

ISSN: 1991-3494 (Print)
ISSN: 2518-1467 (Online)

**SCIENTIFIC JOURNAL OF
PEDAGOGY AND ECONOMICS**

**№5
2026**



ISSN 2518-1467 (Online),
ISSN 1991-3494 (Print)



SCIENTIFIC JOURNAL OF PEDAGOGY AND ECONOMICS

PUBLISHED SINCE 1944

5 (423)

September – October 2026

ALMATY, 2026

EDITOR-IN-CHIEF:

ABYLKASSIMOVA Alma Yesimbekovna, Doctor of Pedagogical Sciences, Professor, Academician of Central Asian Academic Research Center, Director of the Center for the Development of Pedagogical Education, Head of the Department of Methods of Teaching Mathematics, Physics and Computer Science at Abai KazNPU (Almaty, Kazakhstan), <https://www.scopus.com/authid/detail.uri?authorId=57191275199>, <https://www.webofscience.com/wos/author/record/2076124>.

DEPUTY EDITOR-IN-CHIEF:

SEMBIEVA Lyazzat Myktybekovna, Doctor of Economics, Professor of the Eurasian National University (Astana, Kazakhstan), <https://www.scopus.com/authid/detail.uri?authorId=57194226348>, <https://www.webofscience.com/wos/author/record/38875302>.

EDITORIAL BOARD:

RICHELLE Marynowski, PhD in Education, Professor, Faculty of Education, University of Lethbridge, (Alberta, Canada), <https://www.scopus.com/authid/detail.uri?authorId=57070452800>, <https://www.webofscience.com/wos/author/record/16130920>.

SHISHOV Sergey Evgenievich, Doctor of Pedagogical Sciences, Professor, Head of the Department of Pedagogy and Psychology of Professional Education, Moscow State University of Technology and Management named after K. Razumovsky (Moscow, Russia), <https://www.scopus.com/authid/detail.uri?authorId=57191518233>, <https://www.webofscience.com/wos/author/record/2443966>.

ABILDINA Saltanat Kuatovna, Doctor of Pedagogical Sciences, Professor, Head of the Department of Pedagogy, Karaganda University named after E.A. Buketov (Karaganda, Kazakhstan), <https://www.scopus.com/authid/detail.uri?authorId=56128026400>, <https://www.webofscience.com/wos/author/record/4131549>.

RYZHAKOV Mikhail Viktorovich, Doctor of Pedagogical Sciences, Professor, Academician of the Russian Academy of Education, Editor-in-Chief of the journal "Standards and Monitoring in Education" (Moscow, Russia), <https://www.scopus.com/authid/detail.uri?authorId=6602245542>, <https://www.webofscience.com/wos/author/record/13675462>.

BULATBAEVA Kulzhanat Nurymzhanovna, Doctor of Pedagogical Sciences, Professor, Chief Researcher of the National Academy of Education named after Y. Altynsarin (Astana, Kazakhstan), <https://www.scopus.com/authid/detail.uri?authorId=57202195074>, <https://www.webofscience.com/wos/author/record/40173122>.

PETR Hájek, PhD, Unicorn University, Associate Professor, Department of Finance, (Prague, Czech Republic), <https://www.scopus.com/authid/detail.uri?authorId=35726855800>, <https://www.webofscience.com/wos/author/record/672404>.

JUMAN Jappar, Doctor of Economics, Professor, Honorary Academician of Central Asian Academic Research Center, Honored Worker of Kazakhstan, Director of the Center for International Applied Research Al-Farabi Kazakh National University (Almaty, Kazakhstan), <https://www.scopus.com/authid/detail.uri?authorId=59238481900>, <https://www.scopus.com/authid/detail.uri?authorId=56658765400>, <https://www.webofscience.com/wos/author/record/60977874>.

LUKYANENKO Irina Grigorievna, Doctor of Economics, Professor, Head of Department of the National University of Kyiv-Mohyla Academy (Kyiv, Ukraine), <https://www.scopus.com/authid/detail.uri?authorId=57189348551>, <https://www.webofscience.com/wos/author/record/939510>.

YESIMZHANOVA Saira Rafihevna, Doctor of Economics, Professor of the University of International Business (Almaty, Kazakhstan), <https://www.scopus.com/authid/detail.uri?authorId=56499485500>, <https://www.webofscience.com/wos/author/record/45951098>.

Scientific Journal of Pedagogy and Economics

ISSN 2518-1467 (Online),

ISSN 1991-3494 (Print).

Owner: «Central Asian Academic Research Center» LLP (Almaty).

The certificate of registration of a periodical printed publication in the Committee of information of the Ministry of Information and Communications of the Republic of Kazakhstan

№ KZ50VPY00121155, issued on 05.06.2025

Thematic focus: «*publication of the results of new achievements in the field of fundamental sciences*»

Periodicity: 6 times a year.

<http://www.bulletin-science.kz/index.php/en/>

© «Central Asian Academic Research CenterB» LLP, 2026



БАС РЕДАКТОР:

ӘБІЛҚАСЫМОВА Алма Есімбекқызы, педагогика ғылымдарының докторы, профессор, ҚР ҰҒА академигі, Педагогикалық білім беруді дамыту орталығының директоры, Абай атындағы ҚазҰПУ математика, физика және информатиканы оқыту әдістемесі кафедрасының меңгерушісі (Алматы, Қазақстан), <https://www.scopus.com/authid/detail.uri?authorId=57191275199>, <https://www.webofscience.com/wos/author/record/2076124>.

БАС РЕДАКТОРДЫҢ ОРЫНБАСАРЫ:

СЕМБИЕВА Ләззат Мықтыбекқызы, экономика ғылымдарының докторы, Л.Н. Гумилев атындағы Еуразия ұлттық университетінің профессоры (Астана, Қазақстан), <https://www.scopus.com/authid/detail.uri?authorId=57194226348>, <https://www.webofscience.com/wos/author/record/38875302>.

РЕДАКЦИЯ АЛҚАСЫ:

РИШЕЛЬ Мариновски, білім беру саласындағы PhD, Летбридж университеті педагогика факультетінің профессоры, (Альберта, Канада), <https://www.scopus.com/authid/detail.uri?authorId=57070452800>, <https://www.webofscience.com/wos/author/record/16130920>.

ШИШОВ Сергей Евгеньевич, педагогика ғылымдарының докторы, профессор, К. Разумовский атындағы Мәскеу мемлекеттік технологиялар және басқару университетінің кәсіби білім беру педагогикасы және психологиясы кафедрасының меңгерушісі (Мәскеу, Ресей), <https://www.scopus.com/authid/detail.uri?authorId=57191518233>, <https://www.webofscience.com/wos/author/record/2443966>.

ӘБІЛДИНА Салтанат Қуатқызы, педагогика ғылымдарының докторы, профессор, Е.А. Бөкетов атындағы Қарағанды университетінің педагогика кафедрасының меңгерушісі (Қарағанды, Қазақстан), <https://www.scopus.com/authid/detail.uri?authorId=56128026400>, <https://www.webofscience.com/wos/author/record/4131549>.

РЫЖАКОВ Михаил Викторович, педагогика ғылымдарының докторы, профессор, Ресей білім академиясының академигі, «Білім берудегі стандарттар мен мониторинг» журналының бас редакторы (Мәскеу, Ресей), <https://www.scopus.com/authid/detail.uri?authorId=6602245542>, <https://www.webofscience.com/wos/author/record/13675462>.

БОЛАТБАЕВА Күлжанат Нұрымжанқызы, педагогика ғылымдарының докторы, профессор, Ы.Алтынсарин атындағы Ұлттық білім академиясының бас ғылыми қызметкері (Астана, Қазақстан), <https://www.scopus.com/authid/detail.uri?authorId=57202195074>, <https://www.webofscience.com/wos/author/record/40173122>.

ПЕТР Хайек, PhD, Юникорн университеті, Қаржы департаментінің қауымдастырылған профессоры (Прага, Чехия), <https://www.scopus.com/authid/detail.uri?authorId=35726855800>, <https://www.webofscience.com/wos/author/record/672404>.

ЖҰМАН Жаппар, экономика ғылымдарының докторы, профессор, Қазақстанның Еңбек сіңірген қайраткері, ҚР ҰҒА құрметті академигі, әл-Фараби атындағы Қазақ ұлттық университетінің Халықаралық қолданбалы зерттеулер орталығының директоры (Алматы, Қазақстан), <https://www.scopus.com/authid/detail.uri?authorId=59238481900>; <https://www.scopus.com/authid/detail.uri?authorId=56658765400>, <https://www.webofscience.com/wos/author/record/60977874>.

ЛУКЪЯНЕНКО Ирина Григорьевна, экономика ғылымдарының докторы, профессор, «Киево-Могилянская академия» ұлттық университеті кафедрасының меңгерушісі (Киев, Украина), <https://www.scopus.com/authid/detail.uri?authorId=57189348551>, <https://www.webofscience.com/wos/author/record/939510>.

ЕСІМЖАНОВА Сайра Рафихқызы, экономика ғылымдарының докторы, Халықаралық бизнес университетінің профессоры (Алматы, Қазақстан), <https://www.scopus.com/authid/detail.uri?authorId=56499485500>, <https://www.webofscience.com/wos/author/record/45951098>.

Scientific Journal of Pedagogy and Economics

ISSN 2518-1467 (Online),

ISSN 1991-3494 (Print).

Меншіктенуші: «Орталық Азия академиялық ғылыми орталығы» ЖШС (Алматы қ.).

Қазақстан Республикасының Ақпарат және коммуникациялар министрлігінің Ақпарат комитетінде 05.06.2025 ж. берілген № **KZ50VPY00121155** мерзімдік басылым тіркеуіне қойылу туралы куәлік.

Тақырыптық бағыты: *«іргелі ғылым салалары бойынша жаңа жетістіктердің нәтижелерін жариялау»*

Мерзімділігі: жылына 6 рет.

<http://www.bulletin-science.kz/index.php/en/>

© «Орталық Азия академиялық ғылыми орталығы» ЖШС, 2026

ГЛАВНЫЙ РЕДАКТОР:

АБЫЛКАСЫМОВА Алма Есимбековна, доктор педагогических наук, профессор, академик НАН РК, директор Центра развития педагогического образования, заведующая кафедрой методики преподавания математики, физики и информатики КазНПУ им. Абая (Алматы, Казахстан), <https://www.scopus.com/authid/detail.uri?authorId=57191275199>, <https://www.webofscience.com/wos/author/record/2076124>.

ЗАМЕСТИТЕЛЬ ГЛАВНОГО РЕДАКТОРА:

СЕМБИЕВА Ляззат Мыктыбековна, доктор экономических наук, профессор Евразийского национального университета им. Л.Н. Гумилева (Астана, Казахстан), <https://www.scopus.com/authid/detail.uri?authorId=57194226348>, <https://www.webofscience.com/wos/author/record/38875302>.

РЕДАКЦИОННАЯ КОЛЛЕГИЯ:

РИШЕЛЬ Мариновски, PhD в области образования, профессор факультета педагогики Летбриджского университета, (Альберта, Канада), <https://www.scopus.com/authid/detail.uri?authorId=57070452800>, <https://www.webofscience.com/wos/author/record/16130920>.

ШИШОВ Сергей Евгеньевич, доктор педагогических наук, профессор, заведующий кафедрой педагогики и психологии профессионального образования Московского государственного университета технологий и управления имени К. Разумовского (Москва, Россия), <https://www.scopus.com/authid/detail.uri?authorId=57191518233>, <https://www.webofscience.com/wos/author/record/2443966>.

АБИЛЬДИНА Салтанат Куатовна, доктор педагогических наук, профессор, заведующая кафедрой педагогики Карагандинского университета имени Е.А. Букетова (Караганда, Казахстан), <https://www.scopus.com/authid/detail.uri?authorId=56128026400>, <https://www.webofscience.com/wos/author/record/4131549>.

РЫЖАКОВ Михаил Викторович, доктор педагогических наук, профессор, академик Российской академии образования, главный редактор журнала «Стандарты и мониторинг в образовании» (Москва, Россия), <https://www.scopus.com/authid/detail.uri?authorId=6602245542>, <https://www.webofscience.com/wos/author/record/13675462>.

БУЛАТБАЕВА Кулжанат Нурымжановна, доктор педагогических наук, профессор, главный научный сотрудник Национальной академии образования имени Ы. Алтынсарина (Астана, Казахстан), <https://www.scopus.com/authid/detail.uri?authorId=57202195074>, <https://www.webofscience.com/wos/author/record/40173122>.

