

The Effect of Betawi Culture-Based Contextual Teaching and Learning on Students' Mathematical Problem-Solving Ability in Terms of Mathematical Disposition

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Informasi Artikel

Diterima Redaksi: 11 Januari 2026
Revisi Akhir: 19 Agustus 2026
Diterbitkan Online: 30 September 2026

Kata Kunci

Contextual Teaching and Learning, Betawi culture Mathematical disposition Mathematical problem-solving ability

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A B S T R A C T

This study aims to examine the effect of implementing Contextual Teaching and Learning (CTL) integrated with Betawi cultural elements on students' mathematical problem-solving ability (MPSA), while considering mathematical disposition as a moderating variable. A quantitative quasi-experimental approach employing a posttest-only control group design was used in this research, involving eighth-grade students from a junior high school in East Jakarta. Data were collected through a mathematical disposition questionnaire and an essay-based test on mathematical problem-solving with Betawi cultural contexts. Data analysis was conducted using a two-way ANOVA and an independent samples t-test. The findings indicate that students who experienced CTL integrated with Betawi culture demonstrated higher mathematical problem-solving ability compared to those who received expository instruction. Furthermore, a significant interaction was identified between the instructional approach and mathematical disposition, where meaningful differences in problem-solving ability were observed only among students with high mathematical disposition.

Penelitian ini bertujuan menganalisis pengaruh penerapan *Contextual Teaching and Learning* (CTL) terintegrasi budaya Betawi terhadap kemampuan pemecahan masalah matematis (KPMM) siswa, dengan mempertimbangkan disposisi matematis sebagai variabel moderator. Pendekatan kuantitatif eksperimen semu dengan *posttest-only control group design* digunakan dalam penelitian ini dan melibatkan siswa kelas VIII SMP di Jakarta Timur. Data diambil melalui angket disposisi matematis dan tes uraian pemecahan masalah matematis dengan konteks budaya Betawi. Analisis data dilakukan menggunakan *Two-Way ANOVA* dan uji t sampel independen. Hasil studi melaporkan bahwa siswa dengan pembelajaran CTL berbasis budaya Betawi memiliki KPMM lebih tinggi dibandingkan dengan pembelajaran ekspositori. Selain itu, ditemukan adanya interaksi yang kuat antara pendekatan pembelajaran dan disposisi matematis, di mana perbedaan kemampuan pemecahan masalah secara nyata hanya terjadi pada siswa dengan disposisi matematis tinggi.



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1. Introduction

The transformation of global society in the twenty-first century has brought about increasingly complex, dynamic, and uncertain challenges. Such conditions require individuals to possess higher-order thinking capacities that enable them to respond adaptively, critically, and reflectively to a wide range of real-life problems. Within this context, problem-solving ability is no longer regarded merely as an academic skill but rather as a fundamental competency that underpins rational decision-making, innovation, and reflective thinking across diverse real-world contexts [1], [2]. Consequently, contemporary education positions problem-solving as the core of meaningful learning because it engages students in identifying problems, integrating relevant

information, formulating alternative strategies, and evaluating the effectiveness of solutions through logical and systematic reasoning [3], [4].

In mathematics education, the role of problem-solving ability is particularly crucial. Mathematics should not be viewed merely as a collection of symbols, formulas, and procedural techniques but rather as a way of thinking that enables learners to understand, reason about, and represent various real-life phenomena. Mathematics instruction oriented toward problem solving provides students with opportunities to connect mathematical concepts to authentic contexts, thereby making mathematical knowledge more functional and meaningful. Through this process, students are guided to comprehend problems holistically, represent them using mathematical models, select appropriate solution strategies, and evaluate and reflect upon the solutions they obtain [5]. Therefore, fostering mathematical problem-solving ability from primary through secondary education constitutes an essential foundation for sustainable success in mathematics learning.

