International Journal of
Humanities, Education, and Social Sciences

e-ISSN : 3026-0892
p-ISSN : 3026-1422

Index: Harvard, Boston, Sydney, Dimensions, Lens, Scilit, Semantic, Google, etc

https://doi.org/10.58578/IJHESS.v4i3.12557

Problem-Based Learning for Civic Knowledge and Critical Thinking among Preservice Elementary Teachers

Ritha Tuken
Universitas Negeri Makassar, Indonesia
ritha.tuken@unm.ac.id

Submitted:	Revised:	Accepted:	Published:
Sep 24, 2026	Oct 23, 2026	Nov 3, 2026	Nov 8, 2026

Abstract

Problem-based learning (PBL) connects civic concepts with authentic social issues, collaborative inquiry, and reasoned decision-making. This article presents an illustrative quasi-experimental analysis of PBL in relation to civic knowledge and critical thinking, using the Primary School Teacher Education (PGSD) program at Campus V UNM Parepare for April–May 2026 as the specified context. The constructed dataset comprised 33 records from semesters 4 and 6 within a semester 1–6 eligibility scope, with 18 records representing PBL and 15 representing conventional instruction. Civic knowledge was represented by a 20-item multiple-choice test, while critical thinking encompassed five rubric dimensions: interpretation, analysis, evaluation, inference, and explanation. Pretest and posttest scores were analyzed using descriptive statistics, reliability estimates, baseline comparisons, Welch tests of gain scores, and analysis of covariance with HC3 robust standard errors. In the constructed dataset, civic knowledge gains were 20.28 points under PBL and −3.67 points under conventional instruction, while critical-thinking gains were 23.06 and 14.67 points, respectively. Adjusted group differences favored PBL by 25.61 points for civic knowledge ($p < .001$) and 9.59 points for critical thinking ($p = .026$). These values are illustrative and do not constitute verified field findings. The article provides a transparent framework for evaluating instructional differences in civic knowledge and critical thinking in elementary teacher education.

IJHESS Journal is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License

Keywords: Problem-Based Learning; Civic Knowledge; Critical Thinking; Preservice Elementary Teachers; Civic Education

INTRODUCTION

Elementary civic education is expected to develop children's understanding of rights, responsibilities, democratic values, public institutions, and the ways communities address shared problems. Such learning requires teachers who can explain civic concepts and guide learners to examine social issues through evidence and reasoned judgement. Preservice elementary teachers therefore need opportunities to experience civic learning as inquiry and deliberation, not simply as the memorisation of national symbols, rules, and constitutional facts. White (2024) highlights the importance of civic awareness, dispositions, and interpersonal skills in preservice elementary teachers because these competencies are associated with their expectations for future civic teaching.

A persistent challenge in civic education is the gap between knowing civic principles and using them to analyse situations. Students may be able to recall definitions of rights, duties, democracy, or Pancasila but may struggle to evaluate competing claims, identify relevant evidence, or propose a fair response to a community problem. Critical thinking is important because civic issues often involve conflicting interests, incomplete information, and normative disagreement. Abrami et al. (2015) describe critical thinking instruction as a purposeful educational task, while Dwyer et al. (2014) frame critical thinking as a metacognitive process involving reflective judgement and reasoned conclusions. For future teachers, these skills also support the design of learning experiences that encourage pupils to question, explain, and justify their positions.

Problem-Based Learning is a student-centred approach in which learning begins with a complex problem that requires investigation and application of knowledge. Barrows (1986) emphasises that PBL can take different forms depending on how problems, facilitation, and learner responsibilities are designed. Hmelo-Silver (2004) explains that learners work collaboratively to identify what they need to know, engage in self-directed learning, apply new knowledge, and reflect on their reasoning. Savery (2006) similarly positions PBL as a process of integrating theory and practice to develop a viable response to a defined problem.

These features make PBL relevant to civic education, where the purpose is not only to know concepts but also to use them in analysing public concerns.