ПЕТР Хайек, PhD, университет Юникорн, ассоциированный профессор Департамента финансов, (Прага, Чехия), <https://www.scopus.com/authid/detail.uri?authorId=35726855800>, <https://www.webofscience.com/wos/author/record/672404>.

ЖУМАН Жаппар, доктор экономических наук, профессор, заслуженный деятель Казахстана, почетный академик НАН РК, директор Центра Международных прикладных исследований Казахского национального университета им. аль-Фараби (Алматы, Казахстан), <https://www.scopus.com/authid/detail.uri?authorId=59238481900>; <https://www.scopus.com/authid/detail.uri?authorId=56658765400>, <https://www.webofscience.com/wos/author/record/60977874>.

ЛУКЬЯНЕНКО Ирина Григорьевна, доктор экономических наук, профессор, заведующая кафедрой Национального университета «Киево-Могилянская академия» (Киев, Украина), <https://www.scopus.com/authid/detail.uri?authorId=57189348551>, <https://www.webofscience.com/wos/author/record/939510>.

ЕСИМЖАНОВА Сайра Рафиевна, доктор экономических наук, профессор Университета международного бизнеса (Алматы, Казахстан), <https://www.scopus.com/authid/detail.uri?authorId=56499485500>, <https://www.webofscience.com/wos/author/record/45951098>.

Scientific Journal of Pedagogy and Economics

ISSN 2518-1467 (Online),

ISSN 1991-3494 (Print).

Собственник: ТОО «Центрально-азиатский академический научный центр» (г. Алматы).

Свидетельство о постановке на учет периодического печатного издания в Комитете информации Министерства информации и коммуникаций и Республики Казахстан

№ KZ50VPY00121155 выданное 05.06.2025 г.

Тематическая направленность: «публикация результатов новых достижений в области фундаментальных наук».

Периодичность: 6 раз в год.

<http://www.bulletin-science.kz/index.php/en/>

© ТОО «Центрально-азиатский академический научный центр», 2026



CONTENTS

PEDAGOGY

Abildinova G.M., Mukanova T.T., Kazhiakparova Zh.S.

Using AR effects in social networks to assess knowledge on information and communication technologies.....14

Abitayeva U.A., Sarybayeva A.Kh., Almagambetova A.A.

The effectiveness of teaching geometrical optics to future physics teachers using the GeoGebra software.....30

Abylkassymova A., Tuyakov Y., Rysbekova G.

Application of stochastic methods in professionally oriented teaching students of technical specialties.....43

Aidarkhanova K.A., Rauandina A.K.

Innovative approaches to developing dialogic speaking skills of grade 8–9 students in schools with a non-Kazakh language of instruction.....63

Akdeniz E., Bazarbayev K., Shormakova A.

Scientific and methodological foundations for using materials of the Kazakh national press of the early 20th century in teaching the history of Turkey.....77

Bashenova A.M., Tuyakbaev G.A.

Development of students' research competence through folklore and digital technologies.....93

Berdibek A.M., Kudaibergenova A.M.

Case Study technology as a means of forming professional competencies of future educational psychologists.....112

Imangaliyeva B., Torsykbaeva B., Unerbayeva Z.

Teaching the “Theory of Electrolytic Dissociation” section to students with special educational needs.....133

Iminova Yu.B.

Trends in research on preschool children’s safety behavior in Playful Learning: a bibliometric mapping.....148

Kaparova R., Yessenova M., Dyussov M.

Developing skills to find a derivative function using information technology.....171

Kengshilik A.T., Kalekeshov A.M., Abdrassulova Zh.T.

Methodological foundations for the use of artificial intelligence tools in teaching biology to students with special educational needs.....193

Kerimbaeva K.Z., Ussenbay A.U., Beysen A.K.

Effective organization of practical chemistry classes using artificial intelligence tools.....209

Kozhabayev S.E., Nysanov E.A., Abdrashova E.T.

Improving the computational thinking of future IT specialists through programming optimization problem.....226

Massalimova B.K., Dautova Z.S., Sharipkhanova A.

The role of implementing the Sustainable Development Goals using STEM projects.....240

Pernebayeva F., Kulakhmet M., Abdullaeva A.

The effectiveness of using innovative methods in teaching biology based on digital laboratories....256

Ryskulbek D.Zh., Daurenbek S.B., Dosmurzaeva A.S.

Teaching ethnocultural units to a Russian-speaking audience through artificial intelligence: working with translation mismatches.....278

Sabyrbaeva B.T., Zhensikbaeva N.Zh.

Development of students' eco-geographical culture in the context of a green economy.....300

Serikbayeva N., Belenko O., Orynbekova A.

Pedagogical decision-making based on the assessment of students' personal development and psychological well-being.....320

Shamshadinkyzy A., Kulanova S.Sh.

Teaching alash figures in higher education through storytelling and dramatization.....333

Zhumagulova Z.A., Ospanbekov Y.A., Nyssan G.

Methodology of using artificial intelligence in developing problem-solving skills of future physics teachers.....346

ECONOMICS

Ashirbayeva S.B., Yesirkepova A.M., Alzhanova A.A.

The Impact Of Climate Change On Forestry In Kazakhstan And Uzbekistan: Economic Assessment And Comparative Analysis.....360

Beisenbayeva A. K., Sultanova B. B., Turdaliyeva U.N.

Digitalization Of Accounting In Kazakhstan And Ensuring The Quality Of Accounting Information.....379

Esimkhan G.E., Rakhimberdinova M.U., Kabieva A.

Sustainable Development Of The Agro-Industrial Complex Through Innovation And Digital Technologies.....401

Gataulina G., Assanova A., Koshkarbaev K.

The Impact Of Digital Technologies On Nonperforming Loans In The Banking Sector.....418

Kaliyeva S., Umurzakova B., Tashimova U.

Key Directions For Developing A High-Quality Labor Force Market In The Context Of New Technology Adoption.....434

Konyrbekov M.Zh.

Structural And Technological Modernization Of Kazakhstan'S Industries Under Esg Transformation: Assessment Criteria.....453

Kozhakhmetova K., Rakhmatullayeva D., Ruziev K.

Esg-Investment Of Kazakhstan'S Endowment Funds: Institutional Constraints And Mechanisms To Overcome Them.....472

Kussainova D.B. , Intykbayeva S.Zh. , Guliyev F. Digital Financial Inclusion In Kazakhstan: Assessing The Efficiency Of Financial Product Use And Associated Risks.....	495
Madysheva A., Abdimoldayeva A., Mutaliyeva L. Artificial Intelligence In Managing Logistics Costs Of The Agro-Industrial Complex.....	517
Momynkulova S.M., Urkumbayeva A. R. , Yessakhmetova L. M. Innovative Development Of Kazakhstan’S Grain Sector: Trends, Challenges, And Strategic Priorities.....	533
Nurbatsin A., Lodhi R.N., Karacsony P. Gender Inequality In Access To Digital Technologies And Its Impact On Women’S Employment In Kazakhstan.....	554
Nurgaliyeva K. Esg Factors Of Structural Modernization Of Kazakhstan’S Economy: Sectoral Differences And Development Priorities.....	575
Sarkambayeva Sh.G., Turegeldinova A.T., Kumpekeyev A.K. Consumer credit behavior and personalized lending in digital banking.....	598
Skakova S.N., Davletova M.T., Gerasimenko V.V. Social Media And User-Generated Content As Factors Influencing Consumers’ Tourist Decisions In Kazakhstan.....	613
Tansykbayeva G.O., Baigireeva Zh., Nurgaliyeva Zh.E. Digital Transformation Of Remuneration Systems In Kazakhstan: Mechanisms For Improving Efficiency And Fairness.....	631
Tolepov A.Ye., Karibayeva A.M., Muslimkyzy L. The role of high tech medical technologies in improving the efficiency of the healthcare system in the Republic of Kazakhstan.....	650
Tulaganov A.B., Bigozhin R.M., Nurmagambetova A.I. Quality Assurance Activities In Universities Of The Republic Of Kazakhstan: Development Challenges.....	672
Tuleshova G., Serikbayev S., Zhangirova R. Development Of The Circular Economy Based On Marketing Models Of Sustainable Consumption And Waste Recycling.....	688
Wang Jingyan, Kanabekova M., Dzhakisheva U. Factors Driving The Accelerated Economic Development Of Cities In Kazakhstan And China: A Comparative Analysis.....	703
Zhu Jian, Kusmoldayeva Zh., Abraliyev O.A. Artificial Intelligence As A Tool For Improving The Efficiency Of Healthcare System Management In Kazakhstan.....	722

МАЗМҰНЫ

ПЕДАГОГИКА

Абильдинова Г.М., Муканова Т.Т., Кажиякпарова Ж.С.

AR-эффектілерді әлеуметтік желілер арқылы ақпараттық-коммуникациялық технологиялар бойынша білімді бағалауда қолдану.....14

Әбіғасва Ұ.Ә., Сарыбаева Ә.Х., Алмағамбетова А.А.

GeoGebra бағдарламасын қолдану арқылы болашақ физика мұғалімдеріне геометриялық оптиканы оқытудың тиімділігі.....30

Әбілқасымов А., Тұяқов Е., Рысбекова Г.

Техникалық мамандықтағы студенттерді кәсіби бағдарлы оқытуда стохастикалық әдістерді қолдану.....43

Айдарханова К.А., Рауандина А.К.

Қазақ тілінде оқытпайтын мектептерде 8–9-сынып оқушыларының диалогтік сөйлеу дағдыларын қалыптастырудың инновациялық тәсілдері.....63

Акдениз Э., Базарбаев К., Шормакова А.

Хх ғасырдың басындағы қазақ ұлттық баспасөзі материалдарын Түркия тарихын оқытуда пайдаланудың ғылыми-әдістемелік негіздері.....77

Башенова Ә.М., Тұяқбаев Ғ.Ә.

Білім алушылардың зерттеушілік құзыреттілігін фольклор және цифрлық технологиялар арқылы дамыту.....93

Бердібек А.М., Қудайбергенова А.М.

Болашақ педагог-психологтардың кәсіби құзыреттіліктерін қалыптастырудағы Case Study технологиясының рөлі.....112

Иманғалиева Б., Торсықбаева Б., Өнербаева З.

«Электролиттік диссоциация теориясы» тарауын ерекше балаларға оқыту.....133

Иминова Ю.Б.

Playful learning негізінде мектеп жасына дейінгі балалардың қауіпсіз мінез-құлқын зерттеу үрдістері: библиометриялық карталау.....148

Капарова Р., Есенова М., Дюсов М.

Функцияның туындысын табу дағдыларын ақпараттық технологияларды қолдану арқылы қалыптастыру.....171

Керімбаева К.З., Үсенбай А.Ұ., Бейсен А.К.

Химия пәнінде жасанды интеллект құралдарын қолдану арқылы тәжірибелік сабақтарды тиімді ұйымдастыру.....193

Кеңшілік А.Т., Калекешов А.М., Абдрасұлова Ж.Т.

Еббқ бар оқушыларға биология пәнін оқытуда жасанды интеллект құралдарын қолданудың әдістемелік негіздері.....209

Кожабасев С.Е., Нысанов Е.А., Абдрашова Э.Т.

Оңтайландыру есептерін бағдарламалау арқылы болашақ информатиктердің есептеуіш ойлау қабілетін жетілдіру.....226

Масалимова Б.К., Даутова З.С., Шарипханова А.

STEM жобаларды қолдану арқылы тұрақты даму максаттарын жүзеге асырудың маңызы.....240

Пернебаева Ф. С., Құлахмет М., Абдуллаева А.А.

Цифрлық зертханалар негізінде биологияны оқытуда инновациялық әдістерді қолданудың тиімділігі.....256

Рысқұлбек Д.Ж., Дәуренбек С.Б., Досмурзаева А.С.

Этномәдени бірліктерді орыс аудиториясында жиі арқылы оқыту: аудармадағы сәйкессіздіктермен жұмыс.....278

Сабырбаева Б.Т., Женисқбаева Н.Ж.

Жасыл экономика жағдайында оқушылардың экологиялық-географиялық мәдениетін дамыту.....300

Серикбаева Н., Беленко О., Орынбекова А.

Оқушылардың тұлғалық дамуы мен психологиялық әл-ауқатын бағалау негізінде педагогикалық шешім қабылдау.....320

Шамшадинқызы А., Құланова С.Ш.

Жоғары оқу орындарында Алаш қайраткерлерін сторителлинг және драматизация әдістері арқылы оқыту.....333

Жұмағұлова З.А., Оспанбеков Е.А., Нысан Г.

