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CONTENTS

PEDAGOGY

G.M. Abdimanapova, S.E. Aldeshov, L.K. Zhaydakbayeva Analysis of Python programming lessons for high school students.....	14
B.A. Aidarova, A.S. Amirova Opportunities for the development of professional success of future primary school teachers in the context of dual education.....	26
A. Amirbekuly, R.I. Kadirbayeva, K.U. Nyshanbayeva Improving the training of future mathematics teachers based on constructive learning to compose and solve open problems.....	43
S.B. Dyussebaeva, U.K. Orynbayeva, S.S. Zhakipbekova Structural features of forming foreign communicative competence in primary school students.....	61
B. Yermakhanov, T. Daniarov, T. Apendiyev Formation of a healthy lifestyle in students: experimental study and research Results.....	80
G.K. Yeshmurat, L.S. Kainbayeva Examining math anxiety in secondary education: influence of demographics, educational context, and instructional support.....	99
N.B. Imankul, A.B. Ibashova, M.Zh. Koshkinbayeva The role of artificial intelligence in education in the training of future computer science teachers.....	114
A.A. Issatayeva, A.M. Nurbayeva, Serkan Kosar Blended learning technologies in the development of oral and written speech of primary school students.....	131
L.B. Kabylbekova, B.S. Abdimanapov, D.D. Baidaliyev Pedagogical aspects of teaching natural hazards in school geography course.....	150
N. Karelkhan, A.M. Yessengaliyev Analyzing the use of sign language recognition technologies in inclusive learning environment.....	164
A.S. Karmanova, N.K. Akhmetov, G.M. Madybekova Applying gamification in the digital transformation of chemistry education.....	177

G.Zh. Matzhanova, A.Z. Kairzhanova

Teaching languages at secondary school through Lesson study.....194

A.B. Medeshova

Digitalization and open educational space: new opportunities
for Part-time learning model.....209

M.S. Orazalina, A.Zh. Turikpenova, A.V. Sazhyna

Linguistic and cultural aspect of contrastive vocabulary work in the process
of teaching a foreign language.....227

F.S. Orazbayeva

Neurolinguistic methods contributing to the development of communicative
Skills.....245

G. Pilten, A. Kuralbayeva, I. Sönmez

Global use of the Denver II: validity, reliability, and cultural adaptation.....261

E. Satov, M. Kozha, E. Konuralp

Basic sources and methodology of medieval Turkish-Muslim sources.....274

M.E. Toiganbekova, G.A. Kazhigaliyeva

Linguoculturological competence: analysis of educational texts.....293

D. Toktaruly

Developing time management skills of adolescents with mild intellectual
disabilities within the subject of «Vocational training».....307

K.Zh. Uteyeva, G.K. Kassymova, A.K. Sadibekov

Overview on shaping national identity through education in the digital era.....323

ECONOMICS

A.T. Abubakirova, R.M. Tazhibayeva, S.A. Kaltayeva

Development of space tourism and future prospects.....341

A.S. Bekbolsynova, L.M. Sembiyeva, Z.R. Bashu

Implementing strategic goals for business integrity through digital
tax administration.....354

A.B. Bersimbayeva, Y.R. Bersimbayev, A.B. Maidyrova

Evaluating ESG implementation in Kazakhstan's leading universities372

M. Zhamkeyeva, T. Diba, A.K. Abzhatova

Transformation of financing mechanisms for small and medium-sized enterprises in the agricultural sector of Kazakhstan.....384

J. Juman, M.A. Yezhebekov, A.A. Cheirkhanova

ESG principles in quality and profitability management of construction companies of Kazakhstan.....401

A.Zh. Ismailova, A.A. Burtebayeva, Kh. Bektemir

Developing a new public audit paradigm in the age of technological change.....417

A. Kabybay, A. Oralova, C. Cheslovas

State audit approaches to assessing the effectiveness of environmental expenditures in Kazakhstan.....429

A.S. Karbozova, A.K. Bekhozhaeva, M.Sh. Kushenova

Introduction of digital technologies in agricultural management.....442

A. Kuanaliyev, O. Slinkova

Digitalization of public administration in world practice and on the example of the Republic of Kazakhstan.....459

G. Lukhmanova, N. Sartanova, K. Baisholanova

Financial literacy as a key mechanism of fraud avoidance.....477

B.O. Mukanov, G.M. Mukhamedieva, Z.B. Akhmetova, A.N. Lambekova

Gambling market analysis in Kazakhstan.....494

G.A. Rakhymzhanova, N.N. Zhanakova

Household expenditure structure in Kazakhstan: a quantitative assessment.....517

Z.T. Satpayeva, N.M. Akimova, D.M. Kangalakova

The impact of women's scientific activities on Kazakhstan's economic and innovative development.....529

Ye.S. Tursyn, A. Khoich

Development of a methodology for evaluating the effectiveness of investments in agribusiness based on the analysis of the agricultural potential of the East Kazakhstan region.....542

N.M. Sherimova, L.M. Davidenko, A.A. Titkov

Platform ecologization and promotion of ecological branding of industrial complex of Pavlodar region.....566

МАЗМҰНЫ

ПЕДАГОГИКА

Г.М. Абдиманапова, С.Е. Алдешов, Л.К. Жайдакбаева

Жоғары сынып оқушылары үшін Python бағдарламалау
сабақтарының үрдістерін талдау.....14

Б.А. Айдарова, А.С. Амирова

Дуальді білім беру жағдайында болашақ бастауыш сынып
мұғалімдерінің кәсіби табыстылығын дамытудың мүмкіндіктері.....26

