PREPARING PRE-SERVICE PRIMARY TEACHERS TO FOSTER LOGICAL REASONING IN UZBEKISTAN'S TARBIYA CLASSES: A QUASI-EXPERIMENTAL PILOT STUDY

Ummatkulova Sayyora
Independent Researcher, Gulistan State Pedagogical Institute, Uzbekistan

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ABSTRACT

This study examines a pedagogical model for preparing pre-service primary teachers to design reasoning-rich lessons in Uzbekistan's integrated Tarbiya ("Upbringing") subject. A two-group pretest-posttest quasi-experimental pilot involved 60 third-year Primary Education students at Andijan State Pedagogical Institute. Thirty participants followed the conventional Tarbiya methodology syllabus, whereas 30 studied through a modular approach centred on moral-logical dilemmas, Socratic and dialogic questioning, graphic organisers, cause-and-effect reasoning, evidence-based justification, and structured reflection. Methodological preparation was represented by a study-specific 100-point composite score covering lesson-plan construction, pedagogical-logical thinking, and practical teaching proficiency. The experimental-group mean increased from 62.1 to 85.4 points, an absolute gain of 23.3 points and a 37.5% increase relative to baseline. The control-group mean increased from 61.5 to 67.8 points, a gain of 6.3 points and a 10.2% relative increase. The between-group difference in gains was 17.0 points. Available study documentation did not include participant-level scores or variance statistics, so inferential statistics, confidence intervals, and standardised effect sizes are not reported. The findings are interpreted descriptively and support further evaluation of reasoning-oriented Tarbiya teacher preparation. Pupil logical-reasoning outcomes were not directly measured.

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Keywords: *Tarbiya, logical reasoning, critical thinking, pre-service teachers, primary education, dialogic teaching, teacher education.*

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Introduction

Education increasingly requires learners to analyse information, justify judgements, evaluate alternatives, and make responsible decisions in unfamiliar or complex situations. International competency frameworks similarly emphasise agency, reflection, reasoning, and responsible action (OECD, 2019). These aims draw on higher-order processes such as analysis, evaluation, inference, explanation, and metacognition (Anderson & Krathwohl, 2001; Facione, 1990; Kuhn, 1999). Such processes are not confined to mathematics or the natural sciences. Civic, social, language, and moral-educational contexts can also require pupils to identify causes and consequences, compare alternatives, evaluate evidence, justify claims, and reflect on their reasoning.

This perspective is particularly relevant to Uzbekistan's Tarbiya subject. Resolution No. 422 of 6 July 2020 established Tarbiya as an integrated subject in general secondary education, bringing moral, civic, and value-oriented areas into a common curriculum (Cabinet of Ministers of the Republic of

Uzbekistan, 2020). Although Tarbiya is concerned with values and behaviour, its themes also involve interpretation, judgement, and responsible decision making. Honesty, responsibility, environmental care, citizenship, cooperation, safety, and digital conduct can be approached through situations in which pupils identify relevant information, consider consequences, compare possible actions, and justify decisions. This approach preserves the formative purpose of the subject while increasing its cognitive demand.

A persistent pedagogical risk in value-oriented subjects is an emphasis on teacher explanation, textbook reproduction, and recall questions. Pupils may learn that pollution is harmful or honesty is desirable without having to explain why, consider exceptions, evaluate competing obligations, or examine consequences. Remembering a proposition and reasoning about it are different cognitive achievements. The revised taxonomy of educational objectives distinguishes remembering and understanding from analysing, evaluating, and creating (Anderson & Krathwohl, 2001). Reasoning-oriented Tarbiya lessons can therefore extend beyond recognition of socially valued norms by giving pupils structured opportunities to explain, compare, infer, justify, and reflect.

Research on critical-thinking instruction supports explicit, contextualised teaching. Abrami et al. (2015) found that critical-thinking performance can improve when instruction draws attention to thinking processes and provides opportunities for dialogue and authentic application. Teacher education adds a further requirement: pre-service teachers need pedagogical knowledge for formulating questions, designing tasks, anticipating pupil responses, selecting scaffolds, and managing interactions that make reasoning observable (Bubikova-Moan et al., 2026; Huang & Sang, 2023). Research on classroom dialogue likewise shows that structured talk can function as a cognitive tool through which pupils explain, challenge, refine, and coordinate ideas (Howe & Abedin, 2013; Mercer et al., 2004). Meta-analytic evidence also suggests benefits of dialogic teaching-and-learning programmes for teacher professional development, classroom interaction, and child outcomes in pre-primary and primary settings (Xie & Lin, 2025).

