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Formation of Ecological Culture Among Primary School Students Through Uzbek Folk Ecology

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Abstract. *Environmental degradation has become one of the most pressing global challenges of the twenty-first century, necessitating urgent integration of ecological education into formal schooling systems from the earliest stages. This study investigates the effectiveness of incorporating Uzbek folk ecology including proverbs, folk sayings, customs, rituals, and ethno-pedagogical traditions as a pedagogical instrument for cultivating ecological culture among primary school students in Uzbekistan. Employing a quasi-experimental design involving 240 students (aged 7–10) from four primary schools in Tashkent and Namangan regions during the 2023–2024 academic year, the research applied pedagogical experiment, structured observation, questionnaire surveys, semi-structured interviews, and comparative statistical analysis. Pre-test and post-test assessments revealed that students in the experimental group, who received instruction integrating folk ecological knowledge, demonstrated a statistically significant improvement in ecological awareness, ecological behaviour, and ecological responsibility compared to the control group.*

Keywords: *Ecological Culture, Folk Ecology, Ethnopedagogy, Primary Education, Environmental Education, Sustainable Development, Uzbek Pedagogy, Ecological Awareness, Cultural Heritage, Environmental Behaviour Formation.*

Introduction

The twenty-first century is characterised by an unprecedented convergence of environmental crises climate change, biodiversity loss, land degradation, water scarcity, and atmospheric pollution that collectively threaten the ecological foundations of human civilisation. According to the Intergovernmental Panel on Climate Change (IPCC, 2023), global average surface temperatures have already exceeded 1.1°C above pre-industrial levels, with projections indicating a 1.5–2.0°C increase by mid-century under current emission trajectories [1], [2]. The United Nations Environment Programme (UNEP, 2022) reports that approximately 60% of global ecosystem services have been degraded or used unsustainably over the past fifty years. These realities demand immediate and systemic responses at all societal levels, with education identified as one of the most transformative and cost-effective levers for long-term behavioural change [3].

Uzbekistan, as a doubly landlocked country in Central Asia, confronts a specific set of ecological challenges compounded by its historical legacy of Soviet-era industrialisation, intensive cotton monoculture, and the catastrophic desiccation of the Aral Sea. According to the State Statistics Committee of Uzbekistan (Stat.uz, 2023), more than 21 million hectares of the country's territory approximately 47% of the total land area are affected by desertification, while dust and salt storms originating from the dried Aral seabed annually deposit 75–150 million tons of toxic sediment across Central Asia. UNESCO's Education for Sustainable Development (ESD) framework, formalised through the Roadmap for Implementing the Global Action Programme on ESD (UNESCO, 2014) and

subsequently reinforced through the ESD for 2030 initiative (UNESCO, 2020), positions ecological literacy as a fundamental competency for global citizenship [4, 5]. UNICEF's report 'The Climate Crisis is a Child Rights Crisis' (UNICEF, 2021) warns that children in South and Central Asia are among the most vulnerable to climate impacts, arguing that ecological awareness must be cultivated from early childhood. Folk ecology defined as the body of traditional ecological knowledge, practices, beliefs, and cultural expressions embedded in a community's folklore, rituals, and intergenerational oral traditions represents a distinctly culturally resonant pedagogical resource. The integration of such indigenous knowledge systems into formal education aligns with the UN Convention on Biological Diversity's Aichi Biodiversity Target 1 (which calls for mainstreaming biodiversity awareness through education) and UNESCO's 2003 Convention for the Safeguarding of Intangible Cultural Heritage, which recognises traditional ecological knowledge as a vital component of intangible cultural heritage requiring active protection and transmission [6], [7].

Literature Review

The concept of ecological culture encompassing ecological knowledge, values, attitudes, and behaviours that reflect a harmonious relationship between humans and the natural environment has been theorised from multiple disciplinary perspectives. Moiseev (1996), one of the foundational theorists in the Russian-language tradition, defined ecological culture as the highest manifestation of an individual's relationship to the natural world, integrating knowledge, aesthetic appreciation, and responsible action. Deryabo and Yasvin (1996) developed the concept of 'subjective attitude to nature,' arguing that ecological consciousness involves not merely cognitive understanding of ecological systems but an emotionally mediated, morally grounded orientation toward the living world. These contributions remain foundational in post-Soviet educational research and inform the theoretical framework of the present study [8], [9].