Nevertheless, various indicators suggest that Indonesian students' mathematical problem-solving ability (MPSA) remains inadequate. The 2022 Programme for International Student Assessment (PISA) results revealed that the majority of Indonesian students performed only at the basic proficiency level and experienced considerable difficulty in solving mathematical tasks requiring mathematical modelling, higher-order reasoning, and comprehensive evaluation of solutions [6]. These findings indicate that mathematics instruction in schools has not yet sufficiently promoted the development of higher-order thinking, particularly in solving non-routine and contextual problems. Although students generally perform well on procedural tasks, they often struggle when confronted with problems requiring contextual understanding, appropriate strategy selection, and reflective evaluation of their solutions [7], [8], [9]. Recent empirical evidence further confirms this concern, showing that 53.3% of students assessed were categorized as having low mathematical problem-solving ability, with particularly substantial difficulties observed in carrying out solution strategies and checking the results of their solutions [10].

Consistent with these assessment results, numerous empirical studies have demonstrated that students encounter difficulties throughout nearly every stage of mathematical problem solving, including understanding the problem, constructing mathematical models, and determining appropriate solution strategies. This situation reflects a fundamental issue associated with mathematics instruction that remains predominantly teacher-centred, procedure-oriented, and focused on routine exercises. When learning experiences provide limited opportunities for contextual exploration and active student engagement, students' mathematical problem-solving ability is unlikely to develop optimally [11], [12]. Recent empirical evidence also suggests that active and collaborative learning can support students' mathematical problem-solving ability, as students who participated in Cooperative Script learning demonstrated better problem-solving performance than those who received conventional instruction [13].

Beyond pedagogical factors, students' limited capability to solve mathematical problems is also closely associated with affective factors, particularly mathematical disposition. This affective competency reflects students' attitudes, beliefs, perseverance, and perceptions toward mathematics and the process of learning mathematics itself. Students who possess positive mathematical dispositions tend to demonstrate greater perseverance when encountering difficulties, openness to exploring multiple solution strategies, and the ability to view mistakes as valuable opportunities for learning [14], [15], [16]. Conversely, students with low mathematical dispositions are more likely to give up easily, hesitate to explore alternative strategies, and exhibit low confidence in solving mathematical problems [17]. Empirical evidence further supports this relationship. As reported by Rezita and Rahmat [18], mathematical disposition has a significant positive relationship with mathematical problem-solving ability, indicating that students with stronger mathematical dispositions tend to demonstrate better problem-solving ability. Therefore, efforts to

improve mathematical problem-solving ability should be accompanied by initiatives aimed at strengthening students' mathematical dispositions [19], [20].

Previous studies have attempted to enhance students' mathematical problem-solving ability through the implementation of contextual learning approaches, particularly the Contextual Teaching and Learning (CTL) model. The CTL model connects instructional content with students' real-life experiences, thereby increasing engagement, improving problem comprehension, and strengthening students' abilities to formulate and evaluate solution strategies [21], [22], [23]. However, the contexts employed in these studies have generally remained generic and have not systematically incorporated local cultural elements. Learning contexts that are disconnected from students' sociocultural experiences may reduce the meaningfulness of instruction, resulting in difficulties in understanding problem situations and constructing mathematical models, both of which are critical stages of mathematical problem solving. Therefore, integrating local culture into CTL-based instruction is essential for providing more authentic and relevant learning contexts that have the potential to optimize students' mathematical problem-solving ability.

From an ethnomathematics perspective, local culture represents a rich, authentic, and meaningful source of learning contexts. Culture reflects not only social values and practices but also embodies various mathematical activities that have evolved from the practical needs of communities in everyday life [24]. Integrating local culture into mathematics instruction enables students to develop conceptual understanding through contexts that are closely connected to their sociocultural experiences. Such integration facilitates students in understanding problem situations, identifying relevant information, constructing mathematical models, and selecting appropriate solution strategies more meaningfully. Consequently, the incorporation of local culture has the potential not only to enhance mathematical problem-solving ability but also to strengthen students' cultural identity and cultural literacy [12], [25]. Nevertheless, within urban educational settings such as Jakarta, the integration of local culture—particularly Betawi culture—into mathematics instruction remains relatively limited and has yet to be systematically implemented [26], [27].

