

# The Effectiveness of Contextual Mathematics Learning Based on Religious Moderation in Improving Students' Numeracy Literacy and Tolerance Attitudes

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## ABSTRACT

This study examined the effectiveness of contextual mathematics learning integrated with religious moderation in improving students' numeracy literacy and tolerance attitudes. A quasi-experimental method employing a pretest–posttest nonequivalent control-group design was used with 41 students, comprising 21 in the experimental group and 20 in the control group. Numeracy literacy was measured using a test, while tolerance attitudes were assessed through a questionnaire. Data were analyzed using descriptive statistics, assumption tests, multivariate analysis of variance (MANOVA), univariate tests, and normalized gain (N-gain) analysis. The results showed that mean numeracy literacy scores in the experimental group increased from 61.38 to 82.57, compared with an increase from 60.95 to 70.85 in the control group. Similarly, mean tolerance attitude scores increased from 72.43 to 85.19 in the experimental group and from 71.80 to 76.65 in the control group. The reported MANOVA results indicated a statistically significant multivariate difference between the groups (Wilks'  $\lambda = 0.623$ ,  $F = 11.84$ ,  $p < .001$ , partial  $\eta^2 = 0.377$ ). N-gain scores were also higher in the experimental group for both numeracy literacy (0.55 versus 0.25) and tolerance attitudes (0.46 versus 0.17). These findings suggest that contextual mathematics learning integrated with religious moderation may offer advantages in developing students' numeracy literacy and tolerance attitudes. However, the nonrandomized design, small sample size, and limited reporting of instrument validity and reliability warrant caution in interpreting the findings and generalizing them to broader student populations.

## 1. INTRODUCTION

Numeracy literacy involves interpreting quantitative representations, choosing suitable mathematical procedures, and using results to make decisions in everyday situations (Bae et al., 2019; Multahada, 2024; Ruffini et al., 2024). A learning environment dominated by routine exercises may offer students few opportunities to link calculations to real problems. Contextual tasks can instead require interpretation, strategy selection, evaluation, and explanation, all of which are central to mathematical problem solving (Alifia & Saputro, 2019; Amalina & Vidákovich, 2023; Baharin et al., 2018; Susilowati, 2021; Widana & Ratnaya, 2021). Indonesian schools also address the challenge of learning across religious and social differences. Religious moderation emphasizes balanced judgment, mutual respect, and dialogue in diverse communities (Arif, 2021; Muttaqin, 2023). While tolerance can be discussed explicitly in character education, collaborative mathematics activities offer a possible setting in which learners practice listening to different interpretations and negotiating evidence-based solutions. However, the presence of socially relevant examples does not by itself establish that attitudes have improved; such outcomes require measurement. Existing work has investigated contextual mathematics and problem-solving or mathematical competency (Amalina & Vidákovich, 2023; Permadi & Hidayah, 2023), while other research has focused on religious moderation or its integration into education (Arif, 2021; Muttaqin, 2023; Nisa' et al., 2023). The

specific gap addressed here is the limited evidence, in the studies discussed above, evaluating numeracy literacy and tolerance attitudes within the same comparative mathematics-learning intervention. The study therefore asks whether a single context-based instructional design can be associated with differences in cognitive and socio-affective outcomes simultaneously, rather than treating these two areas as unrelated educational aims. The contribution is an empirical joint-outcome comparison of contextual mathematics instruction incorporating religious-moderation themes with regular instruction using a pretest–posttest design and multivariate analysis. This is a design-and-outcome contribution, not a claim that integrating values into mathematics was first proposed here. Three hypotheses concern between-group differences in numeracy literacy, in tolerance attitudes, and in both outcomes considered together.

## 2. METHODS

A quantitative quasi-experimental pretest–posttest control-group design was used. The experimental group comprised 21 students and the control group 20 students ( $N = 41$ ). Both completed pretests and posttests on the two outcomes. Because assignment was not reported as randomized, the groups should be regarded as nonequivalent. The original manuscript does not specify school/grade, selection criteria, sampling procedure, intervention dates, or whether classes were matched. These details must be supplied from the actual research records before publication (Creswell, 2010; Crismono, 2024).