Болашақ физика мұғалімдерінің есеп шығару дағдыларын дамытуда жасанды интеллектті қолдану әдістемесі.....346

ЭКОНОМИКА

Әшірбаева С.Б., Есіркепова А.М., Әлжанова А.А.

Климаттық өзгерістердің Қазақстан және Өзбекстан орман шаруашылығына әсері: экономикалық бағалау және салыстырмалы талдау.....360

Бейсенбаева А.К., Сұлтанова Б.Б., Тұрдалиева Ұ.Н.

Қазақстандағы бухгалтерлік есепті цифрландыру және есептік ақпараттың сапасын қамтамасыз ету.....379

Есімхан Г.Е., Рахимбердинова М.У., Қабиева Ә.

Инновациялар мен цифрлық технологиялар негізінде агроөнеркәсіптік кешеннің тұрақты дамуы.....401

Гатаулина Г., Асанова А., Қошқарбаев Қ.

Цифрлық технологиялардың банк секторындағы проблемалық берешекке әсері.....418

Қалиева С., Өмірзақова Б., Ташимова Ұ.

Жаңа технологияларды енгізу жағдайында сапалы еңбек ресурстары нарығын қалыптастырудың негізгі бағыттары.....434

Қонырбеков М.Ж.

Қазақстан өнеркәсібінің esg трансформациясы жағдайындағы құрылымдық-технологиялық жаңғыруы: бағалау өлшемдері.....453

Қожахметова Қ., Рахматуллаева Д., Рузиев К.

Esg-қазақстанның эндаументтік қорларына инвестициялар: институционалдық шектеулер және оларды еңсеру тетіктері.....472

Құсайынова Д.Б., Интықбаева С.Ж., Гулиев Ф.

Қазақстандағы цифрлық қаржылық инклюзия: қаржы өнімдерін пайдалану тиімділігін және ілеспе тәуекелдерді бағалау.....495

Мәдішева Ә., Әбдімолдаева А., Мұталиева Л.

Агроөнеркәсіптік кешеннің логистикалық шығындарын басқарудағы жасанды интеллект...517

Момынқұлова С.М., Үркімбаева А.Р., Есахметова Л.М.

Қазақстанның астық секторын инновациялық дамыту: үрдістер, проблемалар және стратегиялық басымдықтар.....533

Нұрбақин А., Лодхи Р.Н., Карачони П.

Цифрлық технологияларға қол жеткізудегі гендерлік теңсіздік және оның қазақстандағы әйелдердің жұмыспен қамтылуына әсері.....554

Нұрғалиева Қ.

Қазақстан экономикасын құрылымдық жаңғыртудың esg-факторлары: салалық айырмашылықтар мен даму басымдықтары.....575

Сарқамбаева Ш.Г., Турегелдинова А.Т., Кумпекеев А.К.

Цифрлық банкінгтегі тұтынушының кредиттік мінез-құлқы және дербестендірілген кредиттеу.....598

Скакова С.Н., Давлетова М.Т., Герасименко В.В.

Әлеуметтік желілер мен пайдаланушылар жасаған контент Қазақстандағы тұтынушылардың туристік шешімдеріне әсер ететін факторлар ретінде.....613

Тансықбаева Г.О., Байгиреева Ж., Нұрғалиева Ж.Е.

Қазақстандағы еңбекақы төлеу жүйелерінің цифрлық трансформациясы: тиімділік пен әділдікті арттыру тетіктері.....631

Төлепов Ә.Е., Карибаева А.М., Муслимқызы Л.

Қазақстан Республикасының денсаулық сақтау жүйесінің тиімділігін арттырудағы жоғары технологиялық медициналық технологиялардың рөлі.....650

Тулағанов А.Б., Бигожин Р.М., Нұрмағамбетова А.И.

Қазақстан Республикасының жоғары оқу орындарында сапаны қамтамасыз ету қызметі: даму мәселелері.....672

Түлешова Г., Серікбаев С., Жангирова Р.

Тұрақты тұтыну мен қалдықтарды қайта өңдеудің маркетингтік модельдері негізінде циркулярлық экономиканы дамыту.....688

Ван Цзинъянь, Қанабекова М., Джакишева У.

Қазақстан мен Қытай қалаларының озыңқы экономикалық даму факторлары: салыстырмалы талдау.....703

Чжу Цзянь, Құсмолдаева Ж., Әбралиев О.А.

Жасанды интеллект Қазақстанның денсаулық сақтау жүйесін басқару тиімділігін арттыру құралы ретінде.....722

СОДЕРЖАНИЕ

ПЕДАГОГИКА

Абильдинова Г.М., Муканова Т.Т., Кажиякпарова Ж.С.

Применение AR-эффектов при оценке знаний по информационно-коммуникационным технологиям через социальные сети.....14

Абитаева У.А., Сарыбаева Ә.Х., Алмагамбетова А.А.

Эффективность обучения геометрической оптике будущих учителей физики с применением программы GeoGebra.....30

Абылкасымова А., Туяков Е., Рысбекова Г.

Применение стохастических методов в профессионально ориентированном обучении студентов технических специальностей.....43

Айдарханова К.А., Рауандина А.К.

Инновационные подходы к развитию навыков диалогической речи у учащихся 8–9-х классов в школах с неказахским языком обучения.....63

Акдениз Э., Базарбаев К., Шормакова А.

Научно-методические основы использования материалов казахской национальной прессы начала XX века в преподавании истории Турции.....77

Башенова А.М., Туякбаев Г.А.

Развитие исследовательской компетентности обучающихся посредством фольклора и цифровых технологий.....93

Бердібек А.М., Кудайбергенова А.М.

Технология Case Study как средство формирования профессиональных компетенций будущих педагогов-психологов.....112

Имангалиева Б., Торсыкбаева Б., Унербаева З.

Обучение обучающихся с особыми образовательными потребностями по разделу «Теория электролитической диссоциации».....133

Иминова Ю.Б.

Тенденции исследований безопасного поведения дошкольников в Playful Learning: библиометрическое картирование.....148

Капарова Р., Есенова М., Дюсов М.

Формирование навыков нахождения производной функции с использованием информационных технологий.....171

Кеншилик А.Т., Калекешов А.М., Абдрасулова Ж.Т.

Методические основы применения инструментов искусственного интеллекта в обучении биологии обучающихся с особыми образовательными потребностями.....193

Керимбаева К.З., Усенбай А.У., Бейсен А.К.

Организация практических занятий химии с использованием искусственного интеллекта...209

Кожабаяев С.Е., Нысанов Е.А., Абдрашова Э.Т.

Совершенствование вычислительного мышления будущих информатиков посредством программирования задач оптимизации.....226

Масалимова Б.К., Даутова З.С., Шарипханова А. Роль реализации целей устойчивого развития с помощью STEM-проектов.....	240
Пернебаева Ф. С., Кулахмет М., Абдуллаева А.А. Эффективность использования инновационных методов в обучении биологии на базе цифровых лабораторий.....	256
Рысқұлбек Д.Ж., Дэуренбек С.Б., Досмурзаева А.С. Обучение этнокультурным единицам в русскоязычной аудитории с использованием искусственного интеллекта: работа с несоответствиями при переводе.....	278
Сабырбаева Б.Т., Женискаева Н.Ж. Развитие эколого-географической культуры учащихся в условиях зелёной экономики.....	300
Серикбаева Н., Беленко О., Орынбекова А. Принятие педагогических решений на основе оценки личностного развития и психологического благополучия учащихся.....	320
Шамшадинкызы А., Куланова С.Ш. Преподавание деятельности деятелей Алаша в высших учебных заведениях посредством сторителлинга и драматизации.....	333
Жұмағұлова З.А., Оспанбеков Е.А., Нысан Г. Методика использования искусственного интеллекта в развитии навыков решения задач у будущих учителей физики.....	340

ЭКОНОМИКА

Аширбаева С.Б., Есиркепова А.М., Альжанова А.А. Влияние климатических изменений на лесное хозяйство Казахстана и Узбекистана: экономическая оценка и сравнительный анализ.....	360
Бейсенбаева А.К., Султанова Б.Б., Турдалиева У.Н. Цифровизация бухгалтерского учета в Казахстане и обеспечение качества учетной информации.....	379
Есимхан Г.Е., Рахимбердинова М.У., Кабиева А. Устойчивое развитие агропромышленного комплекса на основе инноваций и цифровых технологий.....	401
Гатаулина Г., Асанова А., Кошкарбаев К. Влияние цифровых технологий на проблемную задолженность банковского сектора.....	418
Калиева С., Умурзакова Б., Ташимова У. Ключевые направления формирования рынка качественных трудовых ресурсов в условиях внедрения новых технологий.....	434
Конырбеков М.Ж. Структурно-технологическая модернизация отраслей промышленности Казахстана в условиях esg-трансформации: критерии оценки.....	453
Кожаметова К., Рахматуллаева Д., Рузиев К. Esg-инвестирование эндаумент-фондов Казахстана: институциональные ограничения и механизмы их преодоления.....	472

Кусаинова Д.Б., Интыкбаева С.Ж., Гулиев Ф.

Цифровая финансовая инклюзия в Казахстане: оценка эффективности использования финансовых продуктов и сопутствующих рисков.....495

Мадышева А., Абдимолдаева А., Муталиева Л.

Искусственный интеллект в управлении логистическими издержками агропромышленного комплекса.....517

Момынкулова С.М., Уркумбаева А.Р., Есахметова Л.М.

Инновационное развитие зернового сектора Казахстана: тенденции, проблемы и стратегические приоритеты.....533

Нурбацин А., Лодхи Р.Н., Карачони П.

Гендерное неравенство в доступе к цифровым технологиям и его влияние на занятость женщин в Казахстане.....534

Нурғалиева К.

Esg-факторы структурной модернизации экономики Казахстана: отраслевые различия и приоритеты развития.....575

Саркамбаева Ш.Г., Турегелдинова А.Т., Кумпекеев А.К.

Кредитное поведение потребителей и персонализированное кредитование в цифровом банкинге.....598

Скакова С.Н., Давлетова М.Т., Герасименко В.В.

Социальные сети и пользовательский контент как факторы, влияющие на туристические решения потребителей в Казахстане.....613

Тансыкбаева Г.О., Байгиреева Ж., Нурғалиева Ж.Е.

Цифровая трансформация систем оплаты труда в Казахстане: механизмы повышения эффективности и справедливости.....631

Төлепов А.Е., Карибаева А.М., Муслимқызы Л.

Роль высокотехнологичных медицинских технологий в повышении эффективности системы здравоохранения Республики Казахстан.....650

Тулаганов А.Б., Бигожин Р.М., Нурмагамбетова А.И.

Деятельность по обеспечению качества в вузах Республики Казахстан: проблемы развития.....672

Тулешова Г., Серикбаев С., Жангирова Р.

Развитие циркулярной экономики на основе маркетинговых моделей устойчивого потребления и переработки отходов.....688

Ван Цзинъянь, Канабекова М., Джакишева У.

Факторы опережающего экономического развития городов Казахстана и Китая: сравнительный анализ.....703

Чжу Цзянь, Кусмолдаева Ж., Абралиев О.А.

Искусственный интеллект как инструмент повышения эффективности управления системой здравоохранения Казахстана.....722

SCIENTIFIC JOURNAL OF PEDAGOGY AND ECONOMICS

ISSN 1991-3494

Volume 5.

Number 423 (2026), 148-170

<https://doi.org/10.32014/2026.2518-1467.1282>

IRSTI: 14.23.05

UDC 372.3/.4

© Iminova Yu.B.*, 2026.

Abai Kazakh National Pedagogical University, Almaty, Kazakhstan.

E-mail: iminova.yulduza@mail.ru

TRENDS IN RESEARCH ON PRESCHOOL CHILDREN'S SAFETY BEHAVIOR IN PLAYFUL LEARNING: A BIBLIOMETRIC MAPPING

Iminova Yulduz — doctoral student, NJSC «Abai Kazakh National Pedagogical University», Almaty, Kazakhstan,

E-mail: iminova.yulduza@mail.ru , <https://orcid.org/0009-0006-9588-7522>.