This situation highlights a gap between the demands of twenty-first-century mathematics education, which emphasizes contextualized and meaningful learning, and classroom practices that continue to be largely abstract and disconnected from students' sociocultural realities. Furthermore, studies specifically examining the effectiveness of a Betawi culture-based CTL model while considering mathematical disposition as a moderating variable remain scarce, particularly at the junior secondary school level. Such an approach has the potential not only to improve students' mathematical problem-solving ability from a cognitive perspective but also to strengthen the affective dimensions of mathematics learning [14], [28].

Based on the foregoing discussion, investigating the implementation of a Betawi culture-based Contextual Teaching and Learning (CTL) model in mathematics instruction, together with an examination of mathematical disposition as a factor influencing students' mathematical problem-solving ability, is both timely and necessary. Accordingly, this study aims to: (1) examine the differences in mathematical problem-solving ability between students taught using the Betawi culture-based CTL model and those taught using conventional instruction; (2) investigate the interaction effect between instructional model and mathematical disposition on students' mathematical problem-solving ability; and (3) identify differences in mathematical problem-solving ability between students with high and low mathematical dispositions across the instructional models employed.

2. Research Method

This study employed a quantitative quasi-experimental design using a posttest-only control group design. A quasi-experimental approach was selected because individual random assignment was not feasible; therefore, naturally existing classroom groups served as the experimental units [29], [30]. The study consisted of an experimental group receiving the CTL model based on Betawi local culture and a control group receiving conventional instruction. After the treatment, both groups were given the same posttest to measure their mathematical problem-solving skills.

Table 1. Posttest-Only Control Group Design

Group	Treatment	Posttest
Experimental Group (R)	Betawi Culture-Based CTL	O
Control Group (R)	Expository Instruction	O

The experimental group received instruction through the Betawi culture-based Contextual Teaching and Learning (CTL) model, whereas the control group was taught using the expository learning model. Following the intervention, both groups completed an essay-based Mathematical Problem-Solving Ability (MPSA) posttest. This design is appropriate for examining treatment effects when the initial characteristics of the comparison groups are assumed to be relatively equivalent [31].

The study was conducted during the first semester of the 2025/2026 academic year at SMP Negeri 144 Jakarta and SMP Negeri 234 Jakarta, both located in Cakung District, East Jakarta. The participants were Grade VIII students. Samples were selected using stratified simple random sampling, with schools serving as strata. One class from each school was randomly selected and subsequently assigned as either the experimental or the control group. This procedure ensured equal sampling opportunities while minimizing selection bias.

The research was implemented in three stages: planning, implementation, and completion. During the planning stage, instructional materials and research instruments were developed and validated by experts. During the implementation stage, the experimental group received mathematics instruction using the Betawi culture-based CTL model, whereas the control group participated in expository instruction. Prior to the intervention, students were classified into high and low mathematical disposition groups based on a mathematical disposition questionnaire. After the intervention, all participants completed the MPSA test. The completion stage involved data processing, statistical analysis, and report preparation.

The study examined three variables: the instructional model (independent variable), mathematical disposition (attribute variable), and mathematical problem-solving ability (MPSA) (dependent variable). The instructional model consisted of the Betawi culture-based CTL model and the expository learning model. Mathematical disposition was classified into high and low categories using the extreme group approach, in which the highest one-third of the scores represented the high-disposition group and the lowest one-third represented the low-disposition group. The middle one-third was excluded to maximize the distinction between groups and improve the detection of treatment effects [32].

Mathematical disposition was treated as an attribute variable rather than a dependent variable because the study aimed to investigate whether differences in mathematical disposition influenced students' mathematical problem-solving ability and whether it moderated the effectiveness of the instructional model. Accordingly, a 2×2 treatment-by-level design was employed and analyzed using a Two-Way ANOVA to examine the main effects of the instructional model and mathematical disposition, as well as their interaction.

The research instruments comprised a mathematical disposition questionnaire and an essay-based MPSA test consisting of five contextual problems based on Betawi cultural contexts and developed according to Polya's problem-solving stages. Prior to implementation, all instruments

underwent content validation by five experts in mathematics education and educational assessment, followed by empirical testing to establish validity and reliability in accordance with standard instrument development procedures [33], [34]. The instruments demonstrated satisfactory psychometric properties (Aiken's $V = 0.88$; item validity coefficients = $0.698\text{--}0.897$; Cronbach's Alpha = 0.851), confirming their suitability for the study.