The study focuses on the methodological preparation of pre-service primary teachers and addresses two research questions: (a) Which pedagogical components characterise a Tarbiya methodology intended to foster pupils' logical reasoning? and (b) What descriptive pretest-posttest changes in methodological preparation were observed in the experimental and control groups? The contribution is twofold. It specifies a practical teacher-development model for reasoning-rich Tarbiya lessons and reports teacher-level outcomes within the limits of the available evidence.

Conceptual and Pedagogical Framework

Logical reasoning is used here as a practical pedagogical construct that includes analysis, comparison, classification, cause-and-effect reasoning, inference, justification, generalisation, and reflective evaluation. It overlaps with established conceptions of critical thinking, although critical thinking also encompasses broader dispositions, epistemic standards, and domain knowledge (Facione, 1990; Kuhn, 1999). In primary classrooms, these processes can be made visible through manageable tasks: identifying a cause, comparing two actions, classifying examples according to a rule, constructing an if-then relationship, selecting evidence, or explaining why one alternative is preferable. This emphasis is consistent with sociocultural accounts in which language, guided participation, and social interaction scaffold increasingly independent thinking (Vygotsky, 1978).

Moral-logical dilemmas form one component of the model. They present situations in which pupils identify relevant facts, recognise competing considerations, anticipate consequences, and justify a decision. The educational value of a dilemma lies in the reasoning it elicits, not simply in controversy. For example, the question of whether a pupil should reveal a friend's secret when keeping it may harm another person can be explored by asking who is affected, which information matters, what values are in tension, and what reasons support each option. This use of structured moral problems is consistent with moral-discussion interventions (Blatt & Kohlberg, 1975) and with contemporary Philosophy for/with Children research linking guided inquiry with reasoning and critical-thinking development (Kilby, 2025; Wei & Chen, 2025).

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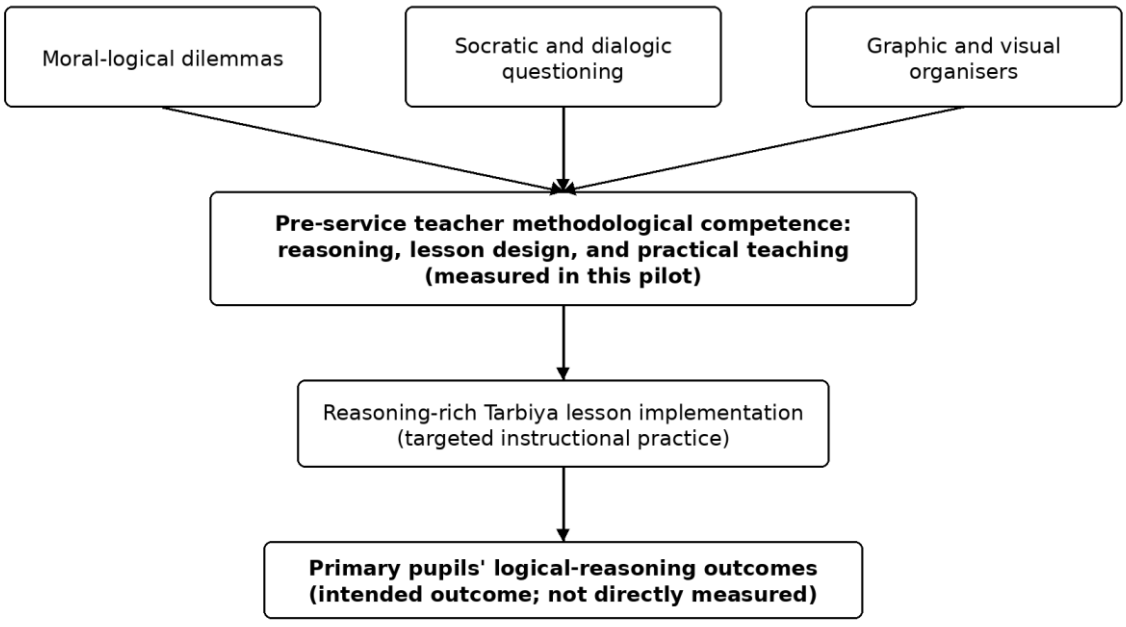
Socratic and dialogic questioning provides a second mechanism. In this model, questioning probes reasons, evidence, assumptions, implications, counterexamples, and alternatives. It does not conceal a predetermined answer behind a sequence of leading questions. Prompts such as 'What makes you think that?', 'What evidence supports your view?', 'What might happen if the situation changed?', and 'Which reason is stronger, and why?' require pupils to make their thinking explicit. Dialogic teaching extends the process by enabling pupils to respond to one another and revise their ideas. Evidence on classroom dialogue indicates that productive talk can support reasoning when participation is purposeful and teachers use follow-up questions to develop ideas (Howe & Abedin, 2013; Mercer et al., 2004; Xie & Lin, 2025).