The theoretical case for PBL is supported by several meta-analyses, although the effects vary by outcome and implementation. Dochy et al. (2003) found a robust positive effect of PBL on student skills but noted that knowledge outcomes can be more complicated. Gijbels et al. (2005) showed that the effects depend partly on the level of knowledge assessed. Walker and Leary (2009) also identified variation across problem types, implementation approaches, disciplines, and assessment levels. Strobel and van Barneveld (2009) reported advantages for long-term retention and skill development, while acknowledging that conventional instruction may perform better on some short-term standardised knowledge measures. Loyens et al. (2015) also found that PBL can facilitate conceptual change through cognitive engagement. These findings suggest that PBL should be designed carefully and assessed through outcomes aligned with its intended learning processes.

Evidence concerning critical thinking is generally encouraging but not uniform. Niu et al. (2013) found statistically significant but small average effects of instructional interventions on college students' critical thinking, with variation by discipline and treatment duration. Abrami et al. (2015) reported a positive average effect of instructional strategies on critical thinking and highlighted the importance of dialogue and explicit instruction. Liu and Pásztor (2022), synthesising 50 empirical studies, reported a positive overall effect of PBL on critical-thinking skills and dispositions, while noting substantial heterogeneity. More recent synthesis work also reports a positive average effect of PBL on higher-education outcomes, while noting moderators such as outcome type, geography, and research quality (Erdem et al., 2026). Shofa et al. (2026) similarly report a positive pooled effect on critical thinking in Indonesian studies but emphasise implementation-related heterogeneity.

Studies in civic education provide a more specific basis for the present focus. Marzuki and Basariah (2017) reported that PBL and Project Citizen were associated with critical thinking and self-discipline in civic education. Sari et al. (2024) examined PBL and critical thinking in elementary civic education, while Darmawati and Mustadi (2023) reported positive effects of PBL on elementary pupils' critical thinking. Retnasari et al. (2026) found that PBL can support civic knowledge and civic skills among elementary school students. Chotimah and Sulkipani (2026) further examined deep learning-oriented PBL in primary civic education and reported higher critical-thinking outcomes in the intervention group.

These studies support the relevance of PBL in school civic education, but the teacher-education context remains an important setting because preservice teachers must learn both civic content and how to teach it.

In teacher education, critical thinking is conceptualised in multiple ways, and transfer across contexts remains an open question (Huang & Sang, 2023). Reviews of PBL in teacher education and other professional domains provide supporting but context-specific evidence (Asri et al., 2024; Su et al., 2025; Zheng et al., 2023). These reviews cannot substitute for evidence from civic education and elementary teacher preparation.

The researcher's argument is that civic knowledge and critical thinking should be treated as complementary outcomes of PBL in PGSD. Civic knowledge supplies the conceptual and institutional content needed to interpret public issues, including Pancasila values, rights and duties, democratic decision-making, and community responsibilities. Critical thinking enables students to interpret the problem, analyse causes and stakeholders, evaluate evidence and alternatives, draw warranted inferences, and explain a defensible solution. When PBL is structured around authentic civic dilemmas, students can practise applying civic concepts while making their reasoning visible through discussion, evidence gathering, and presentation.

The research gap is twofold. First, much of the available PBL evidence in civic education concerns pupils in elementary or secondary schools, whereas preservice teachers are a distinct group with professional responsibilities for future civic instruction. Second, studies often focus on either civic knowledge or critical thinking rather than reporting both outcomes together with pre-test equivalence, instrument reliability, and adjusted post-test comparisons. The present article addresses this gap conceptually by presenting a two-outcome model for PGSD students. It does not claim to establish a new general law of PBL effectiveness; rather, it demonstrates a locally situated analytical design that can be replicated with verified field data.

The theoretical framework combines constructivist problem-based learning with civic competence and critical-thinking frameworks. PBL provides the instructional process: problem orientation, organisation of inquiry, investigation, development and presentation of a solution, and reflection. Civic knowledge is treated as the cognitive content outcome, while critical thinking is represented through interpretation, analysis, evaluation, inference, and explanation. This framework is consistent with the cognitive processes discussed by Abrami

et al. (2015) and Dwyer et al. (2014), and with the PBL processes described by Hmelo-Silver (2004) and Savery (2006).

The objective of this article is to examine, using an illustrative dataset, whether a PBL condition is associated with greater improvement in civic knowledge and critical thinking than conventional instruction among PGSD preservice teachers. The analysis compares pre-test and post-test patterns, examines baseline equivalence, estimates adjusted group differences through ANCOVA, and reports effect-size and normalised-gain indicators. All numerical records are constructed because verified field data were not supplied; they must be replaced before the manuscript is represented as a completed empirical study.