А. Әмірбекұлы, Р.И. Кадирбаева, К.У. Нышанбаева

Ашық есептерді құрастыру мен шешуге конструктивті оқыту негізінде
болашақ математик-мұғалімдерді даярлауды жетілдіру.....43

С.Б. Дюсебаева, Ұ.Қ. Орынбаева, С.С. Жакипбекова

Оқыту үдерісінде бастауыш сынып оқушыларының шеттілдік
коммуникативтік құзыреттілігін қалыптастырудың құрылымдық
ерекшеліктері.....61

Б.Ө. Ермаханов, Т.Ә. Данияров, Т.А. Апендиев

Студенттердің салауатты өмір салтын қалыптастыру: эксперименттік
зерттеу және ғылыми нәтижелер.....80

Г.Қ. Ешмұрат, Л.С. Каинбаева

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оқу барысындағы қолдаудың ықпалы.....99

Н.Б. Иманқұл, А.Б. Ибашова, М.Ж. Кошкинбаева

Болашақ информатика мұғалімдерін даярлауда жасанды интеллектінің
білім берудегі рөлі.....114

А.А. Исатаева, А.М. Нұрбаева, Серкан Кошар

Бастауыш сынып оқушыларының ауызша және
жазбаша тілін дамытудағы аралас оқыту технологиялары.....131

Л.Б. Қабылбекова, Б.Ш. Абдиманов, Д.Д. Байдалиев

Мектеп географиясында табиғи қауіптерді оқытудың педагогикалық
аспектілері.....150

Н. Карелхан, Ә.М. Есенғалиев

Ымдау тілін тану технологияларын инклюзивті оқу ортасында
қолдануды талдау.....164

Ә.С. Қарманова, Н.К. Ахметов, Г.М. Мадыбекова

Химияны оқыту процесін цифрландыруда геймификацияны қолдану.....177

Г.Ж. Матжанова, А.З. Кайржанова

Lesson study арқылы мектепте тілдерді оқыту тәжірибесі.....194

А.Б. Медешова

Цифрландыру және ашық білім беру кеңістігі: Part-time оқу моделі үшін жаңа мүмкіндіктер.....209

М.С. Оразалина, А.Ж. Турикпенова, А.В. Сажина

Шет тілін оқыту процесіндегі қарама-қарсы лексикалық жұмыстың лингвистикалық және мәдени аспектісі.....227

Ф.Ш. Оразбаева

Коммуникативтік дағдыны дамытуға ықпал ететін нейролингвистикалық тәсілдер.....245

Г. Пилтен, А. Куралбаева, И. Сонмез

Денвер II тесті: жаһандық қолданылуы, дұрыстығы, сенімділігі және мәдени бейімделуі.....261

Е. Сатов, М. Қожа, Ержиласун Конуралып

Ортағасырлық түркі-мұсылман деректерінің деректанулық және методологиясы негіздері.....274

М.Е. Тойганбекова, Г.А. Кажигалиева

Тілдік-мәдени құзыреттілік: оқу мәтіндерін талдау.....293

Д. Тоқтарұлы

«Кәсіби еңбек» пәні аясында зияты жеңіл зақымдалған жеткіншектердің тайм-менеджменттік дағдыларын дамыту.....307

К.Ж. Утеева, Г.К. Касимова, Сәдібеков

Цифрлық дәуірде білім беру арқылы ұлттық сананы қалыптастыруға шолу.....323

ЭКОНОМИКА**А.Т. Абубакирова, Р.М. Тажибаева, С.А. Қалтаева**

Ғарыштық туризмнің дамуы және болашақ перспективалар.....341

А.С. Бекболсынова, Л.М. Сембиева, З.Р. Башу

Салық әкімшілігін цифрландыру арқылы бизнестегі адалдықты дамыту стратегиялық мақсаттарын іске асыру.....354

А.Б. Берсимбаева, Е.Р. Берсимбаев, А.Б. Майдырова

Қазақстанның жетекші университеттеріне ESG қағидаттарын енгізуді бағалау.....372

М. Жамкеева, Т. Диба, А.К. Абжатова

Қазақстан ауыл шаруашылығындағы шағын және орта бизнесті
қаржыландыру механизмдерінің трансформациясы.....384

Ж. Жұман, М.А. Ежбеков, А.А. Чейрханова

Қазақстанның құрылыс компанияларының сапасы мен рентабельділігін
басқарудағы ESG-қағидаттар.....401

Ә.Ж. Исмаилова, А.А. Буртебаева, Х. Бектемир

Технологиялық қайта құру жағдайында мемлекеттік аудиттің жаңа
парадигмасын әзірлеу қажеттілігі.....417

А. Қабдыбай, А. Оралова, С. Cheslovas

Қазақстандағы табиғатты қорғау шығындарының тиімділігін бағалаудағы
мемлекеттік аудиттің қолданылатын тәсілдері.....429

А.С. Карбозова, А.Қ. Бекхожаева, М.Ш. Кушенова

Ауыл шаруашылығын басқаруда цифрлық технологияларды енгізу.....442

А. Қуаналиев, О. Слинкова

Әлемдік тәжірибеде және Қазақстан Республикасының мысалында
мемлекеттік басқаруды цифрландыру.....459

