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Guided Critique of Quantitative Research

EDRS 811

1. Citation:

Pan, H., Lin, Q., & Zhu, W. (2025). Overcoming the gap in technology integration in limited conditions in rural classrooms. *The Journal of Educational Research, 118*(5), 413-424. https://doi.org/10.1080/00220671.2025.2490025

2. INTRO: a. Research Problem = Test digital tools in rural classrooms to determine if academic performance can be improved and close the education gap between urban and rural areas // **b. Population =** 2nd and 3rd-grade students in China from rural and urban schools // **c. Research Design =** a quasi-experimental methodology with two randomized groups (control & experimental) and a comparative group using a pre-test/post-test evaluation.

3. SAMPLE: a. Participants = 2nd and 3rd-grade students from three schools, two classes per school // **b. Sample size:** n = 360 (120 per group) // **c. Demographics:** Control: n = 120 (n_b = 54, n_g = 66), average age = 7.01, SD = 0.64; Experimental: n = 120 (n_b = 65, n_g = 55), average age = 7.12, SD = 0.59; Comparative: n = 120 (n_b = 59, n_g = 61), average age = 7.39, SD = 0.73; and Total Group Mean: n = 360 (n_b = 179, n_g = 182), average age = 7.17, SD = 0.65

4. PROCEDURE: a. Participants asked to do: All students and teachers followed the standard curriculum across four key subjects: Chinese language, English language, Mathematics, and Natural Sciences // Teachers received a 3-week standardized training program before implementation and digital support during implementation // Control Group A (rural setting) continued using traditional teaching methods // Experimental Group B (rural setting) and Comparative Group C (urban setting) integrated a structured digital program that used targeted

tools and resources, plus interactive software, educational platforms, and digital content;

b. Measures administered: When: end-of-the-year tests from the previous academic year (baseline pre-test), and end-of-the-year tests from the current academic/implementation year (post-tests) // How many times: Per student participant = Twice (one pre-test + one post-test)

5. MEASURES: a. List each construct & what is assessed: Study assessed academic achievement in four subjects: Chinese language, English language, mathematics, and natural sciences // **b. How each was assessed:** Scores from standardized end-of-year academic tests in four subjects and evaluated on a 100-point scale // **c. Operationalization**: standardized academic tests for each subject // **d. Info on validity or reliability of the measures:** no specifically named tests listed or discussed; using only end-of-year grades for each subject, for each student participant

6. RESULTS: a. Tests: (1) Intragroup Differences (to assess impact before and after the digital interventions): paired tests for each group & each subject = pre-t-tests & post-t-tests; IV = was time when test was administered; DV = grade of each subject; Null was rejected for Experimental and Comparative Groups in all four subjects, but retained for the Control Group; Interpretation: The digital integration resulted in meaningful gains for Experimental Group & Comparative Group, but not for the Control Group. **(2) Intergroup Differences** (data analysis comparisons between groups): One-way ANOVA for each subject; IV = Group (sub-groups are Experimental, Comparative, & Control); DV = Subject Grades; Null was rejected for all four subjects on post-intervention scores, but there were no pre-intervention differences; Interpretation: there were no differences in the pre-intervention scores, but significant between-group differences in post-intervention scores. **(3) Post-hoc Analysis** (to determine statistically significant differences between specific groups): Tukey's test on post-intervention scores revealed significant differences in actual scores on all four subjects; Experimental >

Control and Comparative > Control but no difference in Experimental and Comparative Groups; Interpretation: The Experimental Group (rural setting) and Comparative Group C (urban setting) had similar gains after implementation thus "bridging the digital divide between rural and urban schools". **(4) Effect Size** (to measure the impact of interventions): Cohen's d was reported as large for the intervention groups across all four subjects, thus indicates practical significance; Interpretation: Digital interventions significantly improve students' academic performances. **b. Tests not directly tied to a RQ**: An ANOVA for pre-intervention tests would not be directly tied to the RQ but could be used check them for equivalence. **c. Choice make sense**: These tests make sense since the paired t-tests address differences within groups, ANOVA and Tukey address differences between groups, and Cohen's d addresses the magnitude of the effects.

7. CRITIQUE: a. Areas of strengths: They offered teaching training that was structured and standardized with support during the study's implementation; integrated the digital tools across four subjects; and provided empirical evidence of results showing improvements. **Areas of weakness**: There were several weaknesses acknowledged: a limited number of schools, parental consent & self-selection bias; short-term interventions without long-term outcome assessment; influence of external factors; included a limited set of subjects; and digital integration across various demographic groups. **My position**: I am not sure how generalizable the results are, and I see the potential for a threat to validity based on these weaknesses mentioned above. **b. RQs w/appropriate conclusions**: Given the researchers tested for changes within groups, differences between groups, and differentiation of grouped pairs, their conclusions matched these tests and answered their research problem. **c. Accuracy of conclusions**: The data showed significant gains for the experimental and comparative groups that received the interventions, with tech gains by

rural schools being similar to gains by urban schools. This supports the research problem to explore if the inclusion of digital tools can close the education gap between urban and rural areas.

d. Weakness not addressed: There is no discussion on the variability of end-of-grade test types, the grading process of those tests, or whether the tests were internally developed, externally developed, or standardized. The study did not discuss inter-rater reliability.

e. Most interesting findings: Despite mentioning that the "limited and unstable internet connectivity" in rural areas "remains a significant barrier" (p. 421) and compromises the "continuity and quality of the educational process" (p. 421), the effect size was so large across all subjects.