Data analysis was conducted in two stages. First, the assumptions of normality and homogeneity of variance were tested. Subsequently, a Two-Way ANOVA was performed to examine the effects of the instructional model, mathematical disposition, and their interaction on students' MPSA. Whenever a significant interaction effect was identified, simple effects analysis was conducted to further interpret the interaction pattern [31].

3. Results and Discussion

The descriptive statistics revealed differences in Mathematical Problem-Solving Ability (MPSA) between students who learned through the Betawi culture-based CTL model and those who received expository instruction. Overall, students in the CTL group achieved a higher mean MPSA score and exhibited a more homogeneous distribution of scores than those in the expository group. These findings suggest that the Betawi culture-based CTL model not only improved students' overall mathematical problem-solving performance but also promoted a more balanced distribution of problem-solving ability among students. When the data were examined according to mathematical disposition, the largest difference in MPSA was observed among students with high mathematical disposition. In contrast, students with low mathematical disposition demonstrated relatively similar mean scores across the two instructional models, indicating that the instructional effect was not yet apparent at the descriptive level.

Table 2. Descriptive Statistics of MPSA by Instructional Model and Mathematical Disposition

Mathematical Disposition	Instructional Model	Mean	SD	n
High	Betawi Culture-Based CTL	88,29	8,137	24
	Expository Learning	76,83	13,990	24
Total		82,56	12,716	48
Low	Betawi Culture-Based CTL	75,13	10,576	24
	Expository Learning	75,54	10,591	24
Total		75,33	10,473	48
Overall	Betawi Culture-Based CTL	81,71	11,463	48
	Expository Learning	76,19	12,292	48
Total		78,95	12,143	96

These findings indicate that the effectiveness of the instructional model can be attributed not only to the implementation of the REACT learning sequence within the CTL framework but also to the integration of Betawi cultural contexts as authentic learning resources. Familiar contexts, including local economic activities, traditions, and students' everyday experiences, enabled learners to understand problem situations more meaningfully, identify relevant information, and construct mathematical models more effectively. Consequently, linking mathematical concepts with culturally meaningful contexts facilitated a more authentic problem-solving process and contributed to improved mathematical problem-solving ability. This finding supports the ethnomathematics perspective that local culture provides an effective context for developing students' mathematical reasoning and problem-solving skills through learning experiences closely connected to their daily lives [24], [26].

Before testing the research hypotheses, the MPSA data were examined to verify the assumptions required for parametric analysis, namely normality and homogeneity of variance [33].

The Shapiro–Wilk test indicated that the significance values for both instructional groups and all combinations of instructional model and mathematical disposition exceeded 0.05, indicating that the MPSA scores were normally distributed. The results of the normality test are presented in Table 3.

Table 3. Normality Test for MPSA Scores by Mathematical Disposition Category

Mathematical Disposition Category	Statistic	df	Sig.
High Mathematical Disposition (Betawi Culture-Based CTL)	0.946	24	0.216
Low Mathematical Disposition (Betawi Culture-Based CTL)	0.968	24	0.611
High Mathematical Disposition (Expository Learning Model)	0.950	24	0.266
Low Mathematical Disposition (Expository Learning Model)	0.950	24	0.269

As shown in Table 3, all significance values were greater than 0.05, confirming that the assumption of normality was satisfied for every group. Therefore, the MPSA data met the normality requirement for subsequent parametric analyses.

The homogeneity of variance assumption was subsequently evaluated using Levene's test. As presented in Table 4, the significance values for both the instructional model and the interaction between instructional model and mathematical disposition were greater than 0.05, indicating that the variances of the MPSA scores were homogeneous across all groups.

Table 4. Homogeneity of Variance Test for MPSA Scores

Group / Combination	Levene Statistic	df1	df2	Sig.
Learning Model (Experiment vs Control)	0.372	1	94	0.543
Learning Model × Mathematical Disposition	2.557	3	92	0.060

Since both the normality and homogeneity assumptions were satisfied, the data were considered appropriate for parametric hypothesis testing using Two-Way Analysis of Variance (Two-Way ANOVA).

