

## **Cultivating 21st-Century Collaboration Skills: The Roles Of Group Learning And Interactive Whiteboard-Integrated Instruction In Middle School Social Studies**

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### **Abstract**

*Collaboration is widely recognized as one of the core twenty-first-century competencies, alongside critical thinking, creativity, and communication, that education systems worldwide are seeking to cultivate, yet quantitative evidence on which classroom conditions most reliably predict it, particularly in social studies instruction, remains limited. This study examined the effects of group learning and interactive learning with smartboard (interactive whiteboard) integration on the collaboration skills of Grade VII students in social studies at a public middle school, using an ex post facto, associative quantitative design. Data were collected via Likert-scale questionnaires from all 55 Grade VII students (saturated sampling) and analysed with multiple linear regression in IBM SPSS Statistics 26. Results showed that group learning had no statistically significant effect on students' collaboration skills ( $B = 0.233$ ,  $t = 1.303$ ,  $p = .198$ ), whereas interactive learning with smartboard integration had a significant positive effect ( $B = 0.727$ ,  $t = 5.824$ ,  $p < .001$ ) and was the dominant predictor (standardized beta = .691 versus .155). Together, the two variables significantly predicted collaboration skills ( $F = 49.883$ ,  $p < .001$ ), explaining 65.7% of its variance ( $R\text{-squared} = .657$ ; adjusted  $R\text{-squared} = .644$ ). Diagnostic testing confirmed no multicollinearity*

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*(tolerance = .468, VIF = 2.137 for both predictors) and no clear heteroscedasticity, although the group learning-collaboration relationship showed a significant deviation from linearity, a finding discussed as a boundary condition on the non-significant result. The findings suggest that merely placing students in groups is insufficient to build collaboration skills unless accompanied by genuinely interactive, technology-supported pedagogy, with implications for social studies classrooms in resource-comparable school systems worldwide.*

**Keywords: Group Learning; Interactive Whiteboard; Smartboard-Integrated Instruction; Collaboration Skills; Social Studies Education.**

## INTRODUCTION

Collaboration is consistently named among the core competencies education systems worldwide are seeking to build in learners, alongside critical thinking, creativity, and communication. In Indonesia, this global emphasis is reflected in the Merdeka Curriculum's gotong royong (mutual cooperation) dimension of the Pancasila Student Profile. Collaboration skill is understood here as students' capacity to work actively and responsibly toward shared goals through communication, participation, and mutual respect, a capacity that develops through social interaction, consistent with Vygotsky's (1978) social-constructivist account of learning. Two classroom conditions are widely thought to create such interaction: group learning, in which students discuss, divide tasks, and solve problems together (Roestiyah, 2012), and interactive, technology-supported instruction, in which digital tools mediate students' engagement with content, teachers, and peers.

Interactive whiteboards, often marketed as smartboards, are among the most widely adopted such tools in classrooms internationally, and a substantial literature links their use to greater student engagement and participation (Turel, 2011; Kershner et al., 2010; Guerrero et al., 2016). Social studies is a particularly relevant context for this question, since its grounding in social phenomena makes discussion, negotiation, and joint problem-solving central to how it is best taught. Prior research, however, has tended to examine group-based activity and interactive or digital learning tools separately, and has more often linked them to learning outcomes or motivation than to collaboration skill specifically, leaving the joint and relative contribution of these two classroom conditions to students' collaborative capacity comparatively untested.



This study therefore examined the effects of group learning and interactive learning with smartboard integration, individually and simultaneously, on the collaboration skills of Grade VII students in social studies at a public middle school, addressing three questions: (1) does group learning significantly affect collaboration skills, (2) does interactive smartboard-integrated learning significantly affect collaboration skills, and (3) do the two variables simultaneously affect collaboration skills. Because building learners' collaborative capacity is a shared concern across education systems navigating similar curricular reform and technology-integration agendas, the findings speak to a broadly relevant question: which classroom conditions actually build the collaboration skills that twenty-first-century curricula increasingly demand.

## **LITERATURE REVIEW**

### ***Group Learning and Collaboration***

Group learning places students in small groups to pursue a shared instructional goal through joint activity, giving them the opportunity to exchange ideas, divide tasks, and help one another rather than depend solely on the teacher (Roestiyah, 2012). Its value rests on the premise that social interaction is itself a vehicle for cognitive development, as Vygotsky (1978) argued in situating learning within interaction with others and with cultural tools. Group formation alone does not guarantee effective collaboration, however: Slavin (2015) emphasises that cooperative learning requires structured group goals and individual accountability, without which unequal participation and dependence on a few active members can undermine the collaborative process the grouping was meant to produce.