Г. Лухманова, Н. Сарганова, К. Байшоланова

Қаржылық сауаттылық негізгі механизм ретінде алаяқтықтан аулақ болу.....477

Б.О. Мұқанов, Г.М. Мұхамедиева, З.Б. Ахметова, А.Н. Ламбекова

Қазақстанның құмар ойындар нарығын талдау.....494

Г.А. Рахимжанова, Н.Н. Жанакоева

Қазақстандағы үй шаруашылықтары шығындарының құрылымы:
сандық бағалау.....517

З.Т. Сатпаева, Н.М. Акимова, Д.М. Кангалакова

Қазақстанның экономикалық және инновациялық дамуына әйелдердің
ғылыми қызметінің әсері.....529

Е.С. Тұрсын, А. Хойч

Шығыс Қазақстан облысының ауыл шаруашылығы әлеуетін талдау негізінде
агробизнеске салымдардың тиімділігін бағалау әдістемесін әзірлеу.....542

Н.М. Шеримова, Л.М. Давиденко, А.А. Титков

Павлодар өңірінің өнеркәсіптік кешенінің экологиялық брендингін
платформалық экологияландыру және ілгерілету.....566

СОДЕРЖАНИЕ

ПЕДАГОГИКА

Г.М. Абдимананова, С.Е. Алдешов, Л.К. Жайдакбаева

Анализ эффективности уроков программирования на Python для учащихся старших классов.....14

Б.А. Айдарова, А.С. Амирова

Возможности развития профессиональной успешности будущих учителей начальных классов в условиях дуального образования.....26

А. Амирбекулы, Р.И. Кадирбаева, К.У. Нышанбаева

Совершенствование подготовки будущих учителей-математиков на основе конструктивного обучения составлению и решению открытых задач.....43

С.Б. Дюсебаева, У.К. Орынбаева, С.С. Жакипбекова

Структурные особенности формирования иноязычной коммуникативной компетенции младших школьников в процессе обучения.....61

Б.О. Ермаханов, Т.А. Данияров, Т.А. Апендиев

Формирование здорового образа жизни у студентов: экспериментальная работа и результаты исследования.....80

Г.К. Ешмурат, Л.С. Каинбаева

Изучение математической тревожности в средней школе: влияние демографических факторов, образовательного контекста и поддержки в обучении.....99

Н.Б. Иманкул, А.Б. Ибашова, М.Ж. Кошкинбаева

Роль искусственного интеллекта в образовании при подготовке будущих учителей информатики.....114

А.А. Исатаева, А.М. Нурбаева, Серкан Кошар

Технологии смешанного обучения в развитии устной и письменной речи учащихся начальных классов.....131

Л.Б. Кабылбекова, Б.Ш. Абдимананов, Д.Д. Байдалиев

Педагогические аспекты обучения природным опасностям в школьной географии.....150

Н. Карелхан, А.М. Есенгалиев

Анализ использования технологий распознавания языка жестов в инклюзивной образовательной среде.....164

А.С. Карманова, Н.К. Ахметов, Г.М. Мадыбекова

Использование геймификации в цифровизации обучения химии.....177

Г.Ж. Матжанова, А.З. Кайржанова

Опыт преподавания языков в школе с использованием Lesson study.....194

А.Б. Медешова

Цифровизация и открытое образовательное пространство: новые возможности для модели Part-time обучения.....209

М.С. Оразалина, А.Ж. Турикпенова, А.В. Сажина

Лингвострановедческий аспект контрастивной словарной работы в процессе преподавания иностранного языка.....227

Ф.Ш. Оразбаева

Коммуникативные навыки и нейролингвистические методы, способствующие их развитию.....245

Г. Пилтен, А. Куралбаева, И. Сонмез

Применение теста Денвер II: валидность, надежность и культурная адаптация.....261

Е. Сатов, М. Кожа, Ержиласун Конуральп

Основы источниковедения и методологии средневековых тюрко-мусульманских источников.....274

М.Е. Тойганбекова, Г.А. Кажигалиева

Лингвокультурологическая компетенция: анализ учебных текстов.....293

Д. Токтарулы

Развитие тайм-менеджмент навыков у подростков с лёгкими интеллектуальными нарушениями в рамках предмета «Профессиональный труд».....307

К.Ж. Утеева, Г.К. Касымова, А.К. Садибеков

Обзор формирования национальной идентичности посредством образования в цифровую эпоху.....323

ЭКОНОМИКА

А.Т. Абубакирова, Р.М. Тажибаева, С.А. Калтаева

Развитие космического туризма и перспективы на будущее.....341

А.С. Бекболсынова, Л.М. Сембиева, З.Р. Башу

Реализация стратегических целей развития добросовестности в бизнесе через цифровизацию налогового администрирования.....354

А.Б. Берсимбаева, Е.Р. Берсимбаев, А.Б. Майдырова

Оценка внедрения принципов Esg в ведущих университетах Казахстана.....372

М. Жамкеева, Т. Дибя, А.К. Абжатова

Трансформация механизмов финансирования малого и среднего бизнеса
в сельском хозяйстве Казахстана.....384

Ж. Жуман, М.А. Ежебеков, А.А. Чейрханова

ESG-принципы в управлении качеством и рентабельностью строительных
компаний Казахстана.....401

А.Ж. Исмаилова, А.А. Буртебаева, Х. Бектемир

Необходимость разработки новой парадигмы государственного аудита
в условиях технологических преобразований.....417

А. Кабдыбай, А. Оралова, С. Cheslovas

Подходы государственного аудита к оценке эффективности
природоохранных расходов в Казахстане.....429

А.С. Карбозова, А.К. Бекхожаева, М.Ш. Кушенова

Внедрение цифровых технологий в управлении сельским хозяйством.....442

А. А. Куаналиев, О. Слинкова

Цифровизация государственного управления в мировой практике
и на примере Республики Казахстан.....459