Graphic organisers complement dialogue by making relationships among actions, motives, causes, consequences, evidence, values, and possible solutions visible. A Venn diagram can support comparison, a T-chart can organise reasons for and against an action, a fishbone diagram can distinguish causes and contributing factors, and a cause-effect-solution chain can connect behaviour with consequences and responses. Meta-analytic research has linked graphic organisers with improved comprehension and higher-order thinking (Dexter & Hughes, 2011; Kansizoglu, 2017; Lei et al., 2026). Within Tarbiya, the organiser functions as a cognitive scaffold when pupils must decide how ideas relate, rather than copy a completed diagram.

These components define a teacher-development pathway. The intervention targets pre-service teachers' methodological competence, which is expected to support lesson design and implementation that provide pupils with more opportunities to practise reasoning. Only teacher-level competence was quantified in this pilot. Figure 1 shows the intended progression from teacher preparation to classroom practice and, ultimately, pupil outcomes, while marking the boundary of the evidence reported here.

Figure 1

Conceptual Pathway From Teacher-Education Intervention to Intended Pupil Outcomes



Note. The pilot quantified pre-service teacher methodological competence only; pupils' logical-reasoning outcomes were not directly measured.

Method

Research Design and Participants

A two-group pretest-posttest quasi-experimental pilot design was used. Sixty third-year students majoring in Primary Education at Andijan State Pedagogical Institute participated: 30 were assigned to the experimental group and 30 to the control group. Allocation was described as based on a principle of parity, but random assignment was not documented. The study is consequently treated as quasi-experimental. The

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similar baseline means reported below indicate approximate initial comparability on the study-specific outcome, although unmeasured selection differences cannot be excluded.

The control group studied Tarbiya methodology through the existing programme of lectures and practical classes. The experimental group received a specially designed modular methodology supported by the author's teaching manual for preparing pre-service primary teachers to foster logical reasoning in Grade 4 Tarbiya lessons (Ummatkulova, 2025). The available study documentation does not specify the complete intervention timetable, total number of sessions, or total instructional hours.

Intervention

The experimental methodology integrated moral-logical dilemmas, Socratic and dialogic questioning, and graphic or visual systematisation. Pre-service teachers practised converting Tarbiya topics into tasks that required pupils to analyse, classify, explain causal relationships, use conditional reasoning, select evidence, compare alternatives, and reflect. The intervention embedded these processes in task design and classroom facilitation rather than treating logic as a separate set of exercises.

A documented Grade 4 lesson on air pollution illustrates the approach. The 40-45-minute lesson began with reasoned true-or-false statements, with pupils required to justify each response. A problem scenario involving vehicle exhaust and burning waste then asked small groups to identify causes and consequences and formulate an if-then solution. Pupils classified cards such as car smoke, factory smoke, dust, trees, bicycles, public transport, and ventilation as pollution sources or constructive responses, then built source-effect-solution chains. Groups selected evidence and explained why it was persuasive. The lesson concluded with a practical action plan and an individual reflection ticket. Logical reasoning was thus embedded in concrete, age-appropriate Tarbiya content.

The same design logic can be applied to other Tarbiya themes. Responsibility can be explored through consequences and obligations; trust through evidence and competing duties; cooperation through individual and group outcomes; and digital behaviour through the evaluation of information and consequences. In each case, lesson planning begins by identifying the reasoning process to be elicited and then aligning questions, activities, and assessment with that process.