METHODS

Type of research

The proposed study is quantitative and quasi-experimental. A non-equivalent control-group pre-test–post-test design is used to illustrate the comparison between PBL and conventional instruction. This design is appropriate when intact classes are used and random assignment of individual students is not feasible. The numerical records are constructed for demonstration; they do not document a completed classroom intervention or actual participant recruitment.

Research setting, period, and instructional scenario

The proposed study context is Campus V of Universitas Negeri Makassar, Parepare, South Sulawesi, during April–May 2026. The instructional scenario is framed as a four-week civic education learning sequence for PGSD students. The PBL class is presented with contextual cases relevant to elementary civic life, such as unequal access to shared school facilities, bullying and discrimination, waste management around schools, and deliberative formulation of classroom rules. Students identify stakeholders, clarify civic concepts, gather information, evaluate alternatives, and present a reasoned solution. The comparison class receives lecturer-led explanation and guided discussion of the same civic concepts. These procedures describe the proposed design and are not verified teaching records.

Participants and sampling technique

The revised dataset contains 33 constructed student records, with 18 in the PBL condition and 15 in the conventional condition. The illustrative sample includes 22 female

and 11 male records. Its eligibility scope is limited to PGSD students in semesters 1–6; the available records represent semester 4 (PBL n = 6; conventional n = 9) and semester 6 (PBL n = 12; conventional n = 6). These values are not a verified student roster or recruitment record. In a field study, intact classes should be selected through purposive or cluster sampling based on course equivalence, and baseline characteristics should be reported transparently. Because group assignment is not random in the proposed design, observed differences should be interpreted with caution.

Instruments and data collection

Civic knowledge is represented by a 20-item multiple-choice test scored from 0 to 100, with each correct answer contributing five points. The test blueprint covers Pancasila values, rights and responsibilities, democratic principles, citizenship in school and community settings, and basic civic institutions. Critical thinking is represented by a five-dimension analytic rubric: interpretation, analysis, evaluation, inference, and explanation. Each dimension is scored on a five-level scale from 0 to 4 and converted to a 0–100 composite score. The same construct blueprints are applied at pre-test and post-test for the purpose of this demonstration.

Instrument quality and ethical considerations

The 20-item civic knowledge test yields KR-20 estimates of .733 at pre-test and .847 at post-test in the constructed records. Corrected item-total correlations range from .046 to .467 at pre-test and .173 to .812 at post-test, indicating that some items would require review before actual use. The five-dimension critical-thinking rubric yields alpha coefficients of .889 at pre-test and .846 at post-test, with corrected dimension-total correlations ranging from .646 to .849 and .504 to .786, respectively. These estimates describe the constructed item responses only and cannot be treated as evidence of real instrument validity. A field study should obtain expert judgement, conduct pilot testing, train at least two raters, and estimate inter-rater agreement. Ethical approval, informed consent, confidentiality, and voluntary participation must be addressed before real data collection.

Data analysis technique

The analysis uses descriptive statistics, independent-samples tests for baseline equivalence, paired comparisons within each condition, Welch tests for between-group gain comparisons, normalised gain for civic knowledge, and analysis of covariance (ANCOVA). Post-test scores are modelled as dependent variables, group condition as the predictor, and

the corresponding pre-test score as a covariate. Residual normality and homogeneity of regression slopes are examined. HC3 robust standard errors are used for ANCOVA coefficient inference to reduce sensitivity to heteroskedasticity. Partial eta squared is estimated from the robust group t statistic and residual degrees of freedom, while Hedges' g is reported for gain-score contrasts. Normalised gain is not calculated for critical thinking because some records have a maximum pre-test score of 100, producing a zero denominator. All values are illustrative and should be recalculated from verified records using an auditable workflow.

RESULTS

The results are based on 33 constructed records within the semester 1–6 eligibility scope: 18 in the PBL condition and 15 in conventional instruction. The available records represent semesters 4 and 6. Table 1 presents the illustrative participant profile. The PBL group includes 10 female and 8 male records, while the conventional group includes 12 female and 3 male records. Semester distribution is semester 4 (PBL n = 6; conventional n = 9) and semester 6 (PBL n = 12; conventional n = 6). These figures are not verified institutional statistics.