Г. Лухманова, Н. Сарганова, К. Байшоланова

Финансовая грамотность как ключевой механизм избежания
мошенничества.....477

Б.О. Муканов, Г.М. Мухамедиева, З.Б. Ахметова, А.Н. Ламбекова

Анализ рынка азартных игр Казахстана.....494

Г.А. Рахимжанова, Н.Н. Жанакова

Структура расходов домохозяйств Казахстана: количественная оценка.....517

З.Т. Сатпаева, Н.М. Акимова, Д.М. Кангалакова

Влияние научной деятельности женщин на экономическое и инновационное
развитие Казахстана.....529

Е.С. Турсын, А. Хойч

Разработка методики оценки эффективности вложений в агробизнес на
основе анализа сельскохозяйственного потенциала Восточно-Казахстанской
области.....542

Н.М. Шеримова, Л.М. Давиденко, А.А. Титков

Платформенная экологизация и продвижение экологического брендинга
промышленного комплекса Павлодарского региона.....566

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PEDAGOGICAL ASPECTS OF TEACHING NATURAL HAZARDS IN SCHOOL GEOGRAPHY COURSE

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Abstract. As widely acknowledged, the frequency of natural disasters has significantly increased across many countries, and the number of environmental threats is increasing annually. Their consequences cause significant damage to human life and the social environment. Nowadays, various countries are developing comprehensive mechanisms to prevent natural threats. In this context, education about natural hazards plays a crucial role. Therefore, if school geography provides students with systematic knowledge about natural hazards, their functional literacy will improve, they will develop skills in taking concrete actions in emergency situations and preventing disasters. This article is based on a comprehensive scientific analysis of the significance, features, pedagogical-psychological aspects of teaching natural hazards in school. The study aims to identify the pedagogical and psychological characteristics of teaching natural hazards and their importance in developing students' knowledge, skills, and competencies. The study uses content analysis of regulatory documents, scientific research, and expert evaluation methods. Developing students' understanding of environmental phenomena and their learning about different types of natural hazards should not be limited to theoretical knowledge but should also focus on developing practical skills, psychological preparedness, ecological awareness. The research objectives include analyzing the state of teaching

natural hazards in school and developing pedagogical and psychological methods to enhance students' functional literacy and practical skills. The findings assist in developing individuals with high functional literacy, systematic knowledge and skills in the field of natural hazards.

Keywords: school geography, natural hazards, learning, student, environment, functional literacy

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МЕКТЕП ГЕОГРАФИЯСЫНДА ТАБИҒИ ҚАУІПТЕРДІ ОҚЫТУДЫҢ ПЕДАГОГИКАЛЫҚ АСПЕКТІЛЕРІ

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Аннотация. Бүгінгі таңда бізге белгілі болып отырғанындай, әлемнің көптеген елдерінде табиғи апаттар жиілеп, осындай қауіп-қатерлердің саны жыл сайын артып отырғандығы белгілі. Табиғи қауіп салдарынан адам өмірі мен әлеуметтік ортаға зор шығындар алып келуде. Қазіргі кезде жер бетіндегі әртүрлі мемлекеттер табиғи қауіптердің алдын-алуда кешенді шаралардың түрлі механизмдерін қарастыру үстінде. Бұл тұрғыда табиғи қауіптер саласындағы білім беру маңызды рөл атқарады. Сондықтан да жалпы орта білім беретін мектептердегі география пәнін оқытуда табиғи қауіптер туралы жас ұрпаққа жүйелі білім берілетін болса, онда білім алушылардың функционалдық сауаттылықтары артып, түрлі апаттар жағдайында нақтылы әрекет ету, төтенше жағдайлардың алдын-алу сияқты біліктілік қабілеттері артар еді. Мақала жалпы орта білім беретін мектеп географиясында табиғи қауіптерді оқытудың маңыздылығын, ерекшеліктерін педагогикалық-психологиялық аспектілерін жан-жақты ғылыми талдауға негізделген. Зерттеу жұмысымыздың мақсаты қазіргі кездегі мектеп географиясында табиғи қауіптерді оқытудың педагогикалық-психологиялық ерекшеліктерін, оқушылардың білім, білік, іскерлік дағдыларын дамытудағы маңыздылығын айқындау болып табылады. Ғылыми мақаламызда нормативтік маңызды құжаттар мен зерттеу жұмыстарына контент-талдау, сараптамалық бағалау

әдістерін қолдандық. Мектеп географиясында білім алушылардың қоршаған орта құбылыстары туралы түсініктерін қалыптастыру, табиғи қауіптер мен олардың түрлері жөнінде оқыту тек теориялық білім берумен шектеліп қалмай, олардың практикалық дағдыларын, психологиялық дайындығын және экологиялық санасын арттыруға бағытталуы маңызды. Зерттеудің міндеттері мектеп географиясында табиғи қауіптерді оқытудың жағдайына, білім алушылардың функционалдық сауаттылығын арттыруға және практикалық іс-әрекеттерін дамытуға негізделген педагогикалық-психологиялық әдістеріне талдаулар жасауға бағытталады. Зерттеу нәтижесінде функционалдық сауаттылығы жоғары, табиғи қауіптер туралы жүйелі білімі мен білігі бар тұлғаның қалыптасуына негіз болады.