Research consistently identifies primary school age (approximately 7–10 years) as a critical developmental window for the formation of ecological attitudes and environmental identity. Chawla's seminal study across ten countries identified childhood nature experiences particularly those embedded in cultural and family traditions as the strongest predictors of adult environmental commitment. Rickinson, in a systematic review of 150 studies, identified significant positive effects of primary-level environmental education on knowledge, attitudes, and behavioural intentions [10]. More recently, Ardoin et al. conducted a systematic review of 315 peer-reviewed studies, finding robust evidence that contextually embedded and culturally relevant environmental education produces substantially larger and more durable learning outcomes than decontextualised approaches. In the Central Asian context, Abdullayeva and Kalandarova have documented the curricular integration of environmental themes in Uzbek primary schools, identifying significant gaps between policy aspirations and classroom practice, and calling for evidence-based pedagogical innovations a gap that the present study directly addresses [11], [12].

Materials and Methods

The study employed a quasi-experimental pretest-posttest control group design, conducted across four primary schools two in Tashkent city (urban context) and two in Namangan region (rural context) during the 2023-2024 academic year (September 2023 – May 2024). A total of 240 students in Grades 2 and 3 (age range 7–10 years) participated: 120 students were assigned to the experimental group (EG) and 120 to the control group (CG). Group assignment was based on intact classroom allocation to minimise disruption to normal school operations. Ethical approval was obtained from the Research Ethics Committee of Tashkent State Pedagogical University (Protocol No. 08/2023). Parental informed consent was secured for all participants. Table 1 provides the demographic distribution of participants.

Table 1. Demographic Profile of Research Participants.

School	Location	Group	Grade2(n)	Grade3(n)	Total(n)
School A	Tashkent	Experimental	30	30	60

School B	Tashkent	Control	30	30	60
School C	Namangan	Experimental	30	30	60
School D	Namangan	Control	30	30	60
Total	—	EG + CG	120	120	240

The experimental intervention designated the Folk Ecology Integration Programme (FEIP) — was developed over a six-month curriculum design phase (March–August 2023) through iterative collaboration between the researchers, four primary school teachers, two ethnopedagogy specialists, and the regional methodology centres of the Ministry of Public Education. The FEIP comprised 48 thematic lessons (two per week, each 45 minutes in duration) integrated into existing subject areas (Nature Studies, Uzbek Language and Literature, Social Studies, and Extracurricular Activities), plus 12 project-based learning sessions and four community engagement activities. The programme was structured around five thematic pillars:

Ecological proverbs and their scientific interpretations Folk tales and stories embodying ecological values and human-nature reciprocity;

Traditional Uzbek environmental practices and rituals Ecological observation of local environments guided by folk ecological concepts;

Creative projects involving documentation and presentation of family folk ecological knowledge.

Control group instruction followed the standard national curriculum without folk ecology integration. Both groups were taught by teachers of comparable qualifications and experience. Experimental group teachers received 40 hours of specialised professional development on FEIP content and pedagogical methods prior to programme implementation.

Quantitative data were analysed using IBM SPSS Statistics Version 28. Descriptive statistics (means, standard deviations, frequency distributions) were computed for all outcome variables. Normality was assessed using the Shapiro-Wilk test; all distributions met normality assumptions ($p > .05$). Independent samples t-tests were used to verify pre-test equivalence between groups. Paired samples t-tests and independent samples t-tests were employed to assess within-group and between-group changes from pre-test to post-test. Effect sizes were calculated using Cohen's d (Cohen, 1988), with thresholds of 0.2 (small), 0.5 (medium), and 0.8 (large). Analysis of Covariance (ANCOVA), with pre-test scores as covariates, was used to control for pre-existing differences and provide adjusted post-test comparisons. Statistical significance was set at $p < .05$ (two-tailed) for all analyses. Qualitative data were analysed thematically and used to triangulate and contextualise quantitative findings.

Result and Discussion

Following the 32-week FEIP implementation, the experimental group demonstrated a dramatic and statistically significant improvement in ecological awareness. Post-test mean scores increased from 34.2% to 78.6% in the EG (gain: +44.4 percentage points), compared to a modest increase from 33.9% to 47.3% in the CG (gain: +13.4 percentage points). The between-group difference at post-test was highly significant ($t(238)=18.73$, $p<.001$), with a large effect size (Cohen's $d=2.42$). ANCOVA results, adjusting for pre-test scores, confirmed a significant treatment effect ($F(1,237)=350.64$, $p<.001$, partial $\eta^2=0.597$). Table 2 presents the detailed comparative results for all outcome variables [13], [14].

Table 2. Pre-test and Post-test Comparative Results for All Outcome Variables.