### ***Interactive Whiteboard-Integrated Instruction***

Interactive learning with smartboard integration refers to instruction that uses an interactive whiteboard to support more direct interaction among students, teachers, and content, stimulating curiosity, confidence, and enthusiasm for learning (Kamaladini, 2021). Turel (2011) situates the interactive whiteboard as a technology that, properly used, supports active student participation rather than one-way presentation, while Kershner et al. (2010) found that interactive whiteboards can support young learners' collaborative communication and joint thinking. Mercer, Wegerif, and Major (2020) further emphasise that technology's instructional value lies in enabling dialogic exchange rather than in the device itself, a point consistent with



the conceptualisation of smartboard use in this study as an interactive process rather than mere equipment availability.

### ***Collaboration Skills and Prior Findings***

Collaboration skill is commonly assessed through indicators such as active contribution, productive work, flexibility and compromise, project management, respect for others, and responsibility (Greenstein, 2012), consistent with broader frameworks for structuring and evaluating collaborative learning techniques (Barkley, Cross, & Major, 2014). Empirically, digital and interactive tools have repeatedly been linked to greater student engagement: mobile-device use raised motivation and participation among university students (Guerrero et al., 2016), interactive smartboard use was associated with improved critical thinking (Widyartini et al., 2024), and a quasi-experimental study of interactive whiteboards in Vietnamese classrooms reported similar engagement gains (Bui, 2023), while recent work highlights the collaborative potential of technology-supported learning environments more broadly (Zhu et al., 2025). Group-based interventions such as Two Stay Two Stray have likewise raised collaboration skill and learning outcomes (Dewi & Parmiti, 2022), and collaborative learning models have improved cooperation in social studies specifically (Sarah & Witarsa, 2023; Seli, Muhajir, & Wahid, 2024), though at least one study found group learning did not translate into improved outcomes in a comparable setting (Pratiwi, 2021). Taken together, this literature supports the plausibility of both predictors examined here, while leaving their relative and joint contribution to collaboration skill, the gap this study addresses, largely untested.

## **METHOD**

### ***Research Design and Participants***

This study used a quantitative, ex post facto, associative design, appropriate because group learning and interactive smartboard-integrated instruction were already embedded in ongoing classroom practice and were measured as they naturally occurred rather than manipulated. The study was conducted over approximately three months in the 2025/2026 even semester at a public middle school in a rural regency of Southeast Sulawesi Province, Indonesia. The population comprised all 55 Grade VII students across two classes; because the population was smaller than 100, saturated sampling was used, yielding a sample of all 55 students.



***Instruments and Data Analysis***

Three closed-ended, five-point Likert questionnaires measured group learning (4 items, adapted from Roestiyah, 2012), interactive learning with smartboard integration (6 items, adapted from Kamaladini, 2021), and collaboration skills (6 items, adapted from Greenstein, 2012), for 16 items in total. Item validity was assessed through Pearson product-moment item-total correlation against the critical value for  $df = 53$  at  $\alpha = .05$ , and reliability through Cronbach's alpha, with all three variables found valid and reliable ( $\alpha = .840$  for group learning,  $.879$  for interactive smartboard-integrated learning, and  $.890$  for collaboration skills). Prior to hypothesis testing, classical assumption testing covered residual normality (visual inspection of the normal P-P plot), linearity for each predictor (Test for Linearity, evaluated through the Deviation from Linearity significance value), multicollinearity (tolerance and variance inflation factor, VIF), and heteroscedasticity (visual inspection of the standardized residual scatterplot), following the decision criteria of Ghazali (2018). Hypotheses were then tested through multiple linear regression, evaluated via the t-test for each predictor's partial effect, the F-test for the simultaneous effect, the coefficient of determination (R-squared) for explained variance, and comparison of standardized beta coefficients to identify the dominant predictor, all computed in IBM SPSS Statistics 26.

**RESULTS AND DISCUSSION*****Classical Assumption Testing***

Residuals were approximately normally distributed based on visual inspection of the normal P-P plot, and the standardized residual scatterplot showed no systematic pattern, indicating no clear heteroscedasticity. Multicollinearity testing showed tolerance =  $.468$  and VIF =  $2.137$  for both predictors, well within the accepted thresholds (tolerance  $> .10$ , VIF  $< 10$ ), supporting their joint entry into a single regression model. Linearity testing, however, produced an asymmetric result: the relationship between interactive smartboard-integrated learning and collaboration skills met the linearity criterion (Deviation from Linearity  $p = .979$ ), while the relationship between group learning and collaboration skills showed a statistically significant deviation from linearity ( $p = .007$ ), indicating that the bivariate association between group learning and collaboration skills is not fully captured by a straight-line model. This asymmetry is treated as a boundary condition on the interpretation of the group learning coefficient reported below, rather than as evidence that group learning and collaboration skills are unrelated.



**Regression Results and Hypothesis Testing**

Multiple linear regression, entering group learning (X1) and interactive smartboard-integrated learning (X2) simultaneously, is summarised in Table 1.