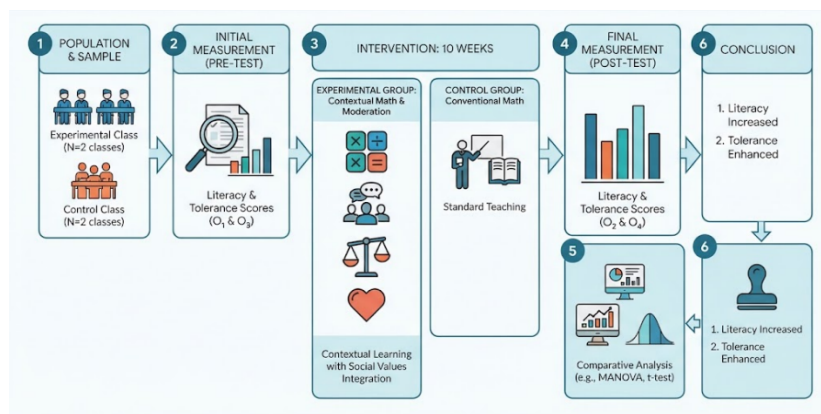


**Figure 1.** Research Framework for the Effectiveness of Contextual Mathematics Learning Based on Religious Moderation in Improving Students' Numeracy Literacy and Tolerance Attitudes.

The experimental instruction used mathematics questions framed around community diversity, demographic information, cooperation, and equitable resource allocation. As described in the submitted manuscript, learners interpreted situations, selected strategies, calculated, discussed alternatives, justified decisions, and reflected on how differences could be addressed respectfully. The control group followed regular mathematics instruction. The submitted methodological description and figure refer to a ten-week intervention, but do not document the number of meetings, mathematical topic sequence, teacher training, fidelity monitoring, or implementation equivalence. A replicable report should provide these details and representative tasks. Numeracy literacy was assessed using a test covering interpretation of quantitative information, application of concepts, contextual problem solving, and drawing conclusions. Tolerance attitudes were assessed with a questionnaire concerning respect for differences, listening, collaboration, and constructive interaction. The submitted manuscript does not report item counts, scoring ranges, rubric construction, expert review, pilot results, reliability coefficients, or validity evidence. These cannot

be inferred from the outcome scores; instrument specifications and empirical quality indicators must be inserted using authentic documentation (Crismono, 2025; Mauá et al., 2020). Descriptive comparisons used pretest/posttest means and standard deviations. The original report lists Shapiro–Wilk tests and Levene tests followed by MANOVA and separate univariate analyses at  $\alpha = .05$ , alongside partial eta squared and normalized gain. For full reproducibility, the final article should identify the exact outcome entered into each model (posttest, change score, or adjusted posttest), include degrees of freedom and the full multivariate assumptions (including covariance-matrix homogeneity), and clarify the N-gain computation. Reported inferential statistics below are retained as supplied and are not independently recalculated from participant-level data (Arikunto, 2021; Crismono, 2023).

### 3. RESULTS AND DISCUSSION

#### 3.1. Description of Research Data

This study aimed to examine the effectiveness of contextual mathematics learning based on religious moderation in improving students' numeracy literacy and tolerance attitudes. The study involved two groups: an experimental group that received contextual mathematics instruction integrated with religious moderation principles and a control group that received mathematics instruction through the regular teaching approach. Both groups were administered pretests before the instructional intervention and posttests upon completion of the learning activities. Numeracy literacy data were collected using a test designed to assess students' abilities to interpret quantitative information, apply mathematical concepts and procedures, solve problems, and draw conclusions in real-life contexts. Meanwhile, tolerance attitudes were measured using a questionnaire covering students' abilities to respect differences, listen to others' perspectives, collaborate, and establish constructive interactions.