Түйін сөздер: мектеп географиясы, табиғи қауіптер, оқыту, білім алушы, қоршаған орта, функционалдық сауаттылық

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ПЕДАГОГИЧЕСКИЕ АСПЕКТЫ ОБУЧЕНИЯ ПРИРОДНЫМ ОПАСНОСТЯМ В ШКОЛЬНОЙ ГЕОГРАФИИ

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Аннотация. В настоящее время, как известно, во многих странах мира участились природные катастрофы, и количество экологических угроз ежегодно растёт. Последствия природных опасностей наносят значительный ущерб жизни людей и социальной среде. В настоящее время различные государства разрабатывают комплексные механизмы предупреждения природных угроз. В этом контексте важную роль играет образование в области природных опасностей. Следовательно, если в процессе преподавания географии в общеобразовательных школах будет систематически предоставляться знания о природных опасностях, то у обучающихся повысится функциональная грамотность, а также сформируются навыки конкретных действий в условиях чрезвычайных ситуаций и способности к их предотвращению. Данная статья

основана на всестороннем научном анализе значимости, особенностей и педагогико-психологических аспектов преподавания природных опасностей в школьной географии. Целью исследования является определение педагогико-психологических особенностей преподавания природных опасностей в современной школьной географии, а также выявление их значимости в развитии знаний, умений и навыков учащихся. В научной статье использованы методы контент-анализа нормативных документов и научных исследований, а также экспертной оценки. Формирование у обучающихся представлений о природных явлениях, обучение их видам природных опасностей не должно ограничиваться только теоретическими знаниями, но также должно быть направлено на развитие практических навыков, психологической готовности и экологического сознания. Задачи исследования направлены на анализ состояния преподавания природных опасностей в школьной географии, на разработку педагогико-психологических методов, способствующих повышению функциональной грамотности учащихся и развитию их практических действий. В результате исследования создаются предпосылки для формирования личности с высокой функциональной грамотностью, обладающей системными знаниями и навыками в области природных опасностей.

Ключевые слова: школьная география, опасные природные явления, обучение географии, учащиеся, окружающая среда, функциональная грамотность

Introduction. If we turn to the rich history of the Kazakh people, it is known that they widely used natural phenomena, features of flora and fauna in their daily life and agriculture, creating excellent examples of conservation and protection of the environment. Continuing the tradition, they educated their descendants with the help of wise sayings, proverbs and legends that laid the foundation for preserving the environment and preventing natural disasters. However, it is no secret that as global competition intensifies in countries around the world and economic and industrial needs increase, the number of natural disasters also increases. In this regard, scientist Y.N. Harari stated: "In the 21st century, there are no other problems on the agenda except hunger, epidemics and wars. One of the fundamental tasks is to protect humanity and the planet as a whole from natural disasters. Thanks to significant economic growth, which provided us with sufficient food, medicine, energy and raw materials, we have largely succeeded in bringing hunger, disease and war under control. However, this growth disrupts the ecological balance of the planet in various ways. This has now become a big problem. Humanity realized this threat too late and took only minimal steps to eliminate it. Despite all the talk about air pollution, global warming and climate change, most countries in the world are not prepared to undertake significant economic and political reforms to improve the situation. When we are faced with a choice between economic growth and environmental sustainability, we always choose growth. "If we want to prevent natural disasters, we must increase our responsibility in all areas in the 21st century," (Harari, 2017).

In this regard, on July 15, 1997, the Law “On Environmental Protection” came into force in the Republic of Kazakhstan. The head of state, President K.K. Tokayev, in each of his Addresses to the people of the country, did not remove from the agenda the issues of environmental protection and the prevention of any threats to it.

The ancient philosopher Aristotle was the first to give a theoretical idea of natural disasters and tried to determine the causes of this phenomenon. In his work "Metrology" he tried to explain the occurrence of earthquakes, lightning and storms and came to the conclusion that humanity should know about such phenomena (Howard, 1972). Some aspects of the problem of environmental protection in the educational process and informing the younger generation about its dangers were considered at the beginning of the 20th century by Kazakh intellectuals M. Zhumabayev and Zh. Aimaulytov, linking them with human psychological feelings (Zhumabayev, 2022; Aimaulyuly, 2023). After our country gained independence, in connection with the disruption of the global ecological balance and the increase in natural disasters, the issue of comprehensive mastery of this topic by students in comprehensive secondary schools was introduced into the curriculum. In this regard, geography teachers should effectively use new, innovative pedagogical methods and approaches, using real-life examples to help students develop their knowledge and skills in the field of natural disasters and improve their functional literacy on this issue. Because it is an undeniable fact that the targeted use of such pedagogical methods influences the psychological thinking of students.

Materials and methods

It is known that recently in developed countries of the world there has been a gradual transition to a “green” economy and the use of advanced innovative technologies to prevent environmental disasters and natural disasters. However, it is no secret that many issues still need to be resolved in this direction. In this context, improving the literacy of students in general secondary schools, starting with responsible government institutions, is a pressing task. In this regard, many scientists and researchers currently believe that students' knowledge and skills about natural hazards should be introduced from the primary school level to higher education institutions.

In their work, M. Çoban and Y. Göktaş proved that various natural disasters, including earthquakes, cause great harm to society and explained the deaths and serious injuries of people as a result of these disasters by the lack of adequate protective measures. In this regard, the researchers note that providing primary school students with practical education rather than various exercises and using digital games on mobile phones that are accessible to every student can facilitate the process of disaster preparedness education (Çoban et al., 2022). V. Leal Filho, M. Sima, A. Sharifi and other scientists came to the conclusion that in connection with the rapid pace of climate change in the modern era, it is important to introduce education in this direction within the framework of educational and scientific practice in higher education institutions. Climate change education in higher education institutions not only increases students' interest in scientific research, but also enables them to use it in their future practice (Leal Filho et al., 2021). This influence is undoubtedly important for future geographers and teachers.