Abstract. To date, there is a necessary amount of literature and methodological recommendations on the problems of child safety. This suggests that this area is relevant for modern society, but at the same time there are certain difficulties in solving it. In this regard, the author conducted a bibliometric mapping of the research literature (1990-2025) on safe behavior, playful learning, and preschool education. The purpose of the study: to conduct a systematic mapping of research trends in the field of safe behavior and playful learning in preschool education over the past 35 years using metadata extracted from the Web of Science database. The main bibliometric methods were statistical, counting the number of publications, citation index, and content analysis. Research results: the search covered the period from 1990 to 2025 (May 28, 2025) and was conducted during 3 weeks of June 2025. Initially, during the search, the WoS database provided a total of $n = 207,799$ publications. Further, the search was filtered by specific indicators, which gave the final set of data for bibliometric analysis $n = 3263$, which were eventually saved and used in the analysis of this study. The ranking of the frequency of publications and citations of data was performed using the VOSViewer software version 1.6.20. The following categories are analyzed: trends in publication and citation data; major journals and publications; leading authors, organizations, and countries/territories; disciplines underlying research. A detailed report on categories is presented in the study. The practical significance of the study lies in the fact that, based on the content analysis obtained, current trends, scientific directions and research prospects in the field of safe behavior and playful learning in preschool education have been identified.

Keywords: Safe behavior, playful learning, early childhood, bibliometric analysis, VOSviewer

For citations: Iminova Yu.B. Conceptual and thematic clusters of research on the safe behavior of preschool children in playful learning: bibliometric mapping of literature. Scientific Journal of Pedagogy and Economics, 2026. — No. 5. — P. 148-170. — DOI: <https://doi.org/10.32014/2026.2518-1467.1282>.

© Иминова Ю.Б.*, 2026.

Абай атындағы Қазақ ұлттық педагогикалық университеті» КеАҚ,
Алматы, Қазақстан.

E-mail: iminova.yulduza@mail.ru

PLAYFUL LEARNING НЕГІЗІНДЕ МЕКТЕП ЖАСЫНА ДЕЙІНГІ БАЛАЛАРДЫҢ ҚАУІПСІЗ МІНЕЗ-ҚҰЛҚЫН ЗЕРТТЕУ ҮРДІСТЕРІ: БИБЛИОМЕТРИЯЛЫҚ КАРТАЛАУ

Иминова Юлдуз — докторант, «Абай атындағы Қазақ ұлттық педагогикалық университеті» КеАҚ, Алматы, Қазақстан,
E-mail: iminova.yulduza@mail.ru , <https://orcid.org/0009-0006-9588-7522> .

Аннотация. Бүгінгі таңда балалардың қауіпсіздігі мәселелеріне арналған әдебиеттердің, әдістемелік ұсыныстардың қажетті саны бар. Бұл бағыт қазіргі қоғам үшін маңызды екенін көрсетеді, бірақ сонымен бірге оны шешудің белгілі бір қиындықтары бар. Осыған байланысты автор қауіпсіз мінез-құлық, playful learning, мектепке дейінгі білім беру туралы зерттеу әдебиеттерін (1990-2025) библиометриялық картаға түсірді. Зерттеудің мақсаты: Web of Science базасынан алынған метадеректерді пайдалана отырып, соңғы 35 жылдағы мектепке дейінгі білім берудегі қауіпсіз мінез-құлық және playful learning зерттеу тенденцияларының жүйелі картасын жасау. Негізгі библиометриялық әдістер статистикалық, жарияланымдар санын есептеу, дәйексөз индексі, мазмұнды талдау болды. Зерттеу нәтижелері: іздеу 1990-2025 жылдар аралығын қамтыды (2025 ж. 28 мамыр) және 2025 жылдың 3 маусымында жүргізілді. Бастапқыда іздеу кезінде WoS базасы Жалпы $n = 207\,799$ басылым ұсынды. Әрі қарай іздеу нақты көрсеткіштер бойынша сүзіліп, $N = 3263$ библиометриялық талдауы үшін нақты мәліметтер жиынтығын берді, олар ақырында осы зерттеуді талдауда сақталды және қолданылды. Жариялау жиілігі мен деректерге сілтеме рейтингі VOSViewer 1.6.20 бағдарламалық құралының көмегімен орындалады. Келесі категориялар талданады: жарияланымдар мен дәйексөздер бойынша мәліметтердің тенденциялары; негізгі журналдар мен басылымдар; жетекші авторлар, ұйымдар және Елдер/аумақтар; зерттеулердің негізінде жатқан пәндер. Санаттар бойынша егжей-тегжейлі есеп зерттеуде берілген. Зерттеудің практикалық маңыздылығы

мынада: алынған мазмұнды талдау негізінде мектепке дейінгі білім берудегі қауіпсіз мінез-құлық пен playful learning саласындағы зерттеулердің заманауи тенденциялары, ғылыми бағыттары мен перспективалары анықталды.

Түйін сөздер: қауіпсіз мінез-құлық, playful learning, мектепке дейінгі білім, библиометриялық талдау, VOSviewer

© Иминова Ю.Б.*, 2026.

НАО «Казахский национальный педагогический университет имени Абая»,
Алматы, Казахстан.
E-mail: iminova.yulduza@mail.ru

ТЕНДЕНЦИИ ИССЛЕДОВАНИЙ БЕЗОПАСНОГО ПОВЕДЕНИЯ ДОШКОЛЬНИКОВ В PLAYFUL LEARNING: БИБЛИОМЕТРИЧЕСКОЕ КАРТИРОВАНИЕ

Иминова Юлдуз — докторант, НАО «Казахский национальный педагогический университет имени Абая», Алматы, Казахстан,
E-mail: iminova.yulduza@mail.ru , <https://orcid.org/0009-0006-9588-7522>.

Аннотация. На сегодняшний день существует достаточное количество литературы и методических рекомендаций, посвящённых проблемам безопасности детей. Это говорит о том, что данное направление актуально для современного общества, однако вместе с тем существуют определённые сложности в решении данной проблемы. В этой связи автором проведено библиометрическое картирование исследовательской литературы (1990–2025 гг.) о безопасном поведении, playful learning и дошкольном образовании. Цель исследования — проведение систематического картирования тенденций исследований в области безопасного поведения и playful learning в дошкольном образовании за последние 35 лет с использованием метаданных, извлечённых из базы Web of Science. Основными библиометрическими методами выступили статистический анализ, подсчёт числа публикаций, анализ индекса цитирования и контент-анализ. Результаты исследования: поиск охватывал период с 1990 по 2025 год (по состоянию на 28 мая 2025 г.) и проводился в течение трёх недель июня 2025 года. Изначально при осуществлении поиска база WoS предоставила в общей сложности $n = 207\,799$ публикаций. Далее результаты поиска были отфильтрованы по конкретным показателям, что позволило сформировать окончательный набор данных для библиометрического анализа ($n = 3263$), который впоследствии был сохранён и использован в данном исследовании. Ранжирование публикаций по частоте и показателям цитирования выполнено с помощью программного обеспечения VOSviewer версии 1.6.20. Проанализированы следующие категории: тенденции в данных по публикациям и цитированию; основные журналы и публикации; ведущие авторы, организации и страны/

территории; дисциплины, лежащие в основе исследований. Подробный отчёт по категориям представлен в исследовании. Практическая значимость исследования заключается в том, что на основе проведённого контент-анализа определены современные тенденции, научные направления и перспективы исследований в области безопасного поведения и playful learning в дошкольном образовании.

Ключевые слова: безопасное поведение, playful learning, дошкольное образование, библиометрический анализ, VOSviewer.

Introduction. Every year, more and more scientific, educational, and methodological literature, as well as practical guidelines, are published around the world on the issues of human safety, particularly concerning preschool children. This shows the importance of the topic for the modern society. However, there are still certain challenges in addressing this issue. Safe childhood and the creation of conditions for children to live their lives fully are identified worldwide as priorities. Every child is born with the same inalienable right to a healthy start in life, education, and safe and peaceful childhood, which forms the foundation for a productive and prosperous adulthood. Protection, health, and well-being of children are central to the mission of the United Nations and the United Nations Children's Fund, and are enshrined in legal documents, including the Declaration of the Rights of the Child, the World Declaration on the Survival, Protection and Development of Children, and the Convention on the Rights of the Child. For instance, Article 3, paragraph 2 of the Convention on the Rights of the Child states: "States Parties undertake to ensure the child such protection and care as is necessary for his or her well-being..." (United Nations, 1989).

Today, all United Nations member states are implementing the 17 Sustainable Development Goals, which are aimed at improving people's lives, protecting the planet, and ensuring peace and prosperity. According to Goal 4: Quality Education, Goal and Indicator 4.A, calls to "build and upgrade education facilities that are child-, disability- and gender-sensitive and provide safe, non-violent, inclusive and effective learning environments for all" (United Nations, n.d.a; United Nations, n.d.b).

In addressing the Sustainable Development Goals and specifically Goal 4 there is the issue of providing quality of educational services, which requires the identification and development of effective forms and methods of working with preschool children. One of the most recognized and effective forms of learning is play. Play is a complex and often ambiguous concept, with different interpretations. Play is a channel through which children develop social and cognitive skills in order to learn how to learn. Despite the available scientific evidence that play stimulates learning opportunities, it is gradually disappearing from children's lives, for a number of reasons based on economic and socio-political values, and this may also be due to changing interests of the younger generation (Hirsh-Pasek et al., 2009).

In this context, amid the ongoing transformation of the education system, a need to reconsider the current content of preschool education arises. This necessity is driven by the evolving needs of the younger generation and specifically, children of Generation Alpha (2010–2025) and Generation Beta (2025–2039), also known as "digital natives" and "children of artificial intelligence". It is known that AI systems and chatbots are rapidly integrating into all aspects of our lives, reshaping the world around us. The question is: How will these generations shape the future? And what will their thinking, education, learning abilities, and interactions look like? In this regard, the focus of our research is a bibliometric review of the scholarly literature on the issue of ensuring safe behavior in preschool children and identifying effective forms of learning. Playful learning is one of the responses to the question: How can we turn everyday experiences into engaging learning opportunities that naturally stimulate types of interaction conducive to developing safe behavior skills? How can we transform daily routines to make them both exciting and productive?

Literature Review. *The potential of playful learning in preschool education for teaching the basics of safe behavior*

Education is a powerful driver of social mobility, and therefore the task is to use children's time as effectively and efficiently as possible by integrating educational elements into everyday life.

Professor Angela Pyle is a researcher in the field of early childhood development and education and director of the Play Learning Lab (University of Toronto). She reviews peer-reviewed research on playful learning in kindergarten, aiming to identify discrepancies and gaps in the existing literature in her study "A Scoping Review of Research on Play-Based Pedagogies in Kindergarten Education" (229 citations). Current studies show that many educators struggle to combine the concepts of play and learning, support play as an essential component, but they primarily engage in didactic teaching. Although they express interest in using play-based learning strategies, they point to practical barriers such as a lack of professional training that hinders the effective implementation of these strategies. Play must be designed to serve more than one goal and take more than one form, enabling educators to move away from a divided approach and instead aim to integrate developmental, academic goals within the same environment. The implementation of play in kindergartens is partially shaped by policy. Future considerations include developing policies that better accommodate diverse approaches to play, supporting both developmental and academic functions (Pyle et al., 2017).

According to the empirical analysis presented in "Learning through play: a review of the evidence" (2017) by a group of researchers (Jennifer M. Zosh, Emily J. Hopkins, Hanne Jensen, et al.) in the chapter "Thriving in the 21st century: challenges and opportunities" it is stated that "Today's children (tomorrow's adults) are growing up amid rapid change, global challenges, and digital connectivity

- all of which shape their life prospects and future work". Play helps children manage emotions related to uncertainty and develop theory of mind - considering what others know and see. Beyond fun, experience in play equips children with essential life skills that go beyond the rote memorization of facts. Play is powerful mechanism that supports children's present well-being and joy while also preparing them to become creative, curious, lifelong learners in the future (Zosh et al., 2017).

The Playful Learning Landscapes team, led by Kathy Hirsh-Pasek, Roberta Golinkoff (Hirsh-Pasek, n.d.), also notes that while children learn and grow through various types of play, the most effective learning occurs when educational goals are purposefully embedded into play from the start and when adults subtly guide the child toward specific learning outcomes.

The transformation of "free play into playful learning" is guided by the five principles of the "Learning Bloom", which outline how children learn best:

- Meaningfulness: learning is more effective when children have a goal tied to something they care about. Activities should be rich in content, such as teaching the basics of safety or promoting critical thinking and creativity;
- Joy: joy enhances children's interest and motivation to learn. Every play experience should result in something new being discovered or created;
- Social Interaction: working together fosters learning. Children learn more when they collaborate, discuss, or interact with others than when they play alone. When families do things together, children usually thrive;
- Active Engagement: children need to be actively "engaged" - doing, not just observing. The activity should be directed toward a learning goal;
- Iterative Thinking: children enjoy activities that allow exploration of new perspectives rather than repetitive tasks. Learning should remain open to change and adaptation.

