
Synthesis of Research on the Effects of Adaptive Education

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Systematic analysis of 38 studies involving 7,200 students in various content areas and grade levels reveals that instruction adapted to individual differences produces strong positive effects.



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Interest in individualized instruction apparently peaked in the 1970s and has declined in recent years (Rothrock, 1982), but adapting education to individual differences remains an essential part of quality education (Fenstermacher and Goodlad, 1983; Wang and Walberg, 1985). The goal of providing appropriate education for all students is apparent in recent public sentiment and legislation stressing educational excellence.

Adaptive programs use a variety of curriculums and instructional strategies that have been shown to be effective in many types of classroom settings and with students from diverse backgrounds. These include mastery learning, cooperative teams, and individual tutorials, as well as large- and small-group instructional approaches that have shown moderate to large effect sizes in previous research syntheses (Walberg, 1984). There is