Table 1. Participant profile by instructional condition (semester 1–6 scope)

Characteristic	Category	PBL (n = 18)	Conventional (n = 15)
Gender	Female	10	12
Gender	Male	8	3
Semester	4	6	9
Semester	6	12	6

Table 2 reports pre-test, post-test, and gain-score means. For civic knowledge, the PBL group increases from 59.17 (SD = 19.04) to 79.44 (SD = 14.54), producing a mean gain of 20.28 points. The conventional group changes from 54.00 (SD = 19.66) to 50.33 (SD = 21.42), producing a mean gain of −3.67 points. For critical thinking, the PBL group increases from 66.39 (SD = 26.56) to 89.44 (SD = 11.23), while the conventional group increases from 64.00 (SD = 27.92) to 78.67 (SD = 22.16). The corresponding gains are 23.06 and 14.67 points.

Table 2. Descriptive statistics for civic knowledge and critical thinking

Outcome	Group	Pre-test M (SD)	Post-test M (SD)	Gain M (SD)
Civic knowledge	PBL	59.17 (19.04)	79.44 (14.54)	20.28 (13.88)
Civic knowledge	Conventional	54.00 (19.66)	50.33 (21.42)	−3.67 (13.69)
Critical thinking	PBL	66.39 (26.56)	89.44 (11.23)	23.06 (18.24)
Critical thinking	Conventional	64.00 (27.92)	78.67 (22.16)	14.67 (15.64)

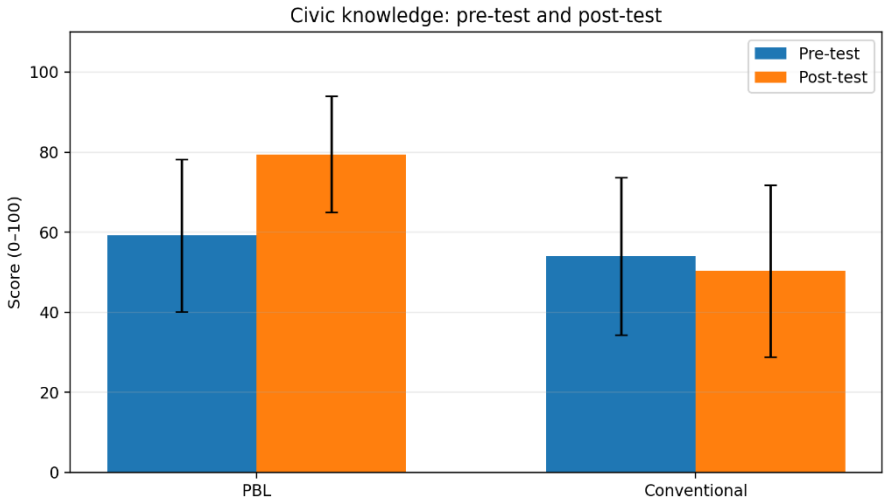


Figure 1. Pre-test and post-test civic knowledge scores by instructional condition

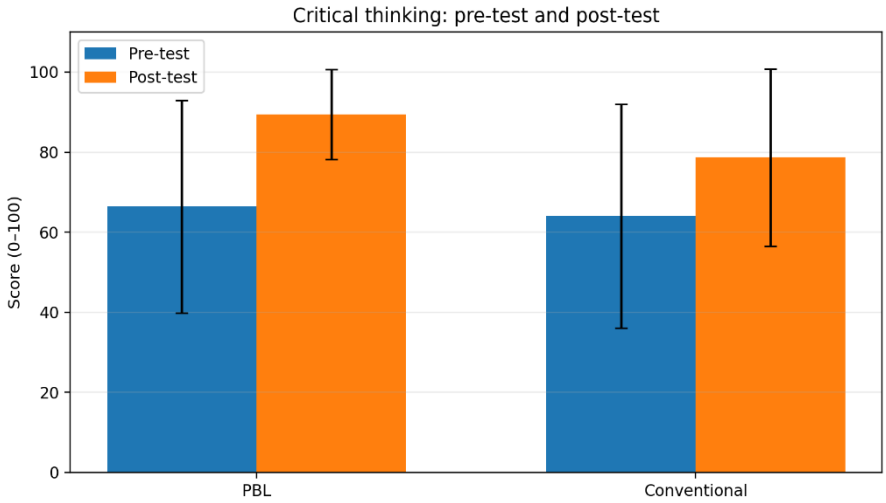


Figure 2. Pre-test and post-test critical-thinking scores by instructional condition

The reliability estimates are presented in Table 3. The civic knowledge test has a KR-20 of .733 at pre-test and .847 at post-test. Corrected item-total correlations range from .046 to .467 at pre-test and .173 to .812 at post-test, indicating that some items show weak discrimination and should be reviewed. The critical-thinking rubric has alpha coefficients of .889 and .846, with dimension-total correlations ranging from .646 to .849 and .504 to .786.