The Learning Bloom with its five principles guides us toward developing the skills necessary for future success. In this context, children need to acquire key competencies grouped into the six core principles of the "6 Cs": collaboration, communication, content, critical thinking, creative innovation, and confidence (Todaro et al., 2022).

Collaboration: this skill progresses through the sequence "On your own–Side-by-side–Back and forth–Building together". The first step on the path to mastering the 6Cs is collaboration. Participating in playful learning helps children develop cooperative skills. For example, while playing children may try to follow safety rules independently, participating in side-by-side play, they observe how others do it. Next, they start interacting, they warn each other about danger or help each other during play. Finally, they learn to work together to create safe environment;

Communication: "Raw Emotion–Show+Tell–Dialogue–Telling a Joint Story", i.e. collaborative work develops communication skills, encouraging children to move from simple emotional expression to learning how to show and tell, taking turns performing, and eventually engaging in a real dialogue. The exchange of

thoughts, ideas, new vocabulary can elevate children's communication to a more advanced level. For instance, a child's ability to express their feelings, warn of danger, or ask for help is a foundation of personal safety. Children begin with basic emotional responses such as fear or anxiety when they see something dangerous. Gradually, through play, they learn to show and tell: for example, "This is hot!". After that they move into dialogue: discussing with other children what is allowed and what is not allowed, and why it is important to be careful. This kind of experience not only helps them better understand safety but also empowers them to speak about it confidently, express their thoughts, and be heard.

Content: "Early Learning-Shallow Understanding-Making Connections-Expertise" i.e., the development of cooperation and communication skills supports children's understanding of content. Playful learning helps children move beyond basic rules-like "don't touch something hot" - to understand that danger can appear in various situations: hot tea, a stove, or an iron. Gradually, they begin to recognize that "hot" can also refer to tap water or a radiator. Through play, children learn to notice similar dangers in different places and remember how to act appropriately.

Critical thinking: "Seeing is Believing-Truths Differ-Opinions-Evidence", i.e. as children explore content, their critical thinking skills develop. Learning through play helps their transition from simply "seeing is believing" to understanding that people can have different perspectives. This allows them to form their own opinions based on what they know. A high level of critical thinking includes the ability to use knowledge to challenge one's own beliefs;

Creative Innovation: "Experimentation-Means-End-Voice-Vision", meaning that critical thinking skills and the ability to manage knowledge and information can lead to creative innovations, which often begin with experimentation and exploration of the world around us. For example, critical thinking skills help children find safe solutions in everyday situations: during a role-playing game like "Let's build a house" using pillows, children might notice that one of the pillows is unstable and can easily fall. Instead of continuing the game as is, they might decide to strengthen the structure, recalling how in real life, caution is needed to avoid injuries. In this way, children not only apply knowledge about safety but also begin to take initiative in creating their own safe solutions, building self-confidence and developing their own style of thinking;

Confidence "Barrel-On-Where Do I Stand?- Calculated Risk-Dare to Fail", where the final stage is confidence. Confidence grows as children acquire and refine the five skills, reflecting how they approach new experiences. Playful learning encourages children to self-reflect and evaluate their efforts, as well as how these efforts relate to their successes and failures, helping them understand that failure is simply part of the learning process. Understanding that failure is part of learning helps children take risks more confidently, "try" and dare to fail. For instance, in the game "Safe City", a child may attempt to help a toy pedestrian cross the road. At first, they might make a "mistake" - sending the pedestrian across on a red light.

Instead of punishment, the adult discusses what happened with the child, and they find the correct solution together. Next time, the child acts more confidently.

Based on the above, children can practice each of the six principles individually, but it is their combination that is essential for holistic personal development. For example, children may learn specific aspects of safe behavior by the means of play such as stopping before crossing the street, asking an adult for help, or identifying dangerous objects individually and at different times. However, the combination of these skills, working together allows a child to feel confident and safe in various situations.

To determine the degree to which the issue we are studying has been explored and developed, a bibliometric review of research literature over the past 35 years was conducted, presented in the following section.

Materials and methods. This study employed a bibliometric approach to mapping the literature from the past 35 years (1990–2025), using metadata extracted from three Web of Science indexes: the Science Citation Index Expanded, the Social Sciences Citation Index, and the Arts and Humanities Citation Index (A&HCI). The following key terms were used in the search: "safety" OR "safe behavior" AND "playful learning" OR "learning through play" AND "preschool age" OR "early childhood".

Several factors contributed to the decision to use WoS as the database for this research:

- WoS remains the gold standard and is the most widely used database for bibliometric analysis;
- WoS is an interdisciplinary database that includes publications from a wide range of research fields and disciplines, covering more than 20,000 journals;
- WoS contains publication and citation data dating back to 1900, which provides deeper historical insight (in contrast, Scopus includes citation data only from 1996 onward; Google Scholar, while broad, lacks citation precision; and citation analysis in PubMed is not available);
- WoS has demonstrated greater accuracy in journal classification systems compared to Scopus (Syzykbayeva et al., 2025).

Based on the rationale outlined above, the choice of WoS as the primary data source for this study is justified by its comprehensive coverage, long-standing historical depth, data accuracy, and reliable classification system, making it an optimal tool for conducting an in-depth bibliometric analysis of the research topic. The PRISMA methodological approach used in this study is illustrated in Figure 1 and discussed in more detail in the following paragraphs.

PRISMA 2020 flow diagram for new systematic reviews which included searches of databases and registers only

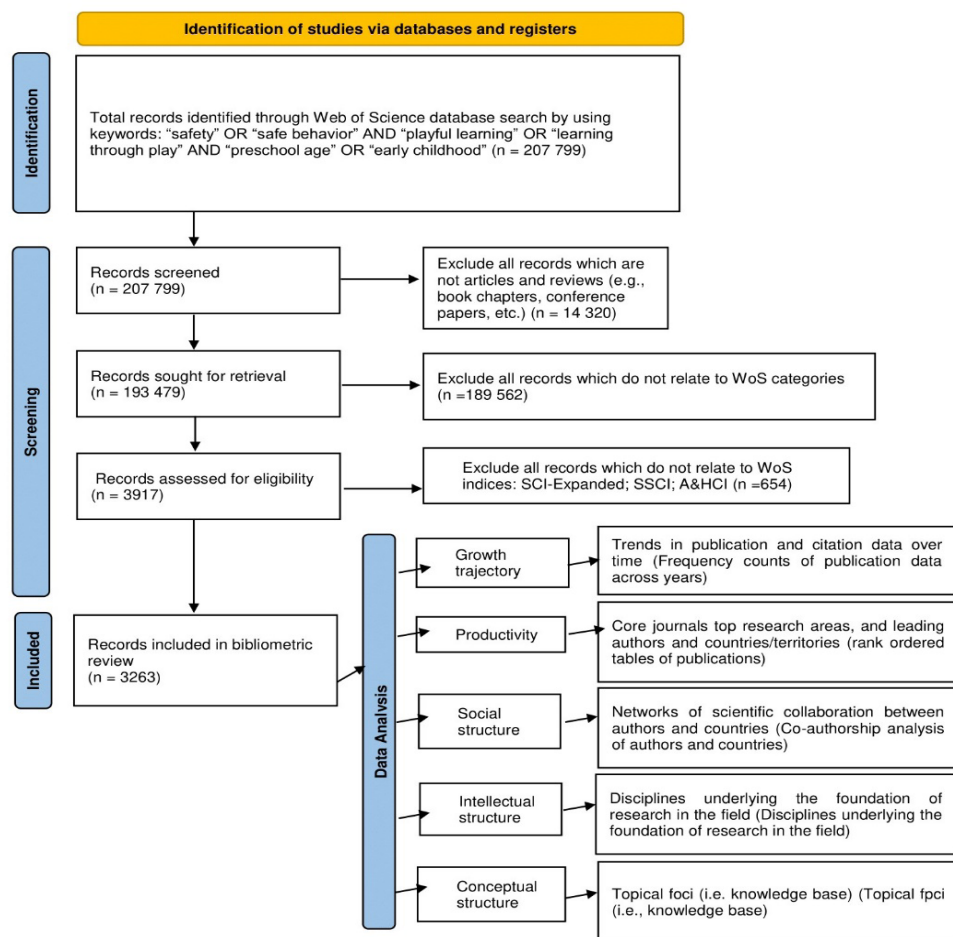


Figure 1 — Methodological design

Search strategy: research design

In this study, a comprehensive search strategy was used to create a representative body of literature relevant to the research problem. The process of identifying relevant publications was carried out in several stages, beginning with the selection of specific keywords and ending with the filtering of results based on predefined criteria. The first stage began on May 28, 2025, and involved formulating the core search terms: "safety", "safe behavior", "playful learning", "learning through play", "preschool age", and "early childhood". To ensure maximum coverage of relevant publications, logical operators OR and AND were used between the keywords, structured as follows: "safety" OR "safe behavior" AND "playful learning" OR "learning through play" AND "preschool age" OR "early childhood". These parameters were chosen to obtain the most accurate and closely related

results for the phenomenon under study. The initial number of relevant documents retrieved was $n=207,799$. The time frame of the search covered the period from 1990 to 2025 (as of 28 May 2025), with no language restrictions. After applying the filter for "Articles and article reviews", books, book chapters, and conference proceedings were excluded, reducing the dataset to $n=193,479$ documents.

Selection Criteria

The selection criterion was based on the Web of Science categories "Social Sciences, Interdisciplinary" and "Education & Educational Research", which initially revealed $n=3917$ publications. Applying additional criteria based on Web of Science domains (Social Sciences Citation Index, Science Citation Index Expanded, and Arts & Humanities Citation Index) resulted in a final dataset of $n=3263$ publications for bibliometric analysis. For each publication, the following metadata were extracted: article title, year of publication, journal, number of citations, author names, affiliations and countries, abstracts, author keywords, and reference lists.

Data Analysis Procedure

Frequency counts were used to identify trends in the publication and citation dynamics of research in the areas of safe behavior, playful learning, and early childhood education. Ranked frequencies of publications and citations were analyzed. The software VOSviewer (version 1.6.20) was used to explore and visualize relationships among authors, organizations, countries, journals, and keywords in the dataset. VOSviewer is a freely available software tool (www.vosviewer.com) for constructing and visualizing bibliometric maps based on network data (Hernández-Torrano et al., 2020). In the software, nodes represent the units of analysis such as authors, organizations, countries, journals, or key concepts. A link between two nodes (e.g., two researchers co-authoring a paper) indicates a relationship, the strength of which is expressed as a numerical value. The stronger the connection, the higher the value. Nodes and links together form networks, which can be grouped into clusters.

On a bibliometric map the size of a node indicates the frequency of occurrence (e.g., of an author, journal, or keyword); the color of a node represents the cluster to which it belongs; the thickness of the line connecting nodes reflects the strength of the relationship; the distance between nodes indicates the degree of relatedness between the two elements.

Results. *Trends in publication and citation data*

Publication and citation trends serve as reliable indicators of the development patterns within a particular field. Between 1990 and May 28, 2025, a total of 3,263 articles were published, which collectively received 88,285 citations. The average number of citations per article is 27.06, and the h-index reached 123, indicating the high quality and relevance of research in this area. On average, 2,596.62 citations per year were recorded, as shown in Figure 2. Figure 2 illustrates the dynamic growth in publications and citations in research related to safe behavior, playful learning, and early childhood education from 1990 to May 2025. The position of

the bars represents the number of publications for specific year, while the height of the bars indicates the number of citations in the database for the corresponding year. The analysis shows that from 1990 to 2004, the number of publications in this field remained relatively unchanged, while the number of citations increased from 0 to 230 during that period. Starting from 2005, the number of publications began to grow steadily, which may reflect rising interest among researchers. For example, 30 publications appeared in 2006, receiving 384 citations. By 2020, the number of publications had increased to 274, with 8,125 citations. In 2024, 283 scholarly articles were published, with 12,036 citations. As of May 28, 2025, the WoS database listed 100 publications from that year, which had already received 4,727 citations and since this data only covers the first half of 2025, a further increase in publications by the end of the year is quite possible.

Based on the above, and drawing on the WoS data analysis, it was determined that the most cited article in the dataset is "The statistical analysis of highway crash-injury severities: A review and assessment of methodological alternatives" (Savolainen et al., 2011), with 730 citations. However, for the purposes of our research, the following publications were of particular interest and are presented in Tables 1 and 1.1.