**Table 1.** Descriptive Statistics of Pretest and Posttest Scores

| Variable            | Group        | N  | Pretest Mean | Pretest SD | Posttest Mean | Posttest SD |
|---------------------|--------------|----|--------------|------------|---------------|-------------|
| Numeracy Literacy   | Experimental | 21 | 61.38        | 7.24       | 82.57         | 6.13        |
| Numeracy Literacy   | Control      | 20 | 60.95        | 7.41       | 70.85         | 7.02        |
| Tolerance Attitudes | Experimental | 21 | 72.43        | 6.15       | 85.19         | 5.24        |
| Tolerance Attitudes | Control      | 20 | 71.80        | 6.32       | 76.65         | 5.97        |

The descriptive analysis indicated that the initial conditions of the two groups were relatively comparable. The experimental group had a mean numeracy literacy pretest score of 61.38, while the control group had a mean score of 60.95. Regarding tolerance attitudes, the experimental group obtained a mean pretest score of 72.43, compared with 71.80 in the control group. Following the instructional intervention, both groups demonstrated improvements; however, the experimental group achieved greater increases. The experimental group's mean numeracy literacy score increased by 21.19 points, whereas the control group showed an increase of 9.90 points. Similarly, tolerance attitude scores increased by 12.76 points in the experimental group and 4.85 points in the control group. These descriptive findings suggest that contextual mathematics learning based on religious moderation was associated with greater improvements in both variables compared with regular mathematics instruction.

#### 3.2.2. Statistical Assumption Tests

Before hypothesis testing, the data were examined using normality and homogeneity tests. These preliminary tests were conducted to determine whether the data satisfied the assumptions required for the inferential statistical analyses.

**Table 2.** Results of the Normality Test

| Variable            | Group        | Shapiro–Wilk | Sig.  | Interpretation |
|---------------------|--------------|--------------|-------|----------------|
| Numeracy Literacy   | Experimental | 0.958        | 0.471 | Normal         |
| Numeracy Literacy   | Control      | 0.963        | 0.584 | Normal         |
| Tolerance Attitudes | Experimental | 0.967        | 0.654 | Normal         |
| Tolerance Attitudes | Control      | 0.955        | 0.385 | Normal         |

The Shapiro–Wilk test results indicated that all significance values exceeded 0.05. Therefore, the numeracy literacy and tolerance attitude data in both the experimental and control groups did not show statistically significant deviations from normality.

**Table 3.** Results of the Homogeneity of Variance Test

| Variable            | Levene's Statistic | Sig.  | Interpretation |
|---------------------|--------------------|-------|----------------|
| Numeracy Literacy   | 0.214              | 0.646 | Homogeneous    |
| Tolerance Attitudes | 0.327              | 0.571 | Homogeneous    |

The homogeneity of variance test yielded significance values of 0.646 for numeracy literacy and 0.571 for tolerance attitudes. Since both values exceeded 0.05, the variances of the two groups were considered homogeneous.

### 3.3. Results of Multivariate Analysis

Since the study involved two dependent variables, namely numeracy literacy and tolerance attitudes, multivariate analysis was conducted to examine the simultaneous effectiveness of the instructional intervention. This approach was employed to determine whether contextual mathematics learning based on religious moderation produced statistically significant differences between the groups across both dependent variables.

**Table 4.** Results of Multivariate Analysis of Variance (MANOVA)

| Test Statistic | Value | F     | Sig.   | Partial $\eta^2$ |
|----------------|-------|-------|--------|------------------|
| Wilks' Lambda  | 0.623 | 11.84 | <0.001 | 0.377            |
| Pillai's Trace | 0.377 | 11.84 | <0.001 | 0.377            |

The multivariate analysis yielded a Wilks' Lambda value of 0.623, with  $F = 11.84$  and  $p < 0.001$ . The partial eta squared value of 0.377 indicated a large multivariate effect of contextual mathematics learning based on religious moderation on the combined outcomes of numeracy literacy and tolerance attitudes. Thus, a statistically significant simultaneous difference was observed between the experimental and control groups in terms of numeracy literacy and tolerance attitudes. These results indicate that the instructional intervention influenced not only students' cognitive and applied learning outcomes but also their socio-affective development.

### 3.4. Effectiveness of Mathematics Learning in Improving Numeracy Literacy

Further hypothesis testing was conducted using univariate analysis to specifically examine the effectiveness of contextual mathematics learning based on religious moderation in improving students' numeracy literacy.