These values describe the constructed records only and do not establish instrument quality for an actual student population.

Table 3. Reliability and item diagnostics of the illustrative instruments

Instrument	Reliability	Corrected item-total r	Items / dimensions
Civic knowledge pre-test	KR-20 = 0.733	0.046–0.467	20 items
Civic knowledge post-test	KR-20 = 0.847	0.173–0.812	20 items
Critical-thinking pre-test	α = 0.889	0.646–0.849	5 rubric dimensions
Critical-thinking post-test	α = 0.846	0.504–0.786	5 rubric dimensions

Baseline comparisons in Table 4 do not indicate statistically significant differences between the groups in civic knowledge (Welch t = 0.763, p = .452) or critical thinking (Welch t = 0.250, p = .804). Levene's tests are non-significant for pre-test and post-test variances in both outcomes (civic knowledge p = .815 and .209; critical thinking p = .947 and .056). The Shapiro–Wilk tests for ANCOVA residuals are also non-significant (civic knowledge W = .986, p = .934; critical thinking W = .959, p = .241). HC3-robust interaction tests do not indicate a violation of homogeneity of regression slopes (p = .232 for civic knowledge; p = .094 for critical thinking). The Breusch–Pagan test suggests residual heteroskedasticity for critical thinking (p = .034), so HC3 robust inference is retained for both models.

Table 4. Baseline equivalence and ANCOVA assumption diagnostics

Test	Civic knowledge	Critical thinking
Baseline group comparison	Welch t = 0.763, p = .452	Welch t = 0.250, p = .804
Levene test, pre-test	p = .815	p = .947
Levene test, post-test	p = .209	p = .056
Shapiro–Wilk, ANCOVA residuals	W = .986, p = .934	W = .959, p = .241
Group × pre-test interaction (HC3)	p = .232	p = .094
Breusch–Pagan, ANCOVA residuals	p = .435	p = .034

Post-test group differences are estimated in Table 5 after controlling for pre-test scores. The PBL group has an adjusted civic knowledge advantage of 25.61 points (HC3 SE = 5.14, t = 4.986, p < .001, 95% CI [15.12, 36.10], partial η^2 = .453). The adjusted critical-thinking difference is 9.59 points (HC3 SE = 4.09, t = 2.343, p = .026, 95% CI [1.23, 17.94], partial η^2 = .155). The models explain 72.3% and 66.7% of the variance in the respective post-test outcomes.

Table 5. ANCOVA adjusted group effects with HC3 robust standard errors

Outcome	Adjusted B (PBL)	HC3 SE	T	p	95% CI	Partial η^2	R^2
Civic knowledge	25.61	5.14	4.986	< .001	[15.12, 36.10]	0.453	0.723
Critical thinking	9.59	4.09	2.343	0.026	[1.23, 17.94]	0.155	0.667

Table 6 compares gain scores using Welch's t test. The PBL group's civic knowledge gain exceeds the conventional group by 23.94 points ($t = 4.972$, $df = 30.08$, $p < .001$, 95% CI [14.11, 33.78], Hedges' $g = 1.69$). The critical-thinking gain difference is 8.39 points and is not statistically significant ($t = 1.422$, $df = 30.96$, $p = .165$, 95% CI [−3.64, 20.42], Hedges' $g = .48$). Normalised gain for civic knowledge is .453 in the PBL condition and −.114 in conventional instruction. Normalised gain for critical thinking is not estimated because five records have a pre-test score of 100, for which the normalised-gain denominator is zero.

