (2026). Scientific and methodological foundations for developing the socio-pedagogical competence for future teachers in the context of globalization. *ASEAN Journal for Science Education*, 5(1), 13-22.
- [14] Moemeke, C. D., and Alordiah, C. (2026). Biology teachers' perceptions and observed technological pedagogical content knowledge (TPACK) for teaching genetics: Implications for professional development. *ASEAN Journal for Science Education*, 5(2), 103-120.
- [15] Comon, J., and Corpuz, G. (2024). Teachers' research competence and engagement: Basis for research development plan. *American Journal of Arts and Human Science*, 3(1), 24-44.
- [16] Magnaye, L. J. (2022). Pedagogical and research competence of the pre-service teachers. *American Journal of Multidisciplinary Research and Innovation*, 1(3), 81-88.
- [17] Antera, S. (2021). Professional competence of vocational teachers: A conceptual review. *Vocations and Learning*, 14(3), 459-479.
- [18] Popovych, I., Semenov, O., Hrys, A., Aleksieieva, M., Pavliuk, M., and Semenova, N. (2022). Research on mental states of weightlifters' self-regulation readiness for competitions. *Journal of Physical Education and Sport*, 22(5), 1134-1144.
- [19] Villagran, M. A. (2022). Cultural competence in research. *School of Information Student Research Journal*, 12(1), 1-9.

- [20] Kutsak, L., Zaskalieta, S., Hamorak, H., Hreniuk, L., and Parshuk, S. (2023). Components of professional competence and innovative professional activity of an HEI teacher. *Revista Eduweb*, 17(3), 222-234.
- [21] Almardanovna, S. D., and Shokirovna, A. M. (2025). The effectiveness of increasing students' cognitive activity in primary education. *Spanish Journal of Innovation and Integrity*, 39, 66-70.
- [22] Rakhmanbergenova, Y. (2022). Teaching creative writing as a strategy of cognitive activity. *International Journal of Language and Literary Studies*, 4(1), 273-281.
- [23] Madin, Z., Aizhana, A., Nurgul, S., Alma, Y., Nursultan, S., Al Ayub Ahmed, A., and Mengesha, R. W. (2022). Stimulating the professional and personal self-development of future teachers in the context of value-semantic orientation. *Education Research International*, 2022(1), 8789773.
- [24] Tabbasam, U., Amjad, A. I., Ahmed, T., and Qiang, X. (2023). Comparison of self-strength, seeking help and happiness between Pakistani and Chinese adolescents: A positive psychology inquiry. *International Journal of Mental Health Promotion*, 25(3), 389-402.
- [25] Popovych, I., Pavliuk, M., Hrys, A., Sydorenko, O., Fedorenko, A., and Khanetska, T. (2021). Pre-game expected mental states in men's mini-football teams: A comparative analysis. *Journal of Physical Education and Sport*, 21(2), 772-782.
- [26] Zhang, H., and Tian, M. (2025). Unpacking the multi-dimensional nature of teacher competencies: A systematic review. *Scandinavian Journal of Educational Research*, 69(5), 1004-1025.
- [27] Luna, A., Chong, M., and Jurburg, D. (2022). Teaching integration, trust, communication, and collaboration competencies using challenge-based learning for business and engineering programs. *IEEE Revista Iberoamericana de Tecnologías del Aprendizaje*, 17(1), 89-98.
- [28] Rowan, L., Bourke, T., L'Estrange, L., Lunn Brownlee, J., Ryan, M., Walker, S., and Churchward, P. (2021). How does initial teacher education research frame the challenge of preparing future teachers for student diversity in schools? A systematic review of literature. *Review of Educational Research*, 91(1), 112-158.
- [29] Chang, W. C., and Viesca, K. M. (2022). Preparing teachers for culturally responsive/relevant pedagogy: A critical review of research. *Teachers College Record*, 124(2), 197-224.
- [30] Tan, X., Cheng, G., and Ling, M. H. (2025). Artificial intelligence in teaching and teacher professional development: A systematic review. *Computers and Education: Artificial Intelligence*, 8, 100355.
- [31] Koski, J., Metsäpelto, R. L., Kyllönen, M., and Poikkeus, A. M. (2026). Finnish student teachers as a focus of teacher education research: A 10-year scoping review of empirical research. *Educational Review*, 78(2), 264-287.
- [32] Ranta, S., Kangas, J., Harju-Luukkainen, H., Ukkonen-Mikkola, T., Neitola, M., Kinos, J., and Kuusisto, A. (2023). Teachers' pedagogical competence in Finnish early childhood education: A narrative literature review. *Education Sciences*, 13(8), 791.
- [33] Cao, W., and Yu, Z. (2023). Exploring learning outcomes, communication, anxiety, and motivation in learning communities: A systematic review. *Humanities and Social Sciences Communications*, 10(1), 866.
- [34] Kozhevnikova, A., and Kozhevnykov, P. (2024). Specifics of innovative educational environment and its influence on the development of future teachers' innovative

- competence. *Scientific Bulletin of Mukachevo State University. Series "Pedagogy and Psychology"*, 10(2), 72-80.
- [35] Kremen, V. G., Hrynevych, L. M., Lugovyi, V. I., and Talanova, Z. V. (2024). Quality of education and innovation-driven development: The New Ukrainian School reform in the context of global trends. *Science and Innovation*, 18(1), 29-43.
- [36] Kharitonenko, L. (2022). Innovations and traditions in Ukrainian language teaching at the educational establishments of Ukraine: Cases, models of the future. *Futurity Education*, 2(1), 68-85.
- [37] Thapa, M. B., and Shrestha, K. (2026). Empowering teachers through ChatGPT: Perceptions and experiences in English as a foreign or second language classrooms as a form of community service. *ASEAN Journal of Community Service and Education*, 5(1), 21-32.
- [38] Amit Jr., R. L. (2026). Empowering teachers through digital competency training: A community service initiative in Central Isulan District, Sultan Kudarat, Philippines. *ASEAN Journal of Community Service and Education*, 5(2), 99-106.
- [39] Ayinde, O. M., Salami, A. O., Ademola, M. A., Nnanna, O. M., and Anosike, C. O. (2026). Empowering information and communication technology teachers through a behavioral approach to computer-aided design for curriculum-oriented instruction: A community-based approach to pedagogical challenges. *ASEAN Journal of Community Service and Education*, 5(2), 121-136.
- [40] Musayaroh, S. (2022). Behaviors of concern to special education teachers in their classroom: Class characteristics and class composition predictors. *ASEAN Journal of Community and Special Needs Education*, 1(2), 55-60.
- [41] Adesokan, A., and Bojuwoye, O. (2023). Teachers' perceived barriers to inclusive education. *ASEAN Journal of Community and Special Needs Education*, 2(2), 91-96.
- [42] Avergonzado, R. A. (2026). Implementing universal design for learning for learners with intellectual disabilities: Evidence from teachers' practices and a proposed inclusive education framework. *ASEAN Journal of Community and Special Needs Education*, 5(2), 135-146.
- [43] Ybyraimzhanov, K., Zhaxylikova, K., Koishibaev, M., Omurzakova, A., and Ayapbergenova, G. (2023). Enhancing students' pedagogical potential with practice-oriented courses in teacher education universities. *Journal of Education and E-Learning Research*, 10(3), 585-594.
- [44] Siminto, and Qodir, A. (2024). Strategic analysis of research-based learning management strategies to enhance teacher competence in schools. *Jurnal Terobosan Peduli Masyarakat (TIRAKAT)*, 1(2), 50-58.