A STUDY OF TEACHING AIDS FAVOUR LEARNING IN THE PRIMARY STUDENTS OF CBSE BOARD

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Abstract

This experimental study examined the effect of teaching aids on learning the "Angle" unit in Mathematics among Grade 6 CBSE students in Ahmedabad. Using an experimental (teaching-aids) and control (traditional) group design with pre- and post-tests, the researcher compared achievement outcomes across 158 students (86 boys, 72 girls) from one purposively selected CBSE school. Statistical analysis (mean, SD, t-test) showed significantly higher post-test scores for the experimental group (M = 29.6) than control (M = 22.8), and significant gains from pre- to post-test within the experimental group. Gender differences within the experimental group were not significant. Based on results, the researcher concludes that teaching aids positively affect conceptual understanding, engagement and achievement in the Angle unit and recommends wider use and further research.

Keywords: *learning, teaching, teaching aid, CBSE, primary school*

The study opens by situating teaching aids within the contemporary Indian education context (CBSE, NEP 2020, Digital India) and argues that mathematics-being abstract—benefits from concrete, visual and interactive instructional supports. The researcher notes the growing need to convert abstract mathematical ideas into tangible experiences, especially in primary grades, and positions teaching aids as critical for improved comprehension and retention. The context includes both face-to-face and distance education scenarios where digital and physical aids are relevant. The research question is stated succinctly: To study whether teaching aids favour learning in primary (Grade 6) students of the CBSE Board, with a focus on the "Angle" unit in Mathematics. The intent is to evaluate the effect of using teaching aids versus traditional methods on students' mathematical achievement.

Key Definitions and Variables

Study — defined both theoretically and operationally as the investigation and reporting of student learning outcomes; Teaching aids - broadly defined to include flashcards, charts, manipulatives, videos, smart boards, apps, and other materials; operationalized in this study by the specific tools used to teach the Angle unit; Variables: Dependent variable - educational achievement in Mathematics (Angle unit). Independent variable - gender (boys/girls); other experimental manipulation is teaching method (teaching aids vs. traditional).

Objectives

To study effectiveness of teaching aids for Grade 6 learning; To study effectiveness in relation to gender; To carry out teaching-aids sessions

(experimental) vs. traditional sessions (control); To develop and use a post-test for comparing achievement.

Five null hypotheses were tested, including no significant differences between: experimental and control post-test means (Ho1), boys and girls within experimental group (Ho2), boys in experimental vs control groups (Ho3), girls in experimental vs control groups (Ho4), pre-test vs post-test of experimental group (Ho5).

Importance and Limitations: The study argues the importance of identifying teaching aids that improve learning (for students, teachers, parents, schools and society). Delimitations: English-medium students, academic year 2024–2025, CBSE students only, and a sample drawn from one school (Ahmedabad).

Review of Related Literature: Theoretical Framework and Relevant Models: The review highlights multiple pedagogical frameworks that support the use of teaching aids in mathematics:

Concrete–Representational–Abstract (CRA) - progressive use of manipulatives, representations, then symbols; Cognitively Guided Instruction (CGI) - emphasizes building on learners' thinking; Van Hiele model - levels of geometric understanding, which aligns well with staged use of aids for angles; Schema-Based Instruction (SBI) - pattern recognition and schematic representation.

These frameworks support the assertion that manipulatives and visual tools aid mathematical internalization.

Empirical Studies Reviewed: Several international and national studies are summarized showing a consistent positive association between audio-visual/ICT aids and student achievement or interest (examples include studies in Rwanda, Nigeria, Bangladesh, Saudi Arabia, Taiwan, Algeria and Ecuador). Common findings: increased achievement, engagement, and teacher/student positive attitudes; but also limitations such as lack of infrastructure in some contexts. The review concludes the present study adds local evidence (Ahmedabad, Grade 6 Angle unit) with an experimental design.

Research Design and Methodology

Population and Sample: Population: All primary CBSE students in Ahmedabad district; Sample: One purposively selected CBSE school (NirmaVidyavihar, Chharodi campus, Ahmedabad). Four divisions of Grade 6 comprising 158 students (86 boys, 72 girls) formed the sample. The researcher explicitly used purposive sampling, a common pragmatic choice for experimental classroom work.

Sampling Rationale: The document explains sampling types (probability vs non-probability), reasons for purposive sampling, and the practical benefits (economy, manageability). The choice is justified because the study is a classroom-based experiment rather than a large generalizable survey.

Tool and Instrument: A self-made post-test (validated with experts and guide) on the Angle unit measured achievement. The researcher described construction steps (planning, item writing, assembling, directions, scoring key), and trialed the

tool with experts for language and option corrections. Pre-test marks were taken from unit marks and used in analysis.

Procedure / Implementation Schedule: The teaching schedule covered five sub-topics (Comparing Angles; Special Types of Angles; Measuring Angles; Drawing Angles; Types of Angles and their measures) taught from 23/06/24 to 27/06/24 (sessions 8:15–9:00), with the post-test administered on 28/06/24. Control groups received traditional instruction; experimental groups received instruction integrated with varied teaching aids.