Foreign scientists S. Fazeli, M. Khagani, M. Mohammad, T.H. Rashidi argue that the frequent increase in natural disasters in countries around the world due to the development of modern global processes leads to significant climate change, and that individual training and targeted education for each student are a guarantee of effective response to natural disasters, reducing human losses, preventing damage and maintaining the stability of the environment of society. In this regard, scientists argue that short-term plans for training on emergency preparedness that could harm humanity are ineffective, arguing that schools and education boards play an important role in educating people. They argue that a long-term, targeted, practice-oriented system of disaster education can guarantee the improvement of students' functional literacy. The researchers recommend making it a habit to conduct various planning workshops for students, emphasizing the importance of involving various communities, local councils and community volunteers in the area in educating students about natural disasters (Fazeli et al., 2024).

Meanwhile, A.I. Rodriguez, M.A. Grigolo, F.E. Tejada, A. Albarracin, M.P. Martinez, R.G. Sales, R. Naranjo in their studies show the need to implement education on natural disasters on a large scale, especially in rural areas, in various remote settlements. They based their conclusions on the aftermath of an earthquake in the El Abanica region of Argentina, which caused significant damage to rural areas. These areas are relatively low-lying and sparsely populated. In this regard, scientists note that students in urban schools have more opportunities to learn about natural hazards than students in rural schools. The importance of using strategies to enhance functional environmental literacy and response to various natural disasters was comprehensively analyzed by examining rural school children's understanding and knowledge of natural disasters (Rodríguez et al., 2025).

Considering that the 21st century is an era of knowledge and science, innovation, meeting the requirements of competition and global development, the issue of using various new technologies in teaching schoolchildren knowledge about dangerous natural phenomena is becoming increasingly relevant. In this regard, M. Parham, R. Teeuw, K. Solana and S. Day demonstrated in their works the importance of using an updated DRR program to improve students' functional literacy about natural hazards in comprehensive secondary schools, including in geography lessons. The DRR program in the pedagogical process is aimed at identifying the causes and factors of various natural hazards, their prevention, teaching students measures of preparedness and minimization of this problem, as well as creating an algorithm for responding to emergency situations (Parham, et al., 2021)

A. Dikshit, B. Pradhan, S.S. Matin, G. Beydoun and others in their works on the specifics and importance of using artificial intelligence in improving the functional literacy of secondary school students in the field of natural hazards, have looked at this issue from a new perspective. Scientists have proven that today in the field of geography and geology, modeling of natural hazards using new technologies can achieve results when implemented using new algorithms and computational laws. In their research, scientists identify three types of control of natural hazards using artificial intelligence. These are satellite images, climate models and ground-based

observations. It also highlights the importance of using the XAI model in teaching natural disasters in secondary schools. This model, implemented with the help of artificial intelligence, will ensure transparency and trust in the field of education, deep understanding of data and turning predictions into concrete actions. This XAI model can be used for early detection of droughts and landslides, floods and hazardous climate events. Therefore, the use of this model in school practice and in teaching geography will yield results. Because during the experiment, students will develop skills such as determining the initial state of natural hazards, visualization, analysis and interpretation of data, and most importantly, their application in practice (Dikshit et al., 2024). E. Gianni, P. Tyrologou, N. Couto, V. Correia and other scientists describing the geological, geomorphological and meteorological factors that influence the occurrence of natural hazards, recommend introducing special courses related to emergency situations at all levels of the education system. He stressed that the course should cover the sources of natural disasters, their consequences and ways to protect against dangerous events. The authors concluded that organizing conferences and seminars with the participation of authorities, the public and experts in this field would be effective in educating the public about natural hazards. (Gianni et al., 2023).

Thus, considering the views and methods proposed by the above-mentioned scientists, it becomes clear that school geography plays a special role in educating about natural hazards, which have become a serious problem and a particular concern to humanity today. In this regard, teaching geography in the country's schools requires the wide use of various modern pedagogical methods and approaches. If we delve into the topic of the study, the subject of geography in schools is developing according to the spiral system of training in accordance with updated educational requirements.

The geography textbook for 10th graders, published by the «School» publishing house in 2019 (authors K. Kaimuldinova, S. Abilmazhinova, A. Saipov), includes a chapter on “Nature Management and Geoecology”. Specific goals and objectives for teaching this chapter to 10th grade students are outlined. Among them are analyzed types of modern nature management, assessment and general principles of impact on the environment, the object of study of geoecology and its relevance today, the threat of pollution of geospheres, global environmental problems and world practice, the state of this issue in our country, scientific work is aimed at proposing ways to prevent the negative impact of anthropogenic factors that negatively affect nature, as well as environmental problems in Kazakhstan (Kaimuldinova, et al., 2019). The geography textbook for grade 11 (authors K. Kaimuldinova, B. Abdimanapov, S. Abilmazhinova) covers a wide range of topics directly related to dangerous natural phenomena. Among them are the topics of managing the processes of nature management in the economic and consumer sectors, mechanisms for regulating nature management in the oil and gas sector, legislative aspects of nature management in state and local territories, environmental problems in the 21st century, features of water use, the impact of ecology on human health, nature management, “eco- and

smart cities - cities of the future” are written in accordance with the principles of systematic and coherence (Kaimuldinova et al., 2020).

In this context, the use of new technologies, maximum use of artificial intelligence capabilities, and the involvement of students in practical work and various research activities will not only increase the effectiveness of geography teaching, but will also contribute to the development of practical skills.