Table 1 — Highly cited publications in WoS

Article title	Publication Details	Number of Citations	Notes
Meta-Analysis of the Effects of Early Education Interventions on Cognitive and Social Development	Camilli, G ; Vargas, S; Ryan, S; Barnett, WS., 2010, Teachers college record	426	Early childhood education programs, focusing particularly on cognitive and social development are discussed (Camilli et al., 2010).
Validation of virtual reality as a tool to understand and prevent child pedestrian injury	Schwebel, David C.; Gaines, Joanna; Severson, Joan, 2008, Accident analysis and prevention	177	Virtual reality is examined as an innovative tool for education. The study demonstrates: construct validity through behavioral development differences; convergent validity via correlations between parent-reported child temperament and behavior in the virtual world; internal reliability of various pedestrian safety measures in the virtual environment; and face validity measured by users' self-reported perception of realism in the virtual world (Schwebel et al., 2008).

It should be noted that the scientific publications presented in Table 1, despite their high citation counts, do not fully reflect the specific focus of our research. Therefore, we extended our search and analysis of studies available in the database and identified that, although the following works (listed in Table 1.1) have lower citation rates, they more closely align with the subject of the present study.

Table 1.1 — Publications focusing on aspects relevant to the present research

Article title	Publication Details	Number of Citations	Notes
A comparison of urban and rural kindergarten teachers' perceptions of school safety for young children: implications for quality teacher education	Wong, Yau-ho Pau, 2017, Early child development and care	1	A comparative analysis was conducted on safety perceptions among urban and rural kindergarten teachers. The study examined knowledge and attitudes toward child safety. It discusses issues of "quality" early childhood education in relation to maintaining the health and safety of preschool children. Characteristics of both children and educators are described, with their processes influenced by the living environment (Wong, 2016).
Children's Perspective in Play: Documenting the Educational Process	Vujicic Lidija, Miketek Marija, 2014, Croatian journal of education-hrvatski casopis za odgoj i obrazovanje	4	The research was based on an extensive examination and documentation of teaching and research activities in a stimulating kindergarten environment. Within this study, children are viewed as meaning-makers and active participants in their own learning processes (Vujičić et al., 2014).

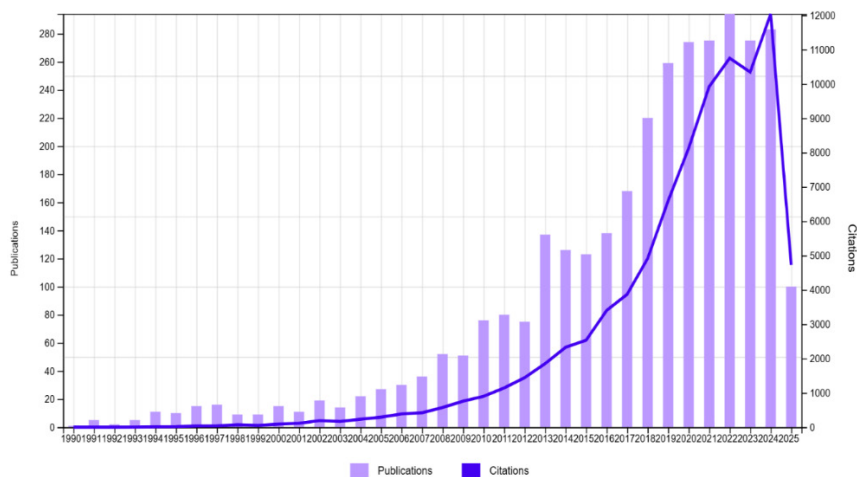


Figure 2 — Trends in publication and citation data

According to Figure 2, this research field has undergone through several stages: initially, a small number of scholars began conducting studies, exploring new ideas and theoretical foundations. These ideas then spread within the scientific community, leading to an exponential growth in publications. This is followed by the maturation of the field, during which the number of publications stabilizes and eventually declines as interest in the field wanes and new ideas are developed. Research on safe behavior and playful learning in early childhood education appears to currently be in the stage of exponential growth. The increase in the number of publications in this area over time is not surprising, considering that publications on early childhood education- particularly concerning safety, safe

behavior, and playful learning - have experienced sustained interest over the past 14 years, from 2010 to the present day (2025). In addition, the rise in publications may be linked to the rapidly changing conditions and needs of the younger generation, whose interests differ significantly from those of previous generations. As a result, many researchers in the field of early childhood education are focused on identifying effective forms of work and types of activities that promote the holistic development of the child's personality.

Table 2 — WoS data analysis

Criteria	Data	Records	% of 3 263
Leading researchers	Abdel-aty M	43	1.318%
	Sayed T	27	0.827%
	Li Y	16	0.490%
	Hu BY	10	0.306%
	Schwebel DC	9	0.276%
Belonging	State University System of Florida	111	3.402%
	Queensland University of Technology Qut	79	2.421%
	University of California System	70	2.145%
	Southeast University China	64	1.961%
	University System Of Ohio	63	1.931%
Affiliations	Accident Analysis and Prevention	1,227	37.603%
	Journal of Safety Research	380	11.646%
	Early Childhood Research Quarterly	144	4.413%
	Early Education and Development	85	2.605%
	Journal of Risk Research	83	2.544%
Publishers	Elsevier	1,888	57.861%
	Taylor & Francis	528	16.181%
	Springer Nature	320	9.807%
	Sage	251	7.692%
	Wiley	54	1.655%
Web of Science Index	Social Sciences Citation Index (SSCI)	3,261	99.939%
	Science Citation Index Expanded (SCI-EXPANDED)	176	5.394%
	Conference Proceedings Citation Index – Social Science & Humanities (CPCI-SSH)	41	1.257%
	Arts & Humanities Citation Index (A&HCI)	35	1.073%
	Social Sciences Other Topics	2,112	64.726%
Research Areas	Public Environmental Occupational Health	1,734	53.141%
	Engineering	1,612	49.402%
	Transportation	1,607	49.249%
	Education Educational Research	1,158	35.489%
Open Access	All Open Access	1,000	30.647%
	Gold	193	5.915%
	Gold-Hybrid	329	10.083%
Countries/Regions	USA	1,205	36.929%
	China	495	15.170%
	Australia	387	11.860%
	England	233	7.141%
	Canada	223	6.834%
	Finland	59	1.808%
Sustainable Development Goals	11 Sustainable Cities And Communities	1,328	40.699%
	03 Good Health And Well Being	957	29.329%
	04 Quality Education	696	21.330%
Languages	English	3,247	99.510%
	German	9	0.276%
	Spanish	6	0.184%
	Turkish	1	0.031%

According to Table 2, the extended analysis of data on the research topic provided the following results. Based on the analysis of the "leading researchers" criterion in the field of safety and safe behavior, the top contributors are: Abdel-Aty M. (43 publications, 1.318%) (Ma et al., 2022), Sayed T. (27 publications, 0.827%) (Alsharif et al., 2024), Li Y. (16 publications, 0.490%) — focuses on preschool children's behavior (Zhu et al., 2020), Hu BY (10 publications, 0.306%) — explores opportunities for play and learning (Allee et al., 2022), Schwebel DC (9 publications, 0.276%) — addresses children's and adolescents' road safety behavior (Schwebel et al., 2024a; Schwebel et al., 2024b; Schwebel et al., 2024c). The dominant thematic areas include: Social Sciences and related fields (2,112 records), Environmental, Occupational, and Public Health (1,734), Education & Educational Research (1,158). This is reflected in the Social Sciences Citation Index with 3,261 citations, accounting for 99.939%, and in the Science Citation Index Expanded with 176 citations. Among academic institutions, the following ones maintain leading positions, demonstrating a significant concentration of research expertise in their regions: Florida State University (111 publications), Queensland University of Technology (79), University of California (70), Southeast University, China (64). Publishing activity is predominantly represented in journals by: Elsevier (1,888 publications), Taylor & Francis (528), Springer Nature (320). The leading platforms of academic discourse are: Accident Analysis and Prevention (1,227 publications), Journal of Safety Research (380), Early Childhood Research Quarterly (144).

Most of the research is open access (1,000 publications), with access models including Gold-Hybrid (329) and Gold (193). Geographically, research is concentrated in the USA (1,205 publications) and China (495), with the USA clearly dominating in this field. In the context of the Sustainable Development Goals (SDGs), the research contributes most significantly to: Sustainable Cities and Communities (SDG 11) – 1,328 publications (40.699%), Good Health and Well-being (SDG 3) – 957 publications (29.329%), Quality Education (SDG 4) – 696 publications, 21.330% of the total number of research results.

Leading authors, countries/territories and collaboration

Based on a bibliometric analysis of co-authorship links conducted using the VOSviewer software (Figure 3), we can confirm the presence of a well-structured network of scientific collaboration in the fields of safe behavior, playful learning, and early childhood education. Mohamed Abdel-Aty occupies a central position in the identified network, showing the highest degree of collaboration and acting as a key intermediary between various research clusters. However, after analyzing the scope of his research, we found that he is primarily engaged in issues of road safety, transportation, public environmental and occupational health, and broader social sciences. In other words, his work mainly focuses on adult safety, and there is no direct contribution to child safety in the database. In this cluster, Abdel-Aty is closely connected to Helai Huang, who also studies transportation engineering, including road safety and transport planning. Issues related to the development of

game-theoretic models for studying pedestrian behavior and safety using artificial intelligence are explored in greater detail by Haque Md Mazharul (Arafat et al., 2025). After analyzing the authors' research and areas of interest, it is worth noting that within the identified cluster, there is a strong thematic link between safety and safe behavior, predominantly associated with road safety. This configuration of the scientific network facilitates efficient knowledge transfer and methodological innovation among different research groups. However, the authors represented in this cluster mainly approach the topic from the perspective of engineering, environment, and transportation. Concepts such as playful learning and early childhood education are not included in this cluster, due to the limited number of publications and lack of strong collaboration links between researchers in these areas.

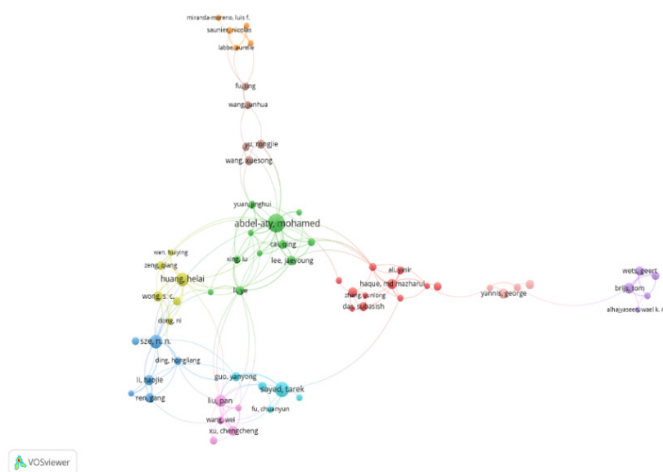


Figure 3 — Leading authors (n=10)

A bibliometric analysis of collaboration in the fields of safety, safe behavior, playful learning, and preschool education identified 17 interconnected clusters, presented in Figure 4. The most prominent cluster is highlighted in yellow, centered around Queensland University of Technology. This university demonstrates the highest density of scientific collaboration and serves as a key coordinating center for international research. Publications from this cluster are primarily related to issues of quality, management, and regulation of early childhood educators' work, as well as matters of road safety. The brown cluster of Southeast University in China focuses on road safety and the causes of traffic accidents. The pink cluster representing the University of Central Florida emphasizes early childhood education, school readiness, educational quality, playful pedagogy, and public safe behavior. The blue cluster, linked to Ohio State University, primarily investigates the creation of safe environments in preschool groups. It also explores pedestrian injuries caused by mobile phone use in public places and the risk of vehicle collisions

with pedestrians and cyclists, particularly among children with disabilities. The red cluster of the University of Washington is more focused on support programs for vulnerable populations and ensuring a healthy and literate home environment. Based on the analysis, it can be concluded that university collaborations are largely determined by their areas of academic specialization. Nevertheless, there are strong connections between European and Asian institutions, which suggests that issues of safety, playful learning, early childhood education are being studied globally.