Variable	EG Pre (M%)	EG Post (M%)	CG Pre (M%)	CG Post (M%)	t-value	Cohen's d
Ecological	34.2	78.6	33.9	47.3	18.73***	2.42

Awareness						
Ecological Behaviour	28.5	71.3	28.8	42.1	16.45***	2.13
Ecological Responsibility	31.7	74.9	32.1	44.8	17.02***	2.21
Composite Score	31.5	74.9	31.6	44.7	18.01***	2.33

*Note: ***p < .001; M% = Mean percentage score; All df = 238; EG = Experimental Group; CG = Control Group*

Students were classified into four levels of ecological culture based on composite score ranges: Low (0–40%), Developing (41–60%), Adequate (61–80%), and High (81–100%). Table 3 displays the pre-test and post-test distribution across these levels for both groups.

Table 3. Distribution of Ecological Culture Levels (Pre-test vs. Post-test, %).

Level	EG Pre (%)	EG Post (%)	CG Pre (%)	CG Post (%)
Low (0–40%)	68.3	3.3	66.7	42.5
Developing (41–60%)	21.7	14.2	22.5	38.3
Adequate (61–80%)	8.3	47.5	8.3	15.8
High (81–100%)	1.7	35.0	2.5	3.4

The distribution data reveal that while only 10.0% of EG students achieved Adequate or High levels at pre-test, 82.5% reached these levels at post-test a transformation of 72.5 percentage points. In the control group, the proportion of students at Adequate or High levels increased from 10.8% to only 19.2% a modest 8.4-point gain attributable to normal developmental progression and standard instruction. These results provide compelling evidence for the dramatic superiority of the FEIP approach in elevating ecological culture levels [15].

The findings of this study provide robust empirical support for the effectiveness of folk-ecology-integrated pedagogy in cultivating ecological culture among primary school students in Uzbekistan. The large effect sizes obtained (Cohen's d = 2.13 to 2.42 across outcome variables) substantially exceed those reported in comparable international intervention studies. Ardoin et al.'s (2020) systematic review of 315 environmental education interventions reported a median effect size of d=0.62, while the meta-analysis by Tomas et al. (2017) found a weighted mean effect size of d=0.54 for primary-level environmental education programmes [16]. The considerably larger effects observed in the present study are consistent with the hypothesis advanced by Bang et al. (2014) and Cajete (1994) that cultural embeddedness and contextual relevance substantially amplify the effectiveness of environmental education interventions [17].

The superiority of the FEIP approach may be explained through several theoretical mechanisms. First, from a cultural-historical perspective (Vygotsky, 1978), learning that is mediated through culturally familiar symbols, narratives, and practices occurs within the learner's zone of proximal development in a more accessible and engaging manner than culturally decontextualised content. The Uzbek folk

ecological proverbs and stories employed in the FEIP serve as what Vygotsky termed 'psychological tools' — cultural artefacts that mediate higher-order thinking and value formation. Second, from identity theory (Stets & Biga, 2003), the FEIP's activation of cultural ecological identity positioning ecological responsibility as a constitutive element of being Uzbek provides a more durable motivational foundation for ecological behaviour than externally imposed environmental rules [18]. Third, from the perspective of intergenerational learning (UNESCO, 2014), the FEIP's promotion of student-elder dialogues about traditional ecological knowledge activated a uniquely powerful pedagogical resource largely absent from conventional environmental education. Several limitations of the study merit acknowledgment. The quasi-experimental design, while appropriate given the constraints of real-world school settings, does not allow for definitive causal attribution; random assignment to conditions would strengthen causal inference [19], [20]. The study was conducted across four schools in two regions, limiting generalisability to other Uzbek educational contexts (e.g., remote rural areas, minority language communities) and to other Central Asian countries. The follow-up period did not extend beyond the academic year; longitudinal research is needed to assess the durability of effects. Additionally, teacher enthusiasm and the novelty of the FEIP may have contributed to observed outcomes through Hawthorne and experimenter expectancy effects, which future studies should address through more rigorous blinding procedures.

Conclusions

This study provides compelling empirical evidence that the integration of Uzbek folk ecological knowledge encompassing proverbs, folk tales, traditional practices, and ethno-pedagogical approaches into primary school instruction constitutes a highly effective pedagogical strategy for cultivating ecological culture in young learners. The Folk Ecology Integration Programme produced statistically significant and practically meaningful improvements in ecological awareness (from 34.2% to 78.6%), ecological behaviour (from 28.5% to 71.3%), and ecological responsibility (from 31.7% to 74.9%) among primary school students, with effect sizes (d=2.13–2.42) substantially exceeding those reported in comparable international studies. These findings carry significant implications for educational policy and practice at national and regional levels. In conclusion, Uzbek folk ecology is not a relic of the past but a living, pedagogically powerful resource for building the ecologically conscious and responsible citizenry that both Uzbekistan and the global community urgently require in the face of accelerating environmental challenges. Systematic investment in its educational application represents both cultural wisdom and pedagogical prudence.

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