**Table 5.** Results of the Univariate Analysis of Numeracy Literacy

| Group        | Pretest Mean | Posttest Mean | Gain  | F     | Sig.   | Partial $\eta^2$ |
|--------------|--------------|---------------|-------|-------|--------|------------------|
| Experimental | 61.38        | 82.57         | 21.19 | 28.64 | <0.001 | 0.424            |
| Control      | 60.95        | 70.85         | 9.90  | —     | —      | —                |

The analysis revealed that the experimental group achieved a numeracy literacy improvement of 21.19 points, whereas the control group demonstrated an increase of 9.90 points. The univariate analysis yielded  $F = 28.64$ , with a significance level of  $p < 0.001$ . The partial eta squared value of 0.424 indicated a large effect of contextual mathematics learning based on religious moderation on numeracy literacy. Accordingly, mathematics instruction that integrates social contexts and diversity into mathematical activities was found to be more effective than regular

instruction in improving students' numeracy literacy. This improvement is consistent with the characteristics of the instructional approach implemented in the experimental group. Students were encouraged to interpret contextual information, select appropriate mathematical strategies, perform calculations, evaluate results, communicate conclusions, and reflect on the values embedded in the problems.

### 3.5. Effectiveness of Mathematics Learning in Improving Tolerance Attitudes

The subsequent univariate analysis was conducted to determine the effectiveness of contextual mathematics learning based on religious moderation in improving students' tolerance attitudes.

**Table 6.** Results of the Univariate Analysis of Tolerance Attitudes

| Group        | Pretest Mean | Posttest Mean | Gain  | F     | Sig.   | Partial $\eta^2$ |
|--------------|--------------|---------------|-------|-------|--------|------------------|
| Experimental | 72.43        | 85.19         | 12.76 | 19.72 | <0.001 | 0.335            |
| Control      | 71.80        | 76.65         | 4.85  | —     | —      | —                |

The results showed that the mean tolerance attitude score in the experimental group increased from 72.43 to 85.19, whereas the control group demonstrated an increase from 71.80 to 76.65. The difference in improvement was statistically significant, with  $F = 19.72$  and  $p < 0.001$ . The partial eta squared value of 0.335 indicated a large effect on students' tolerance attitudes. Therefore, contextual mathematics learning based on religious moderation was more effective than regular mathematics instruction in improving students' tolerance attitudes. These findings suggest that incorporating social contexts into mathematics learning can provide opportunities for students to respect differences, listen to others' perspectives, collaborate, and resolve problems through dialogue. These characteristics represent essential components of the learning experiences designed and implemented in this study.

### 3.6. Normalized Gain (N-Gain) Analysis

To provide a clearer understanding of the magnitude of students' improvements between pretest and posttest measurements, normalized gain (N-gain) analysis was conducted.

**Table 7.** Results of N-Gain Analysis

| Variable            | Group        | Mean N-Gain | Category |
|---------------------|--------------|-------------|----------|
| Numeracy Literacy   | Experimental | 0.55        | Moderate |
| Numeracy Literacy   | Control      | 0.25        | Low      |
| Tolerance Attitudes | Experimental | 0.46        | Moderate |
| Tolerance Attitudes | Control      | 0.17        | Low      |

The N-gain analysis revealed that the experimental group achieved a numeracy literacy N-gain of 0.55, which was classified as moderate, while the control group obtained an N-gain of 0.25, categorized as low. Regarding tolerance attitudes, the experimental group achieved an N-gain of 0.46, compared with 0.17 in the control group. These results further support the inferential statistical findings, indicating that contextual mathematics learning based on religious moderation produced greater improvements in both research variables than regular mathematics instruction.