Outcome Measure and Analytical Strategy

Pre-service teachers' methodological preparation was represented by a study-specific 100-point composite score covering three criteria: lesson-plan construction, pedagogical-logical thinking, and practical teaching proficiency. Study documentation also referred to a pedagogical adaptation of Krutetsky's methodology but did not provide the adapted items, scoring weights, reliability evidence, validation procedures, or inter-rater agreement. The 100-point score is therefore reported as a local composite indicator of methodological preparation. It is not interpreted as a standardised measure of general intelligence, general critical-thinking ability, or pupils' logical reasoning.

Only group sample sizes and pretest and posttest means were available for analysis. Participant-level scores, standard deviations, standard errors, confidence intervals, and the output of the reported inferential test were unavailable. Accordingly, the analysis is descriptive. Absolute gain was calculated as the posttest mean minus the pretest mean. Relative change was calculated by dividing the gain by the pretest mean and multiplying by 100. The difference in gains was calculated by subtracting the control-group gain from the experimental-group gain.

Ethical and Reporting Considerations

The available study documentation did not include an institutional ethics approval identifier or a detailed consent statement. No ethics approval number or consent procedure is reported in the absence of supporting documentation. The analysis uses only aggregate pre-service teacher scores and contains no personally identifying information.

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Results

The two groups began with similar mean scores on the study-specific methodological-preparation indicator: 62.1 points in the experimental group and 61.5 points in the control group, a baseline difference of 0.6 points. At posttest, the experimental-group mean was 85.4, whereas the control-group mean was 67.8. The experimental group therefore gained 23.3 points. Relative to its baseline mean, this corresponds to a 37.5% increase. The control group gained 6.3 points, corresponding to a 10.2% relative increase. The between-group difference in absolute gains was 17.0 points, and the posttest mean difference was 17.6 points (Table 1).

The descriptive pattern favours the experimental condition, but the available aggregate data do not permit estimation of sampling uncertainty. No confidence interval, standardised effect size, or reproducible inferential test is reported. A practical-teaching observation also recorded that 80% of experimental participants shifted pupils from passive listening towards active logical problem solving. Because the observation rubric, assessor procedure, denominator, and corresponding control-group percentage were not documented, this observation is not included in the formal quantitative analysis.

Table 1

Descriptive Changes in Methodological-Preparation Scores

Group	Pretest mean	Posttest mean	Gain (points)	Relative change
Experimental	62.1	85.4	23.3	37.5%
Control	61.5	67.8	6.3	10.2%

Note. Relative change was calculated by dividing the gain by the pretest mean and multiplying by 100. Participant-level data and variance statistics were unavailable; no inferential test, confidence interval, or standardised effect size is reported.

Discussion

The descriptive results suggest that reasoning can be incorporated into Tarbiya teacher preparation while preserving the subject's moral and civic purposes. The experimental group showed a larger gain on the study-specific methodological-preparation score than the control group. This pattern is consistent with evidence that critical-thinking skills benefit from explicit instruction and practice in meaningful contexts (Abrami et al., 2015). It also accords with teacher-education research showing that pre-service teachers need pedagogical knowledge for eliciting and supporting critical thinking (Bubikova-Moan et al., 2026; Huang & Sang, 2023). The present data, however, establish a descriptive difference only; they do not determine whether the intervention itself caused that difference.

Tarbiya offers a credible setting for this work because many of its themes contain relationships that can be examined through reasoning. Responsibility involves consequences and obligations; trust involves evidence, reliability, and competing duties; environmental stewardship depends on causal reasoning; and citizenship requires consideration of individual and collective interests. The Grade 4 air-pollution lesson shows how a civic and environmental theme can be taught through classification, causal chains, conditional statements, evidence selection, and practical planning. In this form, moral learning and intellectual activity reinforce one another.

Questioning is one plausible mechanism behind the model. Conventional recitation questions often verify recall, whereas Socratic and dialogic prompts ask learners to articulate reasons, examine assumptions, compare explanations, respond to counterexamples, and revise claims. Research on classroom dialogue indicates that children can learn to use talk as a tool for collective reasoning and that dialogic programmes can support classroom interaction and teacher development (Mercer et al., 2004; Xie & Lin, 2025). For teacher education, the implication is practical: questioning needs rehearsal through lesson design, microteaching, observation, and reflection. Productive dialogue also depends on wait time, follow-up probing, equitable participation, and the teacher's ability to distinguish a claim from a reason.

