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Individual Paper (Proposal 957)

Title: An Efficacy Study of Interleaved Mathematics Practice

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Background / Context

In a typical mathematics course, the material is divided into many lessons, and each lesson is followed by an assignment consisting of practice problems. Most commonly, each assignment consists solely of problems on the preceding lesson. For example, a lesson on ratios might be followed by an assignment with 12 problems on ratios. In other words, problems of the same kind are arranged in blocks. In the study reported here, *blocked assignments* served as the control. In an alternative approach that is the intervention of interest, problems within the course are rearranged so that most of the problems within each assignment are based on previous lessons and arranged in an *interleaved* order. For example, after a lesson on ratios, an interleaved assignment might include a small block of four ratio problems and one problem from each of eight previous lessons. The remaining eight ratio problems are distributed across future assignments.

Purpose / Objective / Research Question / Focus of Study

We compared the efficacy of interleaved assignments (intervention) and blocked assignments (control) in a controlled, classroom-based experiment.

Setting

We conducted the experiment at a large public middle school in Tampa, Florida.

Participants

Three middle school mathematics teachers and 140 of their seventh grade students participated.

Intervention

Students received 10 assignments over an 8-week period. All students received the same practice problems, but the problems were rearranged to produce two versions of each assignment. Across all assignments, students received 12 problems on each of four different kinds of problems (and dozens of other kinds of problems that were not the focus of this study). In the blocked condition, all 12 problems of a particular kind were blocked into a single assignment. In the interleaved condition, just 4 of the 12 problems appeared together in one assignment, and the remaining 8 were distributed across subsequent assignments.

Research Design

The study used a counterbalanced crossover design. We randomly divided the eight classes into two groups of four with the constraint that each teacher taught at least one class in each group. One group received interleaved assignments for problem kinds A and B and blocked assignments for kinds C and D, and the other group received the reverse.

Data Collection and Analysis

For each assignment, we provided teachers with a slide presentation with solved examples and solutions to each problem. Teachers presented the examples before distributing the assignment. On the following school day, teachers presented the solutions while encouraging students to make any necessary corrections to their own solutions, and then collected the assignments. Within two days of each assignment's due date, at least one of the authors visited the school and scored the assignments. The Final Test was given to students during their regular classroom period and proctored by both the teacher and one author. Students were not told of the test in advance. Two raters scored each answer as correct or not.

Results

Final test scores revealed that interleaved assignments were nearly twice as effective as blocked assignments, 72% vs. 38%, $t(139) = 10.49$, $p < .0001$ (Cohen's $d = 1.05$).

Conclusions

The finding reported here suggests that interleaved mathematics assignments might be feasible and effective. This intervention could be implemented at all levels of mathematics instruction, and creators of mathematics texts and other instructional media can provide interleaved practice by simply rearranging practice problems.

Appendix A. References

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