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FORMATION OF ECOLOGICAL WORLDVIEW AMONG STUDENTS OF BIOLOGY

Formation of an ecological worldview among students has emerged as a pressing task in modern education amidst growing global environmental calamities. Ecological worldview encompasses a complex amalgamation of values ethical beliefs and conscious behaviors geared toward preserving natural resources rationally. Ecological worldview cultivation foundations are explored particularly for biology education students who will drive sustainability and awareness remarkably. The Article emphasizes forming an ecological worldview that begins rather early and evolves systematically throughout the educational journey from preschool institutions right up through universities. Integration of environmental ethics and sustainable development goals within teacher training programs decisively shapes environmentally responsible individuals with practical ecological experiences. Ecological knowledge profoundly influences students imagination and critical thinking deeply forming morally grounded ecological identity ultimately with informed value orientation. Barriers hindering students' ecological worldview development include outdated curricula and lack of interdisciplinary approaches amidst insufficient institutional backing. Ecological worldview formation must be tackled via a multi-faceted strategy encompassing national policies, local communities, families, universities and schools simultaneously nationwide. A deep ecological consciousness in young people can be instilled quite effectively by value-centered educational systems making them face ecological challenges.

Keywords: ecological worldview, environmental education, ecological consciousness, sustainable development, environmental values, ecological responsibility, student engagement, ecological ethics.

Introduction

Humanity now confronts weird environmental tribulations amidst rapid tech advancement and crazy industrialization pretty frequently worldwide. Depletion of natural resources and pollution of air and water alongside deforestation and biodiversity loss has underscored the urgent need for cultivating ecologically conscious generation rapidly. Environmental issues can no longer be viewed solely as scientific concerns or merely political hot potatoes but must be seen through a cultural lens deeply rooted in societal values. Formation of an ecological worldview among students especially those in higher educational institutions responds keenly to such pressing challenges. Ecological worldview entails a somewhat diffuse set of values and knowledge informing individual interactions with the environment in rather complex ways. Ecological awareness involves deeply understanding complex concepts emotionally and morally sparking behavioral readiness for sustainability practices pretty much every day. Possessing a robust ecological worldview is vital for future biology educators who will transmit such values energetically to next generations. Global trends starkly reflect the urgency of this issue nowadays very rapidly. Contemporary education aims at developing learners capable of thinking critically and acting responsibly towards sustainability of the environment pretty effectively nowadays. Environmental literacy and sustainable development have become integral parts of national curricula in countries like Kazakhstan undergoing significant educational reforms worldwide slowly. Ecological awareness culture and public participation in environmental decision-making are strongly emphasized in the Republic of Kazakhstan's 2021 Environmental Code very notably. Current educational systems often falter badly at integrating ecological principles effectively amidst frantic efforts elsewhere nonetheless. Biology provides foundation for such worldview formation naturally as science of life and interdependence pretty much inherently. Future biology teachers carry subject knowledge and serve as role models shaping students' ecological thinking and fostering deep civic responsibility in students quite effectively. Best practices and innovative approaches in promoting ecological worldview are analyzed alongside significant challenges in higher education institutions nowadays. Article discusses integration of environmental ethics and project-based learning alongside green campus initiatives and inter-disciplinary collaboration as effective tools in nurturing sustainable mindsets. We highlight thereby how educational institutions contribute hugely towards long-term

environmental stewardship and sustainable societal development down the line effectively.