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Moral-logical dilemmas and visual organisers support different parts of the same process. Dilemmas create cognitive tension and invite pupils to weigh evidence, values, and consequences; their usefulness depends on disciplined facilitation (Blatt & Kohlberg, 1975; Kilby, 2025; Wei & Chen, 2025). Graphic organisers make reasoning relationships visible and can scaffold comparison, causal analysis, and evaluation (Dexter & Hughes, 2011; Lei et al., 2026). Their strongest pedagogical use is likely to occur when pupils construct or complete an organiser as part of an explanation. Copying a finished diagram may organise information, but it does not necessarily require pupils to determine which relationships are justified.

The model also highlights alignment within teacher education. If a lesson objective refers to analysis, justification, or decision making, the learning task and assessment need to require those processes. Methodology courses can ask pre-service teachers to identify a target reasoning process, specify the evidence that would demonstrate it, and design prompts that move pupils from an initial answer towards an explained and defensible conclusion. Teacher educators can reinforce this alignment by modelling the same pedagogy in university classes. Reasoning-oriented lesson planning can then be rehearsed through peer microteaching and observed during school practicum, using a common rubric focused on the reasoning objective, cognitive demand of the task, quality of prompts, use of evidence, pupil explanation, and reflective closure.

Several alternative explanations should be considered when interpreting the group difference. The experimental condition may have benefited from novelty, additional instructional attention, or closer alignment between the intervention activities and the study-specific composite score. Group allocation was not documented as random, and the available records do not establish whether assessors were blind to condition. Practice effects or differences in implementation may also have contributed to the observed change. These possibilities cannot be separated with the aggregate data available here, but they are important targets for a confirmatory design.

The study has further limitations. It involved 60 participants at one institution, which limits generalisability. Only group means and sample sizes were available, preventing calculation or verification of standard deviations, confidence intervals, standardised effect sizes, and inferential tests. The 100-point composite outcome lacks a fully documented scoring manual and psychometric evidence in the available materials, and intervention duration and instructional dosage were not specified. Ethics and consent documentation was also unavailable. Most importantly, pupils' logical reasoning was not measured directly; the quantitative findings concern pre-service teachers' methodological preparation.

A confirmatory study would benefit from a prospectively specified, multi-site design. Random allocation is preferable where feasible; otherwise, matching and baseline-equivalence procedures need clear documentation. The intervention manual should specify duration, sequence, learning objectives, and fidelity indicators. Teacher competence could be assessed with published scoring criteria and at least two trained raters for performance tasks, with inter-rater reliability reported. Preserving individual-level pretest and posttest data would allow estimation of group-by-time effects with confidence intervals and standardised effect sizes. Direct pupil measures of causal inference, classification, evidence-based explanation, and evaluation of alternatives would make it possible to test the full pathway shown in Figure 1.

Conclusion

This study presents a reasoning-oriented pedagogical model for preparing pre-service primary teachers to teach Uzbekistan's Tarbiya subject. The model integrates moral-logical dilemmas, Socratic and dialogic questioning, graphic organisers, causal analysis, conditional reasoning, evidence-based justification, and reflection. The descriptive pilot results favour the experimental group: its mean methodological-preparation score increased from 62.1 to 85.4, compared with an increase from 61.5 to

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67.8 in the control group. These changes represent gains of 23.3 and 6.3 points, respectively, and a 17.0-point between-group difference in gains.

Interpretation of these findings is necessarily limited by the available evidence. Statistical significance and standardised effect sizes cannot be verified, randomisation was not documented, and pupil logical-reasoning outcomes were not measured directly. Even so, the model shows how Tarbiya teacher education can make reasoning objectives explicit and equip pre-service teachers with practical methods for eliciting explanation, comparison, inference, justification, and reflection. A rigorously documented multi-site study with validated measures, individual-level data, and direct pupil outcomes is needed to determine the reliability, magnitude, and transfer of the observed pattern.

Data Availability and Research Integrity

The analysis is based on aggregate results available in the study documentation. Individual participant scores, variance statistics, the reported inferential-test output, and full psychometric documentation of the 100-point composite measure were unavailable for reanalysis. No unreported statistics are presented. Ethics and consent details are not reported because supporting documentation was unavailable.

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