Table 6. Between-group comparison of gain scores and normalised gain

Outcome	PBL gain M (SD)	Conventional gain M (SD)	Mean difference	Welch t (df)	p	Hedges' g	N-gain PBL / Control
Civic knowledge	20.28 (13.88)	−3.67 (13.69)	23.94	4.972 (30.08)	< .001	1.69	.453 / −.114
Critical thinking	23.06 (18.24)	14.67 (15.64)	8.39	1.422 (30.96)	0.165	0.48	Not estimated*

Within-group tests show significant pre-test to post-test gains in both outcomes for the PBL condition (civic knowledge $p < .001$; critical thinking $p < .001$). In the conventional condition, civic knowledge change is not statistically significant ($p = .317$), whereas critical thinking improves ($p = .003$). These within-group patterns should be interpreted alongside the between-group comparisons, particularly the non-significant Welch comparison of critical-thinking gains.

DISCUSSION

Interpretation of the main findings

The illustrative pattern indicates that the PBL condition has higher adjusted post-test scores than conventional instruction for both civic knowledge and critical thinking after controlling for pre-test scores. However, the Welch comparison of raw critical-thinking gains is not statistically significant ($p = .165$), whereas the civic knowledge gain difference is substantial and statistically significant. These results should be interpreted together: the ANCOVA estimates compare post-test scores conditional on baseline scores, while the gain-

score comparison evaluates unadjusted change. All estimates are based on constructed records and cannot be generalised to real PGSD students.

Why PBL may support civic knowledge

PBL begins with a problem that requires students to identify what they already know and what additional information is needed. In civic education, a carefully selected problem can require learners to apply concepts such as equality, rights, responsibilities, deliberation, public rules, and community participation. Hmelo-Silver (2004) argues that collaborative problem-solving can support flexible knowledge and self-directed learning, while Savery (2006) emphasises the integration of theory and practice. The larger civic knowledge gain in the illustrative constructed PBL group is therefore consistent with the possibility that students retain concepts more effectively when they use them to analyse an authentic issue rather than encounter them only through explanation.

Why PBL may support critical thinking

The PBL sequence requires learners to interpret a situation, distinguish relevant from irrelevant information, examine causes and stakeholders, compare possible responses, infer consequences, and explain a justified solution. These processes align with the critical-thinking dimensions represented in the rubric. Abrami et al. (2015) found that instructional approaches can strengthen critical thinking, particularly when teaching includes dialogue and explicit attention to reasoning. Dwyer et al. (2014) similarly emphasise reflective judgement and metacognition. The illustrative records show a positive adjusted post-test difference, but the non-significant raw gain contrast means that the size and robustness of the critical-thinking advantage should be tested in a larger field study.

Comparison with prior PBL research

The direction of the illustrative results is broadly consistent with previous PBL syntheses, although the magnitude should not be compared directly across designs. Dochy et al. (2003) reported positive effects on skills but more complex findings for knowledge, and Gijbels et al. (2005) showed that assessment level matters. Walker and Leary (2009) also found that PBL effects vary by problem type, implementation, discipline, and assessment. More recent work by Erdem et al. (2026) synthesises PBL outcomes in higher education and reports a positive average effect while identifying moderators. This literature supports a cautious conclusion: PBL can be promising, but its effectiveness depends on problem quality, facilitation, assessment alignment, and sufficient time for investigation.

Civic education evidence and teacher preparation

The findings are also consistent with civic education studies that have examined PBL and critical thinking. Marzuki and Basariah (2017) reported positive effects of PBL and Project Citizen on critical thinking in civic education. Sari et al. (2024) focused on critical thinking in elementary civic education, and Darmawati and Mustadi (2023) found a positive relationship between PBL and elementary pupils' critical-thinking outcomes. Retnasari et al. (2026) examined civic knowledge and civic skills, while Chotimah and Sulkipani (2026) investigated a deep learning-oriented PBL approach in primary civic education. The present design differs by placing the learners in teacher preparation rather than in elementary school classrooms. This shift matters because preservice teachers need to develop content knowledge and pedagogical judgement about how civic issues can be taught to children.

Interpreting the non-significant and divergent results

The comparison group also shows a positive critical-thinking gain, and its within-group change is statistically significant ($p = .003$). By contrast, its civic knowledge gain is negative and not statistically significant ($p = .317$). The PBL group shows larger mean gains in both outcomes, but only the civic knowledge gain difference is statistically significant in the Welch comparison. These divergent results should be reported rather than selecting only the favourable estimates. The small constructed sample also makes confidence intervals important for interpreting uncertainty.