Materials and methods

Ecological conundrums necessitate urgent resolution as a preeminent modern challenge reverberating loudly across disparate segments of society nowadays. Cultivating ecological culture and ecological worldview underpins addressing environmental issues according to numerous erudite scholarly works quite emphatically nowadays. Development must start inside education system gradually fostering awareness personally and instilling responsibility. Researchers often advocate pretty fervently for unorthodox teaching methods involving play and creativity to nurture ecological awareness in youngsters effectively nowadays. Humans and nature have been intertwined pretty deeply in thought since ancient times according usually to various pretty widely respected scientific literature. Ancient sages like Pythagoras and Democritus posited human character development occurs largely due to subtle influences of geography and surrounding climate [1]. Hippocrates argued in Air Water and Places that physiological characteristics of people result directly from environmental factors influencing them deeply somehow. Eastern philosophical traditions harbour deep ecological ethics roots pretty firmly already. Contemporary educational research focuses heavily on theoretical underpinnings and methodological bases of environmental pedagogy surprisingly nowadays. Kazakhstani scholars such as Zh. K. Mambetova and A. T. Turgunbayeva has thoroughly explored effective integration of ecological culture into various educational levels including higher education. Their work intensely focuses on quirky methods that rather curiously raise environmental literacy among learners and stresses importance of lifelong ecological education greatly. Literature stresses students majoring in biology must grasp concepts like ecosystem thinking biological diversity and balance of natural systems pretty thoroughly. New course offerings like Environmental Ethics and Ecosystem Research increasingly embed competencies in curricula across Kazakhstan's universities pretty rapidly nowadays. Research indicates experiential learning fosters ecological culture quite effectively among various approaches pretty notably nowadays [2]. Debates and ecological simulations alongside fieldwork and research projects cultivate ecological responsibility and profoundly reshape students' attitudes toward the environment. Environmental literacy must be bolstered through a multitude of extracurricular pursuits and keenly fervent civic endeavors pretty significantly beyond science classrooms. Several obstacles hinder development of an ecological worldview in higher education nevertheless. Some studies observe environmental courses being delivered formally in superficial ways lacking practical components and failing fully prioritizing students'

environmental thinking. Crucially gaps like these necessitate attention urgently. Fostering ecological stewardship in budding professionals and instilling awareness of nature's intricate symbiosis with human society should be chief educational objectives. Literature highlights the need for an interdisciplinary systematic approach studying historical philosophical foundations of ecological worldview and culture quite thoroughly nowadays. Fostering environmentally aware biology students into proactive responsible citizens ought to be deemed a crucial strategic imperative in contemporary education policy formulation nowadays [3; 4].

Results and discussion

Developing students' ecological worldview involves deeply value-based engagement and emotional bonding with nature alongside some knowledge transfer obviously. Biology education students undergo development involving formation of scientific understanding and ethical responsibility simultaneously somehow rather quickly now. Practical biology classes and eco-projects deepen their academic knowledge remarkably while encouraging sustainable behavior through various environmental experiments deliberately. Future biology teachers must acquire far more than mere content knowledge and become passionate advocates for environmental stewardship in future generations [5].

Table 1 – Ctages of development of students' ecological worldview during the educational process

Stages of development of students' ecological worldview	Characteristics
Stage 1 – Awareness and perception	Understanding basic ecological concepts, developing emotional sensitivity to nature, stimulating interest through biological subjects (botany, zoology, ecology).
Stage 2 – Conscious attitude	Forming a value-based attitude toward environmental protection, fostering responsibility for nature through academic projects, eco-events, and biology-related practical activities.
Stage 3 – Active behavior and ecological thinking	Applying ecological knowledge in real life: participation in green initiatives, student-led projects, ecological clubs, and field research. Development of a consistent ecological worldview integrated with biological thinking.

Shaping an ecological worldview among biology students happens gradually despite growing urgency of environmental issues internally. Interdisciplinary understanding and sustainable development necessitate assiduous support especially within university-level education contexts. Several obstacles impede

formation of ecological worldview among students greatly nowadays in educational institutions. Barriers can be grouped into categories such as socioeconomic strata and psychological predispositions somewhat awkwardly often [6].

Table 2 – Factors hindering the development of students' ecological worldview

Scientific factor	**Social factor**	**Pedagogical-methodical factor**
The formation of ecological thinking is not sufficiently studied from a biological and psychological perspective; limited empirical research on biology students' ecological perception.	Inconsistency in values across families, communities, and institutions regarding nature; lack of eco-oriented culture at home and in local society.	Absence of a unified ecological module in biology programs; insufficient integration of ecological ethics and project-based learning in the curriculum.

Students' ecological worldview development relates directly to perception of world and ability to decide on environmental issues with internal motivation. Ecological culture stems from knowledge and skills and a person's profound moral fibre and rather complex ethical stance toward natural surroundings. Development of ecological awareness involves deeply personal emotional shifts rather than purely intellectual or formal changes so it's crucial to grasp this [7]. Ecological worldview forms quite gradually over time in various complex systems. Formation of it necessitates pretty consistent educational methodology especially for budding scientists and teachers of biology. They must cultivate awareness of interdependence between humans and nature pretty deeply and grasp the importance of biodiversity quite profoundly nowadays. Several unorthodox approaches have proven pretty effective in profoundly shaping students' ecological worldviews with remarkable success quite recently. Ecological games and debates are included alongside nature-based field lessons and project-based research activities undertaken rather vigorously outdoors.