The Two-Way ANOVA was conducted to examine the effects of the instructional model, mathematical disposition, and their interaction on students' mathematical problem-solving ability. The results are presented in Table 5.

Table 5. Two-Way ANOVA Results for Mathematical Problem-Solving Ability

Source	df	Mean Square	F	Sig.
Instructional Model	1	731.510	6.021	0.016
Mathematical Disposition	1	1254.260	10.324	0.002
Instructional Model × Mathematical Disposition	1	846.094	6.964	0.010
Error	92	121.488	–	–

The results presented in Table 5 demonstrate that the instructional model had a statistically significant effect on students' MPSA ($F = 6.021$, $p = 0.016$). Students who learned through the Betawi culture-based CTL model outperformed those who received expository instruction, indicating that contextual learning supported by culturally relevant experiences was more effective in developing mathematical problem-solving ability.

More importantly, a significant interaction was found between the instructional model and mathematical disposition ($F = 6.964$, $p = 0.010$). This result indicates that the effectiveness of the instructional model depended on students' levels of mathematical disposition. In other words, the influence of the Betawi culture-based CTL model on MPSA was not uniform across all students but varied according to their affective characteristics toward mathematics. This finding is consistent with the view that cognitive achievement in mathematics is shaped not only by instructional approaches but also by students' beliefs, attitudes, and persistence in learning mathematics [17], [28].

The interaction effect is illustrated in Figure 1, which shows that students with high mathematical disposition benefited substantially more from the Betawi culture-based CTL model than from expository instruction. In contrast, the performance of students with low mathematical disposition was relatively similar across the two instructional models. This interaction suggests that although culturally contextualized learning provides meaningful learning experiences, its effectiveness is maximized when students also possess positive mathematical dispositions that encourage persistence, confidence, and active engagement in solving mathematical problems.

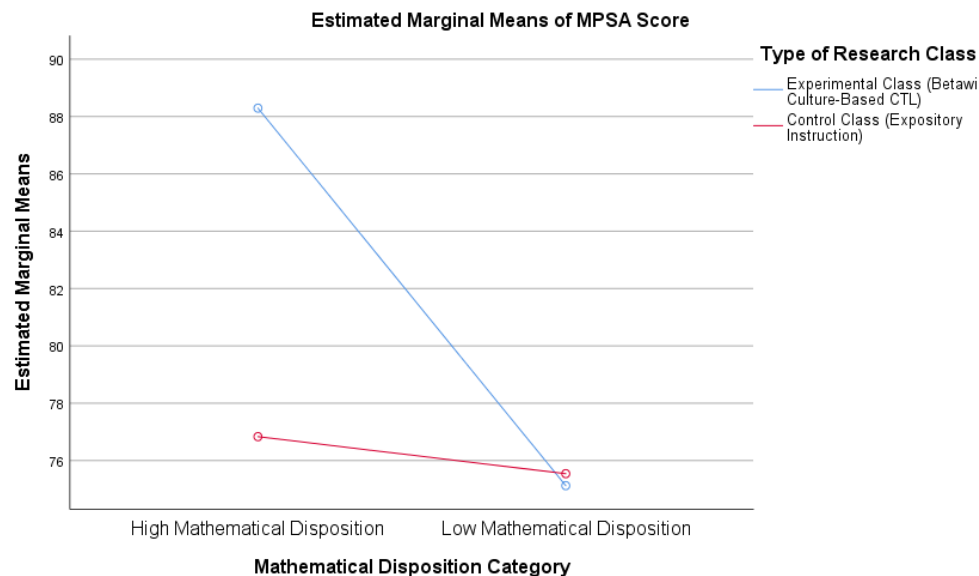


Figure 1. Interaction Between Instructional Model and Mathematical Disposition on MPSA

The significant main effect of the instructional model was further examined using an independent-samples *t*-test to compare students' Mathematical Problem-Solving Ability (MPSA) between the Betawi culture-based Contextual Teaching and Learning (CTL) group and the expository learning group. The results are presented in Table 6.