Instructional implications for PGSD

A practical PBL design for PGSD can use local and school-based civic dilemmas. For example, a case concerning unequal use of a school library can lead students to analyse rights, fairness, public rules, and inclusive decision-making. A case involving bullying can require the distinction between individual conflict and rights violations, while a waste-management case can connect community responsibility with collective action. Each case should provide sufficient information to begin inquiry but leave room for students to identify missing evidence. Lecturers should provide scaffolds such as stakeholder maps, source-evaluation prompts, argument templates, and reflection questions without taking over the reasoning process.

Limitations and future research

The primary limitation is that all records and outcomes are constructed and do not represent actual intervention data. The stated location and period describe the requested research context only. The analysis includes 33 records from semesters 4 and 6, even though the eligibility scope is semesters 1–6; therefore, the results cannot represent every semester in that range. The quasi-experimental structure involves intact groups, so selection effects remain possible even when baseline means do not differ significantly. Future research should collect actual data, document class allocation and instructional fidelity, obtain ethical approval, test the instruments, use blinded or double scoring for rubric responses, and consider follow-up measurement to examine retention and transfer into lesson planning and teaching practice.

CONCLUSION

This article presents an illustrative quasi-experimental framework for examining PBL in relation to civic knowledge and critical thinking among PGSD preservice teachers. In the constructed records, the PBL condition has higher adjusted post-test scores for both outcomes after controlling for pre-test scores. The adjusted differences are 25.61 points for civic knowledge and 9.59 points for critical thinking. However, the unadjusted gain-score comparison is statistically significant only for civic knowledge. These values are illustrative and not empirical evidence from actual students.

The practical contribution is a dual-outcome assessment framework that connects civic concepts with critical inquiry and reasoned civic problem-solving in teacher preparation. The numerical results must not be represented as findings from actual students. Replication with verified participants, validated instruments, documented PBL implementation, and appropriate ethical approval is necessary before drawing conclusions about the effectiveness of PBL at Campus V UNM Parepare or elsewhere.

REFERENCES

Abrami, P. C., Bernard, R. M., Borokhovski, E., Waddington, D. I., Wade, C. A., & Persson, T. (2015). Strategies for teaching students to think critically: A meta-analysis. *Review of Educational Research, 85*(2), 275–314. https://doi.org/10.3102/0034654314551063

Asri, I. H., Jampel, I. N., Putu Arnyana, I. B., Suastra, I. W., & Nitiasih, P. K. (2024). Profile of problem based learning (PBL) model in improving students' problem solving and

critical thinking ability. *KnE Social Sciences, 9*(2), 769–778. https://doi.org/10.18502/kss.v9i2.14898

Barrows, H. S. (1986). A taxonomy of problem-based learning methods. *Medical Education, 20*(6), 481–486. https://doi.org/10.1111/j.1365-2923.1986.tb01386.x

Chotimah, U., & Sulkipani. (2026). Deep learning-oriented problem-based learning to foster critical thinking in civic education in primary schools. *Jurnal Civics: Media Kajian Kewarganegaraan, 23*(2), 854–866. https://doi.org/10.21831/jc.v23i2.101844

Darmawati, Y., & Mustadi, A. (2023). The effect of problem-based learning on the critical thinking skills of elementary school students. *Jurnal Prima Edukasia, 11*(2), 142–151. https://doi.org/10.21831/jpe.v11i2.55620

Dochy, F., Segers, M., Van den Bossche, P., & Gijbels, D. (2003). Effects of problem-based learning: A meta-analysis. *Learning and Instruction, 13*(5), 533–568. https://doi.org/10.1016/S0959-4752(02)00025-7

Dwyer, C. P., Hogan, M. J., & Stewart, I. (2014). An integrated critical thinking framework for the 21st century. *Thinking Skills and Creativity, 12*, 43–52. https://doi.org/10.1016/j.tsc.2013.12.004

Erdem, C., Kaya, M., Tunç Toptaş, H., & Altunbaşak, İ. (2026). Problem-based learning and student outcomes in higher education: A second-order meta-analysis. *Studies in Higher Education, 51*(4), 950–971. https://doi.org/10.1080/03075079.2025.2498084