We believe that, in general, when implementing the pedagogical process in geography lessons in comprehensive schools, especially in the section “Nature Management and Geocology”, the only way for a subject teacher to be comprehensively prepared from a methodological point of view and effectively carry out his professional activities is to purposefully visit areas of increased natural hazard in the local region and places with a favorable environmental situation and conduct research, which would contribute to increasing the literacy of students in this area.

Results

By systematically studying the topic of natural disasters in school geography lessons, students will pay close attention to natural phenomena and lay the foundation for improving their functional literacy, and their practical skills, such as practical actions, will be improved through practical activities.

In this regard, it is advisable for a secondary school geography teacher to use various pedagogical methods and approaches, taking into account their age and individual characteristics, when teaching students natural phenomena, the need to protect nature, and improving their ability to act in dangerous situations. In the course of the study, analyzing the holistic pedagogical process at school, pedagogical theory and professional activities of leading teachers, the system of increasing the literacy of the individual through natural hazards can be presented as follows (Figure 1).

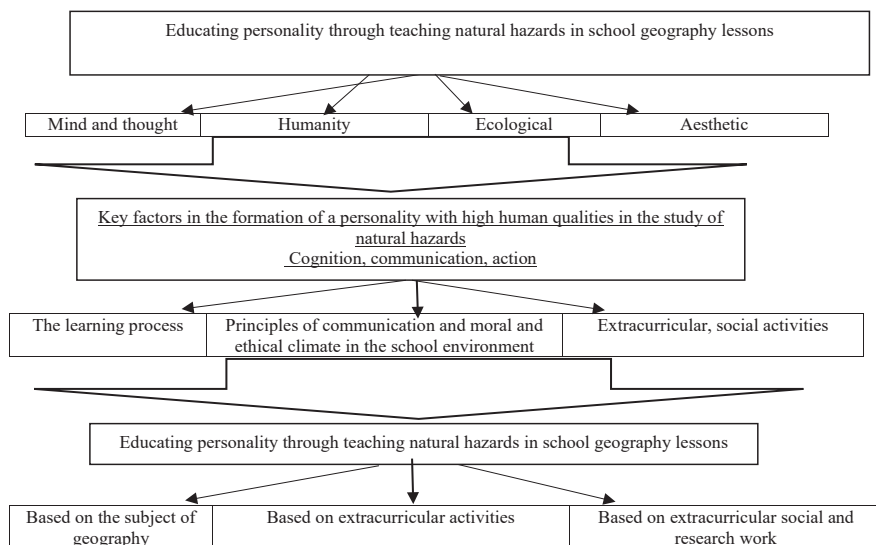


Figure 1. Structure of the system of teaching natural hazards in geography lessons at school

Thus, teaching natural hazards in a school geography course has the following tangible advantages:

1. *Ensuring student safety and readiness.* In school geography lessons, knowledge about dangerous natural phenomena, provided systematically and methodically with the support of various additional materials, develops safety skills in students and increases their readiness for various events.

2. *To improve students' analytical and critical thinking skills.* Under the guidance of the teacher, students will practice identifying the causes and consequences of various natural hazards, as well as the types of hazards that may arise depending on territorial characteristics. If the teacher had taught in detail about territorial natural hazards using special methods, students would have improved their critical thinking skills.

3. *Education implementer.* As students master the materials, they develop a deep understanding of natural phenomena, a sense of compassion for the environment and the work of people in it, and develop moral qualities such as the protection and preservation of nature.

4. *A tool for improving environmental literacy.* Studying natural disasters in school geography lessons allows us to understand the laws of external phenomena, as well as the characteristics of ecosystems. Students understand that the environment has profound implications for humanity and future generations. Therefore, they learn to look for alternative sources of ways to prevent such phenomena. And such advantages of teaching natural hazards in school geography lessons are effectively realized in the course of professionally organized, targeted educational and upbringing lessons based on new innovative technologies.

In addition to the pedagogical process, there is reason to believe that in recent years there has been a growing demand and interest among students in environmental protection and the prevention of environmental disasters. Now we can understand this idea from the following two points.

1. In many regions, students show increased interest in working together with «the Green Country» youth teams to clean up their school grounds and native lands, maintain ecological balance and improve the environment. At the same time, students take part in many volunteer activities. Currently, this problem is being realized in many regions, districts and villages. This includes helping lonely and needy families, cleaning their yards, opening and cleaning rivers in areas near schools and villages, and much more. It's the good deeds that might say.

2. Thanks to state support for talented youth, students will develop a sense of responsibility for protecting the environment, preventing man-made disasters, identifying natural hazards, etc. It is no secret that the desire to invent devices is growing. A clear confirmation of this is the current participation of students in various levels of district, regional and republican youth Olympiads and scientific project competitions, where they demonstrate their skills in the field of eco- and smart cities, cities of the future, digital installations related to the prevention of natural hazards, waste recycling, etc. We can highlight inventions and works of art.

Discussion

The range of measures taken in response to the increase in natural disasters, which have become a pressing problem in countries around the world, has not gone unnoticed in our country either. Issues of environmental protection, prevention of natural disasters and preservation of ecological balance are enshrined in legislation and are one of the most important state tasks of the Republic of Kazakhstan.

Article 38 of the Constitution of the Republic of Kazakhstan states that every citizen of the country is obliged to protect nature and preserve natural resources. (Rogov, 2018).