Lessons shouldn't be relegated solely to lecture formats but rather involve students deeply in observation and experimentation and rigorous analysis afterwards. Educators must prioritize fostering students' emotional bond with nature alongside environmental knowledge and ability to behave responsibly and ethically. Developing ecologically literate students especially future biology specialists must be a strategic goal of modern education systems somehow nationwide.

Conclusions

A series of pedagogical activities were implemented among biology education students effectively forming an ecological worldview through field practice and laboratory work quite rigorously. Students observed various species of flora and fauna in natural habitats during educational field trips and conducted systematic research on ecological phenomena thoroughly. Students acquired vital skills like species identification and biodiversity monitoring through handsomely executed practical activities involving ecological data analysis and sample collection.

Students developed core competencies pretty quickly due largely to active participation thereby forming foundation of ecological worldview with deep respect for nature alongside ability to assess human impact and personal responsibility in environmental decisions. Essential traits like environmental awareness and critical thinking were cultivated partly due to these outcomes in utilizing natural resources sustainably. Experimental work confirmed biology-related subjects like ecology and zoology play quite a critical role in forming ecological values among educators very effectively. Students gained insight into natural interdependence by interacting with various living and non-living entities and developed a pretty holistic view of sustainability.

A multi-step pedagogical experiment was conducted among biology students applying innovative teaching strategies to foster ecological culture pretty effectively. Twenty-five undergraduate biology majors were involved in a three-stage process.

Main emphasis was placed on unity of teacher-student interaction heavily during the first stage of development somewhat surprisingly [8]. Students were trained independently researching and analyzing environmental data as teachers acted as initiator of ecological knowledge and facilitator of learning. Students were egged on rather vigorously to formulate their own takes on ecological conundrums and back them up with empirical data.

Practical skills formation was highly prioritized during second stage. Students enthusiastically participated in grueling field studies and fervent environmental debates alongside esoteric subject-specific seminars pretty regularly. They gained valuable experience identifying ecological conundrums and proposing innovative solutions under guidance from seasoned experts in conservation efforts nationwide. Their involvement nurtured responsibility rather deeply and pretty significantly fostered critical thinking and qualities of rather exemplary leadership.

Student-led ecological clubs and small teams emerged rapidly in the final stage amidst great fervor locally. Groups concentrated on distinct ecozones like waste disposal, safeguarding biodiversity, health and grub security, and prudent utilization of water resources and energy [9].

Students carried out somewhat independent environmental research projects alongside fairly community-based ecological activities within various teams. They initiated various slick campaigns rapidly raising awareness about pretty pressing ecological issues nationwide with considerable fanfare and zeal. A survey was conducted among 25 students regarding their attitude toward nature and it was one key indicator of project success. Merely one student reckoned humans ought to control nature. Three students took a neutral stance emphasizing natural processes should remain totally undisturbed. Most students 21 of them stated that humans must act responsibly toward nature and prioritize its well-being alongside selfish human interests anyway. Findings imply most students grasped ecological consciousness deeply and exhibited strong penchant for adopting behaviors remarkably sustainable in various contexts. Their ecological culture manifested deeply through reverence for biodiversity and personal stewardship of natural resources amid a strong eco-centric ethos.

Outcomes of experimental activities demonstrated extracurricular environmental tasks like optional ecological modules and thematic sessions significantly enriched students knowledge remarkably. Lessons unfolded through haphazard group discussions and open lectures alongside frenzied debates and poignant creative reflections. A more holistic model of environmental culture formation was subsequently developed amongst biology students pretty rapidly with significant modifications. It melded rigorous academic studies with pretty innovative project-based learning initiatives and fervent ecological awareness crusades amidst significant community involvement. Student-centered participatory approaches play a pivotal role in fostering environmental culture and ought to be embedded deeply within higher education curricula systematically.