Table 6. Independent-Samples *t*-Test Results for MPSA by Instructional Model

t	df	Sig. (2-tailed)	Mean Difference
2.276	94	0.025	5.521

As shown in Table 6, the independent-samples *t*-test revealed a statistically significant difference in MPSA between students who learned through the Betawi culture-based CTL model and those who received expository instruction ($t = 2.276$, $df = 94$, $p = 0.025$). The mean difference of 5.521 indicates that students in the CTL group achieved higher mathematical problem-solving performance than those in the expository group.

From a pedagogical perspective, the superiority of the Betawi culture-based CTL model can be attributed to its ability to connect mathematical concepts with students' real-life experiences. According to [35], [36], [37], contextual learning enables students to construct conceptual understanding through authentic experiences, active engagement, and the application of knowledge in meaningful situations. In the present study, the integration of Betawi culture provided familiar and meaningful contexts that enhanced students' understanding of Systems of Linear Equations in Two Variables (SLETV). Rather than treating SLETV as an abstract mathematical topic, students applied the concepts to authentic situations, such as transactions involving traditional Betawi foods, budgeting for cultural performances, planning expenditures for cultural festivals, and other local economic activities. These culturally relevant contexts enabled students to interpret mathematical solutions conceptually rather than merely following procedural steps.

The implementation of the REACT learning sequence (Relating, Experiencing, Applying, Cooperating, and Transferring) further strengthened students' conceptual construction. During the relating stage, students connected SLETV concepts with their everyday cultural experiences. The experiencing stage encouraged them to collect and analyze authentic information, whereas the applying stage required them to solve contextual mathematical problems. Through cooperating, students collaboratively discussed alternative solution strategies, and during transferring, they extended their understanding to unfamiliar situations. These instructional processes are consistent with the principles of constructivism, inquiry, learning communities, reflection, and authentic assessment [38], [39].

In contrast, expository instruction was predominantly teacher-centered, emphasizing concept explanation and routine procedural exercises. Students primarily listened to explanations, took notes, and reproduced solution procedures demonstrated by the teacher. The limited connection between mathematical concepts and authentic contexts restricted opportunities for students to develop higher-order problem-solving strategies and reflective thinking [40], [41], [42]. Therefore, the present findings are consistent with previous studies reporting the effectiveness of CTL in improving mathematical problem-solving ability [23], [43], [44], [45], [46], as well as research emphasizing the role of local cultural contexts in strengthening conceptual understanding and student engagement in mathematics learning [11], [25].

The Two-Way ANOVA results presented in Table 5 also revealed a significant interaction between the instructional model and mathematical disposition ($F = 6.964$, $p = 0.010$), indicating that the effectiveness of the instructional model depended on students' affective characteristics. Specifically, students with high mathematical disposition responded more positively to the Betawi culture-based CTL model. These students perceived mathematics as meaningful, useful, and learnable through persistent effort, characteristics that [17] describe as productive disposition. Within the CTL environment, they were able to connect contextual problems with SLETV concepts, construct mathematical models independently, and actively participate in collaborative discussions.

Conversely, students with low mathematical disposition exhibited a more limited response to the CTL approach. Although the instructional model provided authentic learning contexts, the relatively high cognitive and affective demands associated with the experiencing and transferring stages posed challenges for these students. This finding is consistent with the perspectives of [47], [48], who argued that mathematical disposition develops gradually through repeated and meaningful learning experiences.

To further investigate the interaction effect, an independent-samples *t*-test was conducted for students with high mathematical disposition. The results are presented in Table 7.

Table 7. Independent-Samples *t*-Test Results for Students with High Mathematical Disposition

t	df	Sig. (2-tailed)	Mean Difference
3.468	46	0.001	11.458

The results indicated a significant difference in MPSA between students with high mathematical disposition who learned through the Betawi culture-based CTL model and those who received expository instruction ($t = 3.468$, $df = 46$, $p = 0.001$). The mean difference of 11.458 demonstrates a substantial advantage for students in the CTL group.