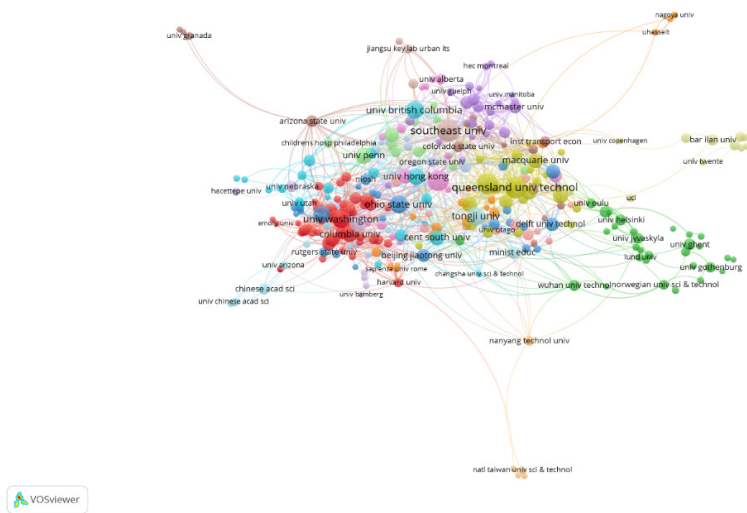


Figure 4 — University collaboration (n=17)

The next aspect we examined is the geographic centers engaged in research on safety, safe behavior, playful learning, preschool education, as presented in Figure 5.

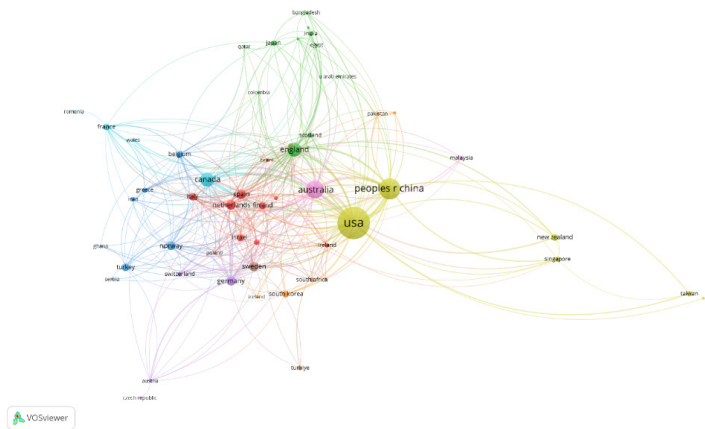


Figure 5 — Countries/territories (n=9)

The yellow cluster, with the United States at its center (see Fig.5.1), demonstrates the most intensive scientific collaboration with nearly all research institutions included in the cluster. The strongest link is observed with China. According to Table 3, the United States is the leading country studying issues related to teacher education, family upbringing, quality of early childhood education, playful pedagogy, with a total of 1,207 scientific publications.

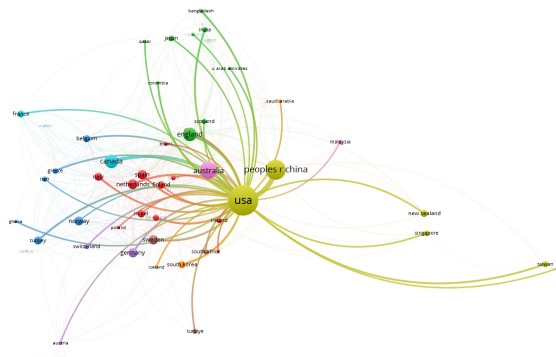


Figure 5.1. — The position of the United States in international collaboration

Like the United States, China also has widespread collaborations with various research institutions. Most notably, it maintains close ties with countries in Europe, Southeast Asia, Australia, Canada. There are also observed connections with Pakistan and the United Arab Emirates. Geographic location appears to influence the density of collaboration; for instance, European countries show active cooperation among themselves and with both the United States and China. Countries like New Zealand, Singapore, Taiwan are more closely connected with China, the United States, the United Kingdom, Finland. Turkey tends to collaborate primarily with neighboring European countries, but also maintains ties with the United States, China, Canada.

The network visualization analysis highlights the central role of the United States (1,207 publications), China (495), and Australia (387) in the global research network. This is reflected in the node size and the number of outgoing connections. A high density of inter-cluster links indicates the intensity of research in the areas of teacher education, including preschool education, safety, and play.

Underlying disciplines in the field

Based on data obtained from the WoS database and analyzed using VOSviewer software, a co-occurrence analysis of keywords in titles, abstracts, and keyword lists was conducted to identify common themes or research focuses related to safety, safe behavior, playful learning, and preschool education, as illustrated in Figure 6. The analysis included only studies with at least three overlapping keywords, which showed that out of 12,432 keywords, 2,072 met the threshold criteria.

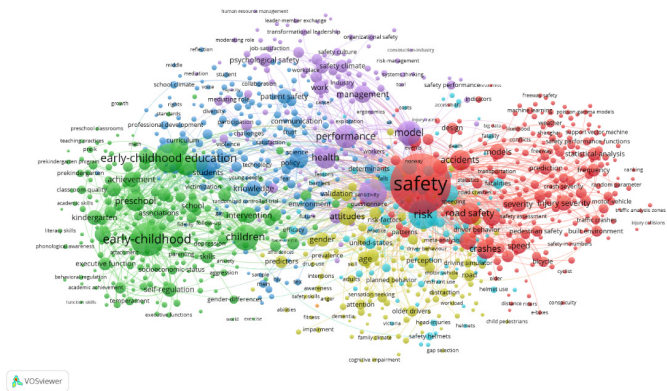


Figure 6 — Thematic research focuses

Using the VOSviewer software, which is applied for building and visualizing networks of term co-occurrences extracted from large volumes of academic literature, we identified key overlaps with the following keywords: "safety" (Fig.6.1), "early childhood education" (Fig.6.2), "early childhood" (Fig.6.3), "children" (Fig.6.4), "behavior" (Fig.6.5), "play" (Fig.6.6), "health" (Fig.6.7), "performance" (Fig.6.8), "model" (Fig.6.9), and "risk" (Fig.6.10).



Fig.6.1 — “Safety”

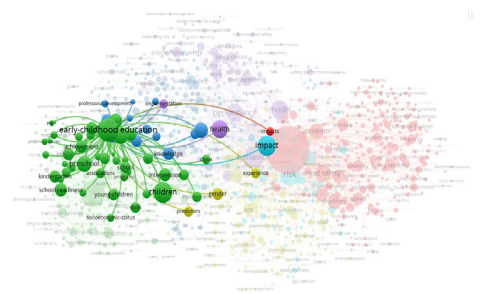


Fig.6.2 — “Early-childhood education”

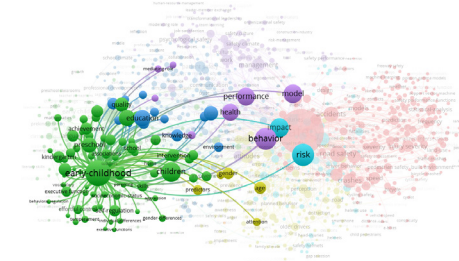


Fig.6.3 — “Early-childhood”

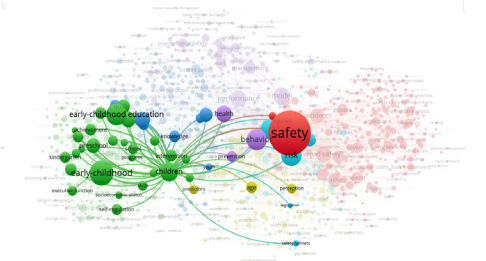


Fig.6.4 — “Children”

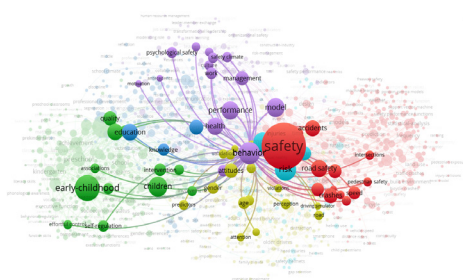


Fig.6.5 — “Behavior”

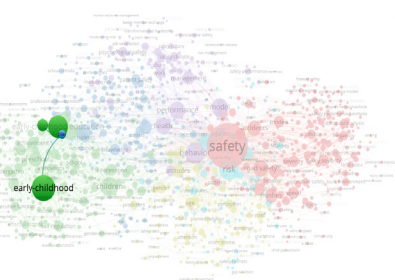


Fig.6.6 — “Play”

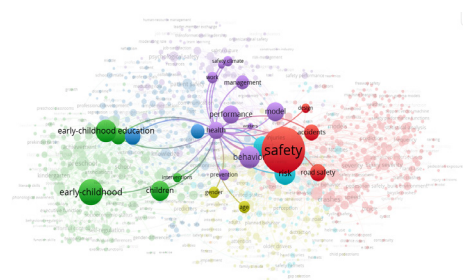


Fig.6.7 — “Health”

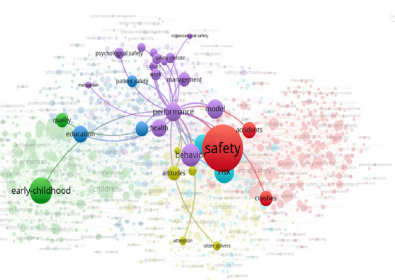


Fig.6.8 — “Performance”

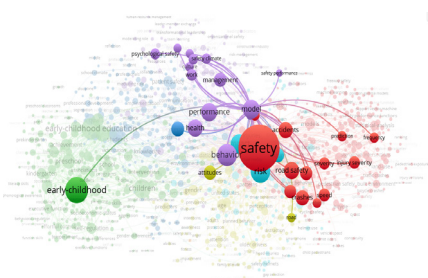


Fig.6.9 — “Model”

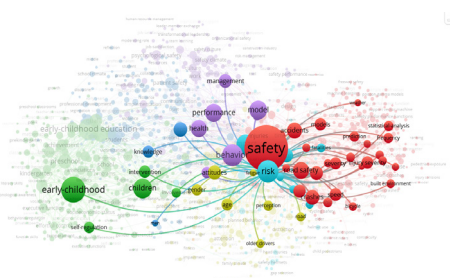


Fig.6.10 — “Risk”

According to the VOSviewer results, ten major clusters were identified out of the 3,263 academic publications analyzed. Six of these clusters reflect general research themes, while four are specifically related to the topics under study, summarizing the primary areas of interest in safety, early childhood education, and play. First, there appears to be a broad academic interest in the subject within educational contexts, as indicated by the frequent appearance of terms such as safety, early childhood education, early childhood, children, behavior, play, health, performance, model, and risk. Among the identified clusters, the most extensive associations are with the term "safety", which shows strong connections to terms such as "behavior, risk, road safety, children, education, health, performance, model, quality". Within the red cluster specifically, "safety" is most closely linked

to terms like "road safety, driver behavior, crashes, traffic accidents, severity, bicycle, pedestrian safety, models, statistical analysis, frequency, prediction, injury severity, design, weather" and etc. This indicates that the majority of research on safety focuses on road behavior and the causes of traffic accidents.

The next significant cluster is the green one, centered around the keyword "Early childhood education". Here, the most frequent associations are with "children, health, impact, preschool, knowledge". Within this cluster, there are additional connections with terms like "children, preschool, kindergarten, skills, intervention, achievement, school, young children, school readiness". These keywords are specifically related to early childhood education; however, there is a notable absence of connections to safety and play, which is significant given the focus of this study.

The third cluster, "Early childhood", overlaps with the "Early-childhood education" (cluster 2), but also includes connections to "behavior, risk, health, education, play, performance, knowledge". This suggests that the topic of early childhood is commonly addressed in conjunction with themes of "health and play".

The fourth keyword, "Children", is connected to concepts related to both safety and early childhood. The most prominent links include "safety, early childhood education, early childhood, health, risk, intervention". Within the green cluster, the internal associations primarily involve "preschool, early childhood, early childhood education, kindergarten, intervention, self-regulation, and achievement".

The fifth keyword, "Behavior", shows strong connections with "safety, risk, early childhood, children, health education, road safety". This suggests a clear link between environmental research and issues of safety and early childhood. Specifically, the purple cluster reveals associations with health, model, performance, safety climate, psychological safety, work, and motivation, indicating that this cluster leans more toward healthcare and environmental science.

The next keyword, "play", occupies a central position. However, according to VOSviewer, among the 12,432 keywords analyzed, it showed a direct connection only with "early childhood". This may be due to the inclusion criteria set in the analysis (minimum of 3 co-occurring keywords), and the relatively infrequent pairing of "play" with terms like "safety" and "early childhood education". Therefore, deeper exploration of this concept is warranted.

The seventh keyword, "Health", is associated with "safety, risk, road safety, children, early childhood education, early childhood, performance, model, gender, age". These associations suggest that health is closely tied to safety, early childhood, academic performance, and is also affected by age-related factors.