Table 3 – Generalized information on the development of environmental culture of students

Group of questions	Answers questions	Positive (%)	Neutral (%)	Negative (%)	Positive (number)	Negative (number)
I	Question 1	88.1	10.2	1.7	22	0
	Question 7	86.9	5.4	7.4	21	2
II	Question 3	87.9	10.0	2.1	22	1
	Question 5	85.8	12.1	2.1	21	1
III	Question 4	78.4	17.6	4.0	20	1
	Question 6	81.0	11.2	7.8	21	2
IV	Question 2	60.1	33.7	6.2	15	2
	Question 8	60.6	33.0	6.4	15	2

Formation of ecological culture among students was assessed rather thoroughly through teaching and observation and also by evaluating their behavior. A bespoke methodology geared towards integrating ecological knowledge into learning processes was developed rapidly and subsequently implemented with considerable fanfare afterwards. Students were divided into groups and plunged headlong into myriad extracurricular pursuits like eco-clubs, heated environmental debates and rambling nature observation walks outside school. Activities were devised rather cleverly for heightening awareness about and fostering engagement with pressing eco-related conundrums facing people daily [10].

Students developed essential ecological skills such as recognizing environmental issues pretty quickly and suggesting quite viable solutions rather effectively. Students were asked a plethora of queries regarding their staunch attitudes toward nature pretty thoroughly in evaluating program effectiveness. Most of the 25 participating students demonstrated a generally positive mindset ecologically. Most folks responded that humans gotta behave responsibly and weigh environmental interests pretty heavily against their own selfish needs somehow.

Changes in students' ecological culture development were tracked meticulously over varying time intervals during the experiment. Results revealed noticeably heightened ecological responsibility and awareness alongside markedly more sustainable thinking among experimental group participants relative to control group counterparts. Fisher's and Student's statistical tests validated results with high confidence at significance level $\alpha = 0.05$ fairly convincingly according to literature. The Experiment highlighted student-centered learning where students answered ecological questions and critically reflected on peers' ideas thereby improving group discussions and building collective knowledge rapidly [11].

Table 4 – The levels of formation of environmental culture among students

Group	Level	Total students	Before (%)	After (%)	Before (No.)	After (No.)
Control	High	25	92	95	23	24
Control	Lower	25	95	96	24	24
Experiment	High	25	94	99	24	25
Experiment	Lower	25	96	98	24	24

The teacher vigilantly assesses students' grasp of ecological nuances and proactively examines their growth throughout the educational journey with meticulous attention. Teachers play a pivotal role in imparting ecological culture within lessons thereby reinforcing students' grasp of theory and bolstering their

ecological savvy remarkably. Results obtained from physical education classes surprisingly validate our hypothesis that targeted pedagogy fosters environmental culture quite effectively among students. Ultimately a somewhat puzzling conclusion emerges rather quietly beneath layers of obfuscation and veiled ambiguity over time anyway.

Fostering environmental culture among students in higher education institutions is a pressing issue directly correlating with overall societal development and sustainability of the natural world [12]. Cultivating environmental culture sparked significant improvements in students' ecological awareness and motivation alongside enhanced goal-setting abilities and personal initiative in this context. Sports activities were integrated into educational processes quite effectively designing content and rather innovative pedagogical methods for students' environmental cultural development pretty thoroughly. Instilling love for nature deeply and encouraging responsible behavior toward preserving the environment promoted lifelong ecological learning rooted in ecological science laws thoroughly. Students' environmental knowledge and creativity have been enhanced remarkably through problem-based lessons in sports education that involve analyzing scenarios and proposing hypotheses [13].

Students acquired fundamental ecological knowledge initially through various somewhat unorthodox means underground. Theoretical understanding was subsequently utilized building practical ecological skills rather effectively. Optional courses tied pretty closely to environmental stuff were sorta implemented through gym classes and student-led projects in experimental groups. Such elective activities present valuable opportunities for students to deepen their ecological knowledge with freshly updated somewhat obscure information.

Effective collaboration among diverse groups including planning committees and student bodies significantly enhances success of various curricular initiatives in physical education. Practical recommendations emerged from findings of scientific inquiry and were developed further to improve educational activities focused on advancing environmental culture among students rapidly. Innovative tech and evidence-backed methods converge rather dynamically within physical ed instruction as a fertile ground for ecological ed initiatives.