This finding suggests that students with high mathematical disposition were better able to capitalize on the characteristics of CTL to develop reflective and adaptive problem-solving strategies. Schoenfeld emphasized that students' beliefs about mathematics influence how they approach and persist in solving mathematical problems, highlighting the affective dimension of mathematical problem solving [49].

The REACT learning sequence enabled students to activate prior knowledge [50], explore multiple representations of mathematical problems [51], and critically reflect on alternative solution strategies. Moreover, integrating local cultural contexts enhanced students' confidence and strengthened the meaningfulness of learning, thereby fostering deeper cognitive and affective engagement. By contrast, expository instruction provided limited opportunities for exploration and reflection, preventing students with high mathematical disposition from fully realizing their learning potential.

A different pattern emerged among students with low mathematical disposition, as presented in Table 8.

Table 8. Independent-Samples *t*-Test Results for Students with Low Mathematical Disposition

t	df	Sig. (2-tailed)	Mean Difference
-0.136	46	0.892	-0.417

The independent-samples *t*-test revealed no statistically significant difference in MPSA between students with low mathematical disposition who learned through the Betawi culture-based CTL model and those who received expository instruction ($t = -0.136$, $df = 46$, $p = 0.892$). These findings suggest that, in the short term, both instructional approaches produced comparable learning outcomes for students with low mathematical disposition.

From both cognitive and affective perspectives, this result is understandable. Students with low mathematical disposition tend to experience mathematics anxiety, low self-confidence, and a tendency to avoid cognitively demanding tasks [47], [48]. Consequently, they may have difficulty taking full advantage of the opportunities for exploration, collaboration, and reflection provided by the CTL model, particularly during the experiencing, cooperating, and transferring stages.

Nevertheless, previous studies have demonstrated that contextual learning possesses considerable long-term potential for fostering positive mathematical dispositions through sustained and meaningful learning experiences [28], [52]. Therefore, integrating local culture into mathematics instruction may serve as an effective starting point for strengthening students' emotional connection to mathematics and enhancing its perceived relevance, although improvements in mathematical problem-solving ability among students with low mathematical disposition may require longer instructional periods and continuous pedagogical support.

Overall, the findings of this study demonstrate that the Betawi culture-based Contextual Teaching and Learning (CTL) model is more effective than expository instruction in enhancing students' mathematical problem-solving ability, particularly among students with high mathematical disposition. This effectiveness appears to result from the interaction between authentic cultural contexts, active student engagement, and students' affective characteristics. Accordingly, the present study reinforces the view that successful mathematical problem solving depends not only on cognitive competence but also on students' mathematical disposition and the implementation of meaningful, context-based instructional practices.

4. Conclusion

The findings of this study demonstrate that the Betawi culture-based Contextual Teaching and Learning (CTL) model significantly enhances students' Mathematical Problem-Solving Ability (MPSA). Students who learned through this instructional approach achieved higher MPSA scores than those who received expository instruction. This advantage can be attributed to the integration of mathematical concepts with culturally familiar and authentic contexts, which promoted greater cognitive engagement and active participation throughout the learning process.

The study also revealed a significant interaction between the instructional model and mathematical disposition, indicating that the effectiveness of the Betawi culture-based CTL model

depends not only on the instructional design but also on students' affective characteristics, particularly their attitudes, beliefs, and readiness to engage in mathematically demanding tasks.

Furthermore, the Betawi culture-based CTL model was particularly effective for students with high mathematical disposition, enabling them to develop more structured and reflective problem-solving strategies than those receiving expository instruction. In contrast, no significant difference was found between the two instructional models among students with low mathematical disposition. This finding suggests that these students require more intensive pedagogical support and longer-term exposure to contextual learning before its benefits can be fully realized.

The findings highlight the importance of integrating local cultural contexts into mathematics instruction while simultaneously fostering students' mathematical disposition to maximize the effectiveness of contextual learning in improving mathematical problem-solving ability. Future research is encouraged to examine the long-term effects of culture-based CTL across different mathematical topics, educational levels, and cultural settings to strengthen the generalizability of these findings.

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