### 3.7. Summary of Hypothesis Testing Results

**Table 8.** Summary of Hypothesis Testing Results

| No. | Hypothesis                                                                                                   | Test Statistic | Sig.   | Effect Size        | Decision  |
|-----|--------------------------------------------------------------------------------------------------------------|----------------|--------|--------------------|-----------|
| H1  | Contextual mathematics learning based on religious moderation is effective in improving numeracy literacy.   | $F = 28.64$    | <0.001 | $\eta^2 p = 0.424$ | Supported |
| H2  | Contextual mathematics learning based on religious moderation is effective in improving tolerance attitudes. | $F = 19.72$    | <0.001 | $\eta^2 p = 0.335$ | Supported |

|    |                                                                                                                |                             |        |                      |           |
|----|----------------------------------------------------------------------------------------------------------------|-----------------------------|--------|----------------------|-----------|
| H3 | The instructional approach is simultaneously effective in improving numeracy literacy and tolerance attitudes. | Wilks' $\lambda =$<br>0.623 | <0.001 | $\eta^2p =$<br>0.377 | Supported |
|----|----------------------------------------------------------------------------------------------------------------|-----------------------------|--------|----------------------|-----------|

Overall, the research findings demonstrate that contextual mathematics learning based on religious moderation had positive and statistically significant simultaneous effects on students' numeracy literacy and tolerance attitudes. The effect of the instructional intervention on numeracy literacy was greater than its effect on tolerance attitudes, as indicated by the respective partial eta squared values of 0.424 and 0.335. These findings indicate that integrating religious moderation contexts into mathematics instruction does not diminish the academic orientation of learning. Instead, the social contexts incorporated into the instructional activities provide opportunities for students to apply mathematics to understand real-world problems while simultaneously developing positive social attitudes. Within the instructional design, contexts such as community diversity, mutual cooperation, equitable resource distribution, demographic data, and other social phenomena were incorporated into mathematical activities. These results also support the novelty of the study, which positions numeracy literacy as a representation of cognitive and applied learning outcomes and tolerance attitudes as a representation of socio-affective development. Thus, instructional effectiveness is evaluated not only through improvements in mathematical abilities but also through the development of students' social character.

## DISCUSSION

The stronger numeracy improvement in the experimental group is consistent with the rationale of contextual learning: interpreting social and numerical information demands more than procedural calculation. Learners must identify relevant quantities, select appropriate models, and justify why a numerical result matters. This interpretation aligns with work on mathematical problem solving and contextual proficiency (Amalina & Vidákovich, 2023; Schoenfeld, 2013). However, the study does not isolate which element authentic context, collaborative work, or explicit values-based reflection contributed most to the observed differences. The tolerance finding is conceptually plausible because instruction invited students to hear alternative strategies, discuss resource allocation, and justify decisions respectfully. This corresponds to religious moderation as the practice of engaging differences without hostility (Arif, 2021; Muttaqin, 2023). Such classroom interaction may provide experiences relevant to tolerance, rather than merely transmitting definitions of social values. Nevertheless, self-reported attitudes can be influenced by expectations and social desirability, and posttest differences cannot establish durable changes in everyday behavior. Evaluating both outcomes together extends an exclusively cognitive assessment of contextual mathematics teaching. The reported multivariate difference suggests that the two sets of scores distinguished the study groups when considered jointly. This should not be read as proof that numeracy gains caused tolerance gains or that the two outcomes improved by the same mechanism. Future work could measure the instructional process directly, document dialogue quality, and test how participation mediates each outcome. Several limits qualify interpretation. The sample included only 41 students in two nonrandomized groups, leaving selection and classroom-level confounding possible. A single classroom per condition would also make student-level significance tests potentially overconfident if clustering were ignored. No follow-up measurement establishes persistence. Intervention replication details and instrument quality indices are incomplete, and the model specifications require confirmation from original output. Accordingly, the results support a promising local comparison rather than unrestricted causal or population-wide claims.

#### 4. CONCLUSION

Among the 41 students studied, contextual mathematics instruction using religious-moderation themes was associated with greater pretest–posttest improvements in numeracy literacy and tolerance attitudes than regular instruction. The submitted analysis reported significant multivariate and univariate differences, with moderate average N-gains in the experimental group. Because the design was quasi-experimental, group assignment was not documented as randomized, and the sample was small, the findings should not be generalized beyond comparable settings without replication. Future studies should document sampling and instruments fully, verify model specifications, use broader samples and classroom-level controls, and examine whether gains persist over time.

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