In order to implement measures to protect the environment in our country, the Environmental Code of the Republic of Kazakhstan was adopted on January 2, 2021. This code comprehensively addresses such issues as public health protection, prevention of environmental disasters and air pollution, and the use of natural resources in accordance with modern requirements to create a healthy environment for all residents of our country. It is shown that earthquakes and disasters occurring under the influence of anthropogenic conditions and natural phenomena are characterized by such factors as changes and destruction of the environment, and pose a threat to people and various living beings, as well as to their vital interests. (Aigarinova et al., 2018). In his Address to the People of Kazakhstan "Economic Orientation of a Fair Kazakhstan" for 2023, the President of the Republic of Kazakhstan K.K. Tokayev noted that the situation in the countries of the world has changed dramatically due to environmental pollution, and noted that they are experiencing various natural disasters, and that this problem has existed in our country for several years. In this regard, the Head of State drew attention to the need to train and mobilize specialized specialists in higher education institutions in the near future. At the initiative of the President, a number of collegial meetings and forums were held this year with the participation of leading countries of the world on issues of prevention and protection from natural disasters. Among them, the current year in our country has been declared the "Year of Ecology" within the framework of the Shanghai Cooperation Organization. Also, heading the International Fund for Saving the Aral Sea, has been taken comprehensive measures to solve the problem of water shortage in Central Asia and improve the environmental situation in the region. (Kabyzbekova et al., 2025)

After our country gained independence, a number of fundamental works and scientific studies were published on issues of environmental protection, prevention of natural disasters and its use in the educational process.

Domestic scientists R.K. Kerimbaeva and A.E. Mankesh came to the conclusion in their research that a complex of knowledge about the environment, various natural phenomena, ecology should begin in kindergartens, and argued that effectively organized work in this direction contributes to the formation of children's worldview.

S.K. Konyrova, A.K. Egesinova, N.T. Yesenalina and others spoke about the importance of teaching topics of natural disasters, ecology and environmental phenomena at the initial stage of education in secondary school formulated in their works.

Some aspects of increasing the environmental literacy of senior school students and educating them on issues of dangerous natural phenomena were discussed by K.N. Sarybekov, G.M. Sabdenaliev, L.S. Nurbaeva, D. Childebaev, R.T. Tolegenova, U.A. Esnazarova, K.Zh. Buzaubakova and others scientists' research continued. Valuable research on the formation of knowledge and skills on environmental hazards and nature conservation in the system of professional training of future teachers and geographers in higher education institutions received a scientific and comprehensive analysis in the works of B.Sh. Abdimanapov, K.D. Kaimuldinova, and M.A. Askarova. We believe that it would be more effective if, based on the work of the above-mentioned scientists, modern attention to natural hazards and improving the functional literacy of young people and students was implemented at all levels of educational institutions among of them:

Taking into account age-related characteristics, to form in children of the kindergarten group a worldview about the importance of the environment for human life, various natural phenomena, the relevance of maintaining cleanliness through role-playing and developmental games and simple methods;

Enrich the content of the curriculum of natural science and world studies lessons in the education and upbringing system of primary school students with the importance of protecting and preserving the environment, and improve their literacy by providing examples from the works and stories of writers and intellectuals about human activities to protect nature. To connect knowledge about the protection of plants and animals, conservation of nature with simple practical work. According to scientist S.K. Konyrov, the introduction of natural conditions of the native land into the education system of primary school students not only forms their love for nature, but also creates the basis for increasing their environmental culture. (Konyrova, 2003).

The role and function of geography in improving the environmental literacy of high school students is unique. Taking into account updated educational requirements to improve the level of literacy of students in the field of natural hazards, the use of information technology, computer graphics and maps, diagnostics of materials from publicly available official websites on the topic of emergency situations, development of diagrams, and implementation of SWOT analysis methods are being implemented. Organization of educational excursions and conducting scientific research and familiarization work in places of ecological imbalance and occurrence of various natural phenomena in the territory of the district and region. Based on the results obtained, activities such as developing group forecasting projects related to risk prevention will improve students' functional literacy.

Professional training of specialists in higher education institutions for work on the protection and preservation of the environment. Organization of complex scientific expeditions to seismically dangerous areas, implementation of practical scientific research projects and works. Exchange of experience with leading foreign scientists, development of a program based on inventions and innovative patents. There is no doubt that in the training of future geography teachers, such topical issues as

environmental protection, familiarization with methods and approaches related to nature conservation, and mastering the patterns of their application in pedagogical practice will yield positive results if effectively implemented.

Conclusion

To sum up our scientific article, it cannot be denied that the violation of the ecological balance by economic and industrial complexes, plants and factories is caused by the rapid acceleration of modern global processes, the growth of natural hazards caused by atmospheric changes. In this regard, taking into account modern requirements and patterns of social development, teaching dangerous natural phenomena in the school geography course is of great importance. In the educational process, through effective and targeted educational work, students develop a sense of compassion and responsibility for the environment and a culture of safety.

Teaching about natural hazards in geography lessons in comprehensive schools is also very relevant for solving the problems set by the state - explaining the consequences of natural disasters, teaching preventive measures and preparedness for them. Teaching natural hazards in geography lessons in comprehensive schools is also very relevant for solving the tasks set by the state - explaining the consequences of natural disasters, teaching preventive measures and preparedness for them. Based on the findings of scientists within the framework of the research topic, teaching natural hazards in school geography lessons not only gives students cognitive knowledge, but also demonstrates in practice the rules of behavior in emergency situations and the importance of preparedness for various natural phenomena, which improves the quality of education. In this context, the activities of creatively thinking teachers who possess high professional skills and competence, who deeply understand the laws of pedagogical processes and who are able to apply methods and approaches based on new information technologies play an important role.

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