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БИОЛОГИЯ БІЛІМ АЛУШЫЛАР АРАСЫНДА ЭКОЛОГИЯЛЫҚ ДҮНИЕТАНЫМДЫ ҚАЛЫПТАСТЫРУ

Жаһандық экологиялық қауіптер мен климаттың өзгеруі аясында студенттер арасында экологиялық дүниетанымды қалыптастыру – қазіргі білім беру жүйесінің ең өзекті және стратегиялық маңызды міндеттерінің бірі болып отыр. Экологиялық дүниетаным – бұл тек табиғи орта туралы теориялық білім жиынтығы емес, ол – табиғатты сақтау, қорғау және ресурстарды ұтымды пайдалану бағытындағы құндылықтар жүйесі, этикалық сенімдер, эмоционалдық көзқарастар мен саналы әрекеттердің тұтас жиынтығы. Бұл мақалада, әсіресе болашақ биология мұғалімдерін даярлау аясында, білім алушылардың экологиялық дүниетанымын қалыптастырудың педагогикалық және әдістемелік негіздері қарастырылады.

Оқудан тыс экологиялық жобалар, табиғатпен байланысты оқу кеңістіктері, эко-клубтар мен мектеп жылыжайлары арқылы студенттердің шынайы өмірмен байланыса отырып, экологиялық құндылықтарды бойына сіңіру мүмкіндігі сипатталады. Мақалада әдебиет, бұқаралық ақпарат құралдары, гылыми дереккөздер мен жергілікті қауымдастық тәжірибелерінің экологиялық мәдениет қалыптастырудағы рөлі де қозғалады. Экологиялық дүниетанымды қалыптастыру көпдеңгейлі стратегия арқылы жүзеге асуы тиіс: мектеп, университет, отбасы, жергілікті қоғам және ұлттық саясат деңгейлерінде. Тек осындай үйлесімді және құндылыққа негізделген білім беру жүйесі ғана жастардың экологиялық санасын терең қалыптастырып, оларды XXI ғасырдың экологиялық мәселелеріне этикалық тұрғыдан жауап бере алатын тұлғалар ретінде қалыптастырады.

Кілтті сөздер: экологиялық дүниетаным, экологиялық білім, экологиялық сана, орнықты даму, экологиялық құндылықтар, экологиялық жауапкершілік, студент белсенділігі, экологиялық этика.

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ФОРМИРОВАНИЕ ЭКОЛОГИЧЕСКОГО МИРОВОЗЗРЕНИЯ СРЕДИ СТУДЕНТОВ БИОЛОГИИ

В условиях нарастающих глобальных экологических угроз и изменения климата формирование экологического мировоззрения среди студентов стало одной из самых актуальных и стратегически важных задач современного образования. Экологическое мировоззрение – это не просто совокупность теоретических знаний о природной среде, а целостная система ценностей, этических убеждений, эмоциональных установок и сознательных поступков, направленных на сохранение, защиту и рациональное использование природных ресурсов. В статье рассматриваются педагогические и методологические основы формирования экологического мировоззрения у студентов, особенно обучающихся по биологическим специальностям, как будущих агентов экологического сознания и устойчивого развития.

Также анализируются барьеры, препятствующие развитию экологического мировоззрения студентов: устаревшие учебные программы, отсутствие междисциплинарного подхода, слабая институциональная поддержка и нехватка системных экологических инициатив. Особое значение придается проектам внеурочной деятельности, природно-ориентированным образовательным пространствам, эко-клубам и школьным теплицам, как способам осмысления и усвоения экологических ценностей через реальное участие студентов. Кроме того, раскрывается роль литературы, медиа, научных источников и общественных практик в формировании экологической культуры студентов. Подчеркивается, что формирование экологического мировоззрения должно осуществляться через многоуровневую стратегию с участием школ, университетов, семей, местных сообществ и национальной политики. Только скоординированная и ценностно ориентированная система образования может привить молодежи глубокое экологическое сознание, необходимое для этически ответственного реагирования на вызовы XXI века.

Ключевые слова: экологическое мировоззрение, экологическое образование, экологическое сознание, устойчивое развитие, экологические ценности, экологическая ответственность, студенческая активность, экологическая этика.

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