**Table 1. Multiple Regression Coefficients**

| Variable                                        | B     | Std. Error | Beta | t     | Sig.  | Tolerance | VIF   |
|-------------------------------------------------|-------|------------|------|-------|-------|-----------|-------|
| (Constant)                                      | 2.509 | 2.108      | -    | 1.190 | .239  | -         | -     |
| Group Learning (X1)                             | 0.233 | 0.178      | .155 | 1.303 | .198  | .468      | 2.137 |
| Interactive Smartboard-Integrated Learning (X2) | 0.727 | 0.125      | .691 | 5.824 | <.001 | .468      | 2.137 |

Group learning did not significantly predict collaboration skills ( $t = 1.303$ ,  $p = .198 > .05$ ); although its coefficient was positive, the null hypothesis could not be rejected, so the first hypothesis was not supported. Interactive smartboard-integrated learning significantly and positively predicted collaboration skills ( $t = 5.824$ ,  $p < .001$ ), supporting the second hypothesis, and its standardized beta (.691) exceeded that of group learning (.155), identifying it as the dominant predictor in the model. Tested simultaneously, the two variables significantly predicted collaboration skills,  $F(2, 52) = 49.883$ ,  $p < .001$  (Table 2), supporting the third hypothesis; the model explained 65.7% of the variance in collaboration skills ( $R\text{-squared} = .657$ ; adjusted  $R\text{-squared} = .644$ ), leaving 34.3% attributable to factors outside the model.

**Table 2. Model Summary and Simultaneous (F) Test**

| R    | R-squared | Adjusted R-squared | F      | df    | Sig.  |
|------|-----------|--------------------|--------|-------|-------|
| .811 | .657      | .644               | 49.883 | 2, 52 | <.001 |

**DISCUSSION**

Group learning's non-significant effect is best understood alongside the linearity finding: group learning was implemented only moderately well at the outset, with task allocation and participation the weakest aspects, consistent with Slavin's (2015) argument that cooperative



learning requires structured group goals and individual accountability to translate shared activity into genuine collaborative gain. Where participation is uneven, the mere existence of groups may not reliably build collaboration skill, and the significant deviation from linearity further suggests the relationship is not adequately described by a straight line, a pattern the present linear model cannot resolve. This result diverges from Pratiwi (2021), who reported positive effects of group learning in a comparable setting, though that study targeted learning outcomes rather than collaboration skill, plausibly accounting for the divergence.

Interactive smartboard-integrated learning's significant, dominant effect is consistent with international evidence linking interactive whiteboard and digital-tool use to greater student engagement (Guerrero et al., 2016; Widyartini et al., 2024; Bui, 2023). Baseline observation showed smartboard use concentrated in group presentation (65.0%) and not yet fully extended to discussion and problem-solving (40.0%), helping explain why the variable, as measured, captures a process broader than device use alone: consistent with Turel (2011) and Kershner et al. (2010), the smartboard functions as a medium for dialogic exchange (Mercer, Wegerif, & Major, 2020) rather than a presentation aid, and it is this interactive use that plausibly drives the observed effect.

The significant simultaneous effect, explaining 65.7% of variance, indicates collaboration skill is jointly shaped by social interaction and technology-mediated engagement rather than either condition alone, consistent with Vygotsky's (1978) account of learning as mediated by both social interaction and cultural tools, and with recent evidence on technology-supported collaborative learning (Zhu et al., 2025). Because smartboard-integrated learning carried the larger share of that contribution, technology-mediated interactivity, not group placement alone, appears the more powerful lever here, with the caveat that group learning's weaker, non-linear relationship may reflect implementation quality rather than a genuine absence of potential, relevant to social studies classrooms elsewhere pursuing similar technology-integration agendas.

## CONCLUSION

Group learning did not significantly predict students' collaboration skills ( $B = 0.233$ ,  $t = 1.303$ ,  $p = .198$ ), a result read alongside a significant deviation from linearity and baseline evidence of uneven task allocation within groups. Interactive learning with smartboard integration significantly and positively predicted collaboration skills ( $B = 0.727$ ,  $t = 5.824$ ,  $p < .001$ ) and was the dominant predictor. Tested simultaneously, the two variables significantly predicted



collaboration skills,  $F(2, 52) = 49.883$ ,  $p < .001$ , explaining 65.7% of its variance. Overall, technology-mediated, genuinely interactive instruction is a more powerful and reliable lever for building collaboration skills in social studies than group placement alone, a pattern with plausible relevance to classrooms elsewhere pursuing similar twenty-first-century-skills goals under comparable resource conditions.

## RECOMMENDATIONS

Students are encouraged to participate more actively and take individual responsibility within group tasks rather than relying on a few active members. Teachers are encouraged to strengthen group learning through clearer task allocation, while extending smartboard use beyond presentation toward discussion and joint problem-solving. School leaders are encouraged to support interactive instruction through adequate facilities and teacher training. Future research should test additional relevant variables and consider non-linear or moderated models better suited to relationships that do not appear adequately linear.

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