Data Collection & Ethical Considerations: Permission was obtained from the school; the researcher collected completed tests and thanked participants. Data collection emphasized completeness of tests and cooperation of school staff. Statistical techniques planned: mean, standard deviation (SD), standard error, and t-test for hypothesis testing (conducted with computer support).

Analysis and Interpretation of Data

Overview of Analytical Strategy: Both descriptive (means, SD) and inferential (t-tests) statistics were used. The t-test was applied to compare group means (independent samples for group comparisons; paired t for pre/post within the same group). Assumptions and rationale for using t-tests are stated (interval/ratio data, near equal variances, approximate normality).

Key Results — Pre-test vs Post-test

A tabulated excerpt of pre- and post-test scores shows generally higher post-test scores across students; the highest pre-test score observed was 26 and highest post-test 30 in the sample table. The raw score listing supports an overall positive trend.

Post-test: Experimental vs Control: Experimental group (N = 79): Mean (M) = 29.6, SD = 6.80; Control group (N = 79): Mean (M) = 22.8, SD = 7.03; Computed t = 4.68, which exceeds the critical t at $p < 0.01$, so Ho1 rejected. The experimental group outperformed the control group, indicating a significant positive effect of teaching aids on achievement in the Angle unit.

Gender Comparisons within Experimental Group; Boys (experimental, N = 42): M = 22.6, SD = 7.21; Girls (experimental, N = 37): M = 24.8, SD = 6.54; Computed t = 1.52, not significant at 0.01 (NS). Thus Ho2 not rejected: no statistically significant gender difference in the experimental group's post-test performance. This suggests that teaching aids were equally beneficial across genders in this sample.

Boys: Experimental vs Control: Boys experimental: M = 22.6, SD = 7.21 (N = 42); Boys control: M = 19.7, SD = 6.54 (N = 44); t = 3.72, significant at $p < 0.01$ → Ho3 rejected: boys taught with aids outperformed boys in control.

Girls: Experimental vs Control: Girls experimental: M = 24.8, SD = 6.54 (N = 37); Girls control: M = 21.6, SD = 5.60 (N = 35); t = 3.90, significant at $p < 0.01$ → Ho4 rejected: girls taught with aids outperformed girls in control.

Pre-test vs Post-test in Experimental Group: Pre-test (experimental, N = 79): M = 26.3, SD = 5.41; Post-test (experimental): M = 29.6, SD = 6.80; t = 5.94, p

$< 0.01 \rightarrow$ Ho5 rejected: significant improvement within the experimental group from pre- to post-test.

Interpretation

Across comparisons, the experimental group showed consistent and statistically significant gains compared to controls; both boys and girls benefited. Gender differences within the experimental group were not significant, implying equitable benefit. The effect sizes are not reported in the document (recommendation: compute Cohen's d for future reporting), but mean differences and t-values indicate robust effects. Graphical representations of the means are included in the original document (graphs 4.1–4.5).

Summary, Findings, Implications and Suggestions

Summary of the Research Steps: The study formulated objectives and hypotheses, reviewed literature, designed an experimental pre-post test control group study, selected 158 Grade 6 students from one CBSE school using purposive sampling, implemented a five-day instructional intervention (23–27 June 2024) and administered a post-test on 28 June 2024. Data were analyzed using mean, SD and t-tests.

Major Findings: Post-test mean of experimental group (29.6) significantly higher than control (22.8); teaching aids had a positive effect; No significant difference between boys and girls **within** the experimental group (gender parity in benefit); Boys in experimental group outperformed boys in control ($t = 3.72$); Girls in experimental group outperformed girls in control ($t = 3.90$); Experimental group improved significantly from pre-test to post-test ($t = 5.94$).

Educational Implications

Conceptual clarity: Teaching aids (protractors, manipulatives, digital geometry apps, angle clocks) make angle concepts more tangible. Active learning: Hands-on and visual aids foster multisensory learning leading to better retention. Diverse learners: Visual, kinesthetic and auditory learners benefit from varied aids, supporting inclusive instruction. Motivation & attitudes: Teaching aids can reduce math anxiety and increase enjoyment and engagement.

Limitations: Sample limited to one English-medium CBSE school in Ahmedabad; generalizability is limited. Study confined to a single unit (Angle) and a short intervention period (5 days); long-term retention was not measured. Use of purposive sampling (non-probability) limits population inference.

Suggestions for Teachers and Schools: Integrate physical and digital teaching aids routinely in geometry lessons (protractors, manipulatives, digital geometry tools). Provide teacher training on effectively designing lessons with aids and formative assessment to gauge conceptual understanding in class. Invest in low-cost, high-impact aids and consider phased adoption in resource-constrained schools.

Suggestions for Future Research: Replicate with randomized sampling across multiple schools and boards to increase external validity. Extend interventions to other mathematical units and subjects (Science, Social Science, Languages) and measure long-term retention. Report effect sizes (Cohen's d), confidence

intervals, and consider ANCOVA to control for pre-test differences. (Not present in the current document; recommended.)

Conclusion

The empirical evidence from this study indicates that teaching aids significantly favour learning of the Angle unit among Grade 6 CBSE students in the sampled school. Both boys and girls benefitted; experimental gains were robust compared to traditional instruction. While the study is contextually limited, findings support broader classroom integration of teaching aids, teacher training, and further rigorous research to generalize results.

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