Gijbels, D., Dochy, F., Van den Bossche, P., & Segers, M. (2005). Effects of problem-based learning: A meta-analysis from the angle of assessment. *Review of Educational Research, 75*(1), 27–61. https://doi.org/10.3102/00346543075001027

Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn? *Educational Psychology Review, 16*(3), 235–266. https://doi.org/10.1023/B:EDPR.0000034022.16470.f3

Huang, J., & Sang, G. (2023). Conceptualising critical thinking and its research in teacher education: A systematic review. *Teachers and Teaching, 29*(6), 638–660. https://doi.org/10.1080/13540602.2023.2212364

Liu, Y., & Pásztor, A. (2022). Effects of problem-based learning instructional intervention on critical thinking in higher education: A meta-analysis. *Thinking Skills and Creativity, 45*, Article 101069. https://doi.org/10.1016/j.tsc.2022.101069

Loyens, S. M. M., Jones, S. H., Mikkers, J., & van Gog, T. (2015). Problem-based learning as a facilitator of conceptual change. *Learning and Instruction, 38*, 34–42. https://doi.org/10.1016/j.learninstruc.2015.03.002

Marzuki, M., & Basariah, B. (2017). The influence of problem-based learning and Project Citizen model in the civic education learning on student's critical thinking ability and self discipline. *Jurnal Cakrawala Pendidikan, 36*(3), 382–400. https://doi.org/10.21831/cp.v36i3.14675

Niu, L., Behar-Horenstein, L. S., & Garvan, C. W. (2013). Do instructional interventions influence college students' critical thinking skills? A meta-analysis. *Educational Research Review, 9*, 114–128. https://doi.org/10.1016/j.edurev.2012.12.002

Retnasari, L., Wirdianne, T. A., Abdulkarim, A., Sundawa, D., Wardani, E. K., & Sulaiman. (2026). The effect of problem based learning model on civic knowledge and civic

skills in elementary school. *Jurnal Kalacakra Ilmu Sosial dan Pendidikan, 7*(1), 1–13. https://doi.org/10.31002/j.kra.v7i1.3192

Sari, N. A., Dasna, I. W., Kusumaningrum, S. R., & Sitanggang, I. (2024). Effect of problem-based learning model on critical thinking skills in civic education learning. *Studies in Learning and Teaching, 5*(3), 595–606. https://doi.org/10.46627/silet.v5i3.433

Savery, J. R. (2006). Overview of problem-based learning: Definitions and distinctions. *Interdisciplinary Journal of Problem-Based Learning, 1*(1), 9–20. https://doi.org/10.7771/1541-5015.1002

Shofa, G. Z., Meiliasari, & Rahayu, W. (2026). The effectiveness of problem-based learning on critical thinking skill: A meta-analysis study reviewed by implementation type, cluster, and geography. *Desimal: Jurnal Matematika, 9*(2), 457–478. https://doi.org/10.24042/djm.v9i2.32442

Strobel, J., & van Barneveld, A. (2009). When is PBL more effective? A meta-synthesis of meta-analyses comparing PBL to conventional classrooms. *Interdisciplinary Journal of Problem-Based Learning, 3*(1), 44–58. https://doi.org/10.7771/1541-5015.1046

Su, T., Liu, J., Meng, L., Luo, Y., Ke, Q., & Xie, L. (2025). The effectiveness of problem-based learning (PBL) in enhancing critical thinking skills in medical education: A systematic review and meta-analysis. *Frontiers in Education, 10*, Article 1565556. https://doi.org/10.3389/feduc.2025.1565556

Walker, A., & Leary, H. (2009). A problem-based learning meta-analysis: Differences across problem types, implementation types, disciplines, and assessment levels. *Interdisciplinary Journal of Problem-Based Learning, 3*(1), 12–43. https://doi.org/10.7771/1541-5015.1061

White, E. S. (2024). Preservice elementary teachers and future civic teaching. *The Journal of Social Studies Research, 48*(4), 261–273. https://doi.org/10.1177/23522798241252939

Zheng, Q.-M., Li, Y.-Y., Yin, Q., Zhang, N., Wang, Y.-P., Li, G.-X., & Sun, Z.-G. (2023). The effectiveness of problem-based learning compared with lecture-based learning in surgical education: A systematic review and meta-analysis. *BMC Medical Education, 23*(1), Article 546. https://doi.org/10.1186/s12909-023-04531-7