The next keyword, "Performance", is linked to "safety, health, education, early childhood, risk, psychological safety, safety climate, attitudes, attention, quality, patient safety". This implies that performance is deeply connected to both physical and psychological safety, which in turn affect the quality of actions and learning outcomes. When analyzing performance-related factors, the need for structured frameworks arises, which brings us to the ninth keyword, "model". This term is

associated with "safety, risk, early childhood, health, road safety, performance, psychological safety, safety climate, crashes".

The tenth keyword, "risk", which, as we see, is interconnected with "safety, road safety, crashes, children, early childhood, health, bicycle, performance, knowledge, self-regulation". When ensuring the safety of both children and adults, it is essential to first consider the potential risks that may arise at various stages of life. The ability to cope with or avoid these risks directly depends on a person's level of awareness - more specifically, on the knowledge, skills, and competencies they have developed in the area of safe behavior.

According to the analysis visualized using the VOSviewer software, we can conclude that the 10 major clusters derived from 3,263 scientific articles highlight a significant number of studies focused on safety and safe behavior, particularly in the context of road traffic, causes of accidents and disasters, pedestrian crossing rules, and related topics. This is not surprising, as the number of vehicles on the road increases every year, with nearly every second family owning two or more cars. This contributes to endless traffic jams and a lack of driver tolerance. Adult inattentiveness primarily affects the younger generation. It is also worth noting that the concept of "playful learning" did not yield any results based on certain indicators, even though it appeared fairly frequently among the listed keywords. We assume that this may be due to the search parameters we set, which required at least three matching keywords. A related term, "play", showed only one connection with "early childhood", which also indicates the limited scope of the presented data. Therefore, a key task for future research is a more detailed examination of the concept of "playful learning".

Conclusion and Discussion. This study presents a review of the evolution and current state of research in the fields of safe behavior, playful learning, and early childhood education over the past 35 years, based on data available in the WoS database. The results show that these three keywords, when integrated, represent a relatively new research area that has seen a significant increase in interest over the past decade. This progress is primarily due to the efforts of a small group of researchers, with the top 10 most active coming from the USA (1210), China (497), Australia (387), the UK (233), Canada (223), the Netherlands (108), Spain (103), Germany (98), Sweden (97), and Turkey (70). However, the contribution of researchers from South America, Africa, and the Baltic states to the academic literature is significantly limited. The results indicate that researchers in this field have explored a broad range of topics and issues, which can be grouped into three broad areas: "safety", "early childhood education", "play", and one narrow area - "playful learning".

Based on the results obtained, which are promising in nature and reveal patterns within the studied concepts that have not yet reached maturity and are expected to continue developing in the future, researchers in this field have explored a wide range of topics related to safety and early childhood education. This provides us with an opportunity to thoroughly examine the spectrum of relevant phenomena.

However, this scope is limited primarily to road safety, which prevents us from gaining insight into other aspects related to safety. The concept of "early childhood education" is largely considered in terms of quality learning, school readiness, and the training of early childhood educators. Unfortunately, the concept of "playful learning" is either absent or appears only sporadically in the identified cluster, and therefore is not represented in it. There are only minor connections observed among the three key concepts—"Safety," "Early Childhood Education," and "Play" in the existing research. However, this opens up promising opportunities for future research on how these can be integrated into the organization of the educational and developmental process.

As mentioned earlier, no bibliometric review can provide a perfect picture of the development and current state of research in this field. This study is no exception, and its results are limited in scope, as the search approach used to build the literature foundation on safety, playful learning, and preschool education may have excluded some relevant studies. Future research could consider expanding the results of this study by using alternative databases and including additional types of publications beyond journal articles. Moreover, future comparisons should explore the knowledge structure in this field, including other categories that go beyond those considered in this study. Despite these limitations, we believe that this research provides a comprehensive review of the literature on safe behavior and playful learning in early childhood education, offering valuable insights into the development of the field, its current status, and the challenges that limit our understanding, measurement, and progress.

References

- Allee K., Roberts S., Hu B., Clark M., and Stewart M. (2022) Let's talk play! Exploring the possible benefits of play-based pedagogy on language and literacy learning in two Title I kindergarten classrooms. *Early Childhood Education Journal*, 50. — P. 1–14. <https://doi.org/10.1007/s10643-020-01141-6> (in English)
- Alsharif T., Lanzaro G., and Sayed T. (2024) Distracted walking: Does it impact pedestrian-vehicle interaction behavior? *Accident Analysis & Prevention*. — 208 p. — Article 107789. <https://doi.org/10.1016/j.aap.2024.107789> (in English)
- Arafat M.E., Kaye S.-A., Schroeter R., and Haque S.M.M. (2025) A game theoretical model to examine pedestrian behaviour and safety on unsignalised slip lanes using AI-based video analytics. *Accident Analysis & Prevention*, 217. — Article 108034. <https://doi.org/10.1016/j.aap.2025.108034> (in English)
- Camilli G., Vargas S., Ryan S., and Barnett W.S. (2010) Meta-Analysis of the Effects of Early Education Interventions on Cognitive and Social Development. *Teachers College Record*, 112(3). — P. 579-620. <https://doi.org/10.1177/016146811011200303> (in English)
- Hernández-Torrano D., and Ibrayeva L. (2020) Creativity and education: A bibliometric mapping of the research literature (1975–2019). *Thinking Skills and Creativity*, 35. — Article 100625. <https://doi.org/10.1016/j.tsc.2019.100625> (in English)
- Hirsh-Pasek K., and Golinkoff R. (n.d.) Playful Learning Landscapes Action Network's playbook. <https://playfullearninglandscapes.com/playbook-2/> (in English)
- Hirsh-Pasek K., Golinkoff R.M., Berk L.E., and Singer D.G. (2009) A mandate for playful learning in school: Presenting the evidence. Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780195382716.001.0001> (in English)

Ma W., Alimo P.K., Wang L., and Abdel-Aty M. (2022) Mapping pedestrian safety studies between 2010 and 2021: A scientometric analysis. *Accident Analysis & Prevention*, 174. — Article 106744. <https://doi.org/10.1016/j.aap.2022.106744> (in English).

Pyle A., De Luca C., and Danniels E. (2017) A scoping review of research on play-based pedagogies in kindergarten education. *Review of Education*, 5(3). — P. 352-353. <https://doi.org/10.1002/rev3.3097> (in English)

Savolainen P.T., Mannering F.L., Lord D., and Quddus M.A. (2011) The statistical analysis of highway crash-injury severities: a review and assessment of methodological alternatives. *Accident; analysis & Prevention*, 43(5). — P. 1666–1676. <https://doi.org/10.1016/j.aap.2011.03.025> (in English)

Schwebel D.C., Gaines J., and Severson J. (2008) Validation of virtual reality as a tool to understand and prevent child pedestrian injury. *Accident; analysis & Prevention*, 40(4). — P. 1394–1400. <https://doi.org/10.1016/j.aap.2008.03.005> (in English)

Schwebel D.C., Johnston A., and McClure L.A. (2024) Children's ability to estimate approaching vehicle time-to-arrival following training in a virtual pedestrian environment. *Traffic Injury Prevention*, 25(7). — P. 919–924. <https://doi.org/10.1080/15389588.2024.2352171> (in English)

Schwebel D.C., Johnston A., McDaniel D., and McClure L.A. (2024) Child pedestrian safety training in virtual reality: How quickly do children achieve adult functioning and what individual differences impact learning efficiency? *Journal of Safety Research*, 89. — P. 135–140. <https://doi.org/10.1016/j.jsr.2024.01.012> (in English)

Schwebel D.C., Johnston A., McDaniel D., Severson J., He Y., and McClure L.A. (2024) Teaching children pedestrian safety in virtual reality via smartphone: A noninferiority randomized clinical trial. *Journal of Pediatric Psychology*, 49(6). — P. 405–412. <https://doi.org/10.1093/jpepsy/jsae020> (in English)

Syzdykbayeva A., Duisenbay K., Alikhankyzy G., and Abdigapbarova U. (2025) Chinese Language Education: Bibliometric Mapping of Literature on Teaching, Learning, and Textbook Compilation. *Eurasian Journal of Applied Linguistics*, 11(1). — P. 229-241. <https://doi.org/10.32601/ejal.11119> (in English)

Todaro R., Hassinger-Das B., Zosh J., Lytle S., Golinkoff R., and Hirsh-Pasek K. (2022) Playful Learning Landscapes Promoting Literacy Through Youth Engagement and Culturally Relevant Design. *Afterschool Matters*, 35. — P. 9-16 (in English)

United Nations. (1989) Official Records of the General Assembly, Forty-fourth Session, Supplement No. 49 (A/44/49). — P. 230–239. https://www.un.org/ru/documents/decl_conv/conventions/childcon.shtml (in English)

United Nations. (n.d.). Global issues: Children. <https://www.un.org/en/global-issues/children> (in English)

United Nations. (n.d.). Sustainable Development Goals. <https://www.un.org/sustainabledevelopment/> (in English)

Vujicic L., and Miketek M. (2014) Children's Perspective in Play: Documenting the Educational Process. *Croatian Journal of Education*. 16. — P. 143-159 (in English)

Wong Y. ho P. (2016) A comparison of urban and rural kindergarten teachers' perceptions of school safety for young children: implications for quality teacher education. *Early Child Development and Care*, 187(1). — P. 80–88. <https://doi.org/10.1080/03004430.2016.1151418> (in English)

Zhu J., Ooi L.L., Wu M., Li Y., Coplan R.J., and Cao Y. (2020) Exploring the links between unsociability, parenting behaviors, and socio-emotional functioning in young children in suburban China. *Early Education and Development*, 32(7). — P. 963–980. <https://doi.org/10.1080/10409289.2020.1821538> (in English)

Zosh J.M., Hopkins E.J., Jensen H., Liu C., Neale D., Hirsh-Pasek K., Solis S.L., and Whitebread D. (2017) Learning through play: a review of the evidence (white paper). The LEGO Foundation, DK. https://cms.learningthroughplay.com/media/wmtlmb0/learning-through-play_web.pdf (in English)

Publication Ethics and Publication Malpractice in the journals of the Central Asian Academic Research Center LLP

For information on Ethics in publishing and Ethical guidelines for journal publication see <http://www.elsevier.com/publishingethics> and <http://www.elsevier.com/journal-authors/ethics>.

Submission of an article to the journals of the Central Asian Academic Research Center LLP implies that the described work has not been published previously (except in the form of an abstract or as part of a published lecture or academic thesis or as an electronic preprint, see <http://www.elsevier.com/postingpolicy>), that it is not under consideration for publication elsewhere, that its publication is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out, and that, if accepted, it will not be published elsewhere in the same form, in English or in any other language, including electronically without the written consent of the copyright-holder. In particular, translations into English of papers already published in another language are not accepted.

No other forms of scientific misconduct are allowed, such as plagiarism, falsification, fraudulent data, incorrect interpretation of other works, incorrect citations, etc. The Central Asian Academic Research Center LLP follows the Code of Conduct of the Committee on Publication Ethics (COPE), and follows the COPE Flowcharts for Resolving Cases of Suspected Misconduct (http://publicationethics.org/files/u2/New_Code.pdf). To verify originality, your article may be checked by the Cross Check originality detection service <http://www.elsevier.com/editors/plagdetect>.

The authors are obliged to participate in peer review process and be ready to provide corrections, clarifications, retractions and apologies when needed. All authors of a paper should have significantly contributed to the research.

The reviewers should provide objective judgments and should point out relevant published works which are not yet cited. Reviewed articles should be treated confidentially. The reviewers will be chosen in such a way that there is no conflict of interests with respect to the research, the authors and/ or the research funders.

The editors have complete responsibility and authority to reject or accept a paper, and they will only accept a paper when reasonably certain. They will preserve anonymity of reviewers and promote publication of corrections, clarifications, retractions and apologies when needed. The acceptance of a paper automatically implies the copyright transfer to the Central Asian Academic Research Center LLP.

The Editorial Board of the Central Asian Academic Research Center LLP will monitor and safeguard publishing ethics.

Requirements for articles design for publication in the journal are available on the websites:

[www: nauka-nanrk.kz](http://www.nauka-nanrk.kz)

ISSN 2518–1467 (Online),

ISSN 1991–3494 (Print)

<http://www.bulletin-science.kz/index.php/en>

Managing Editor: A.Shormakova

Editors: D.S. Alenov, M.Konyrbekov

Computer layout: G.D. Zhadyranova

Signed for print: October 15, 2026

Format: 70×90 1/16. 26.5 printed
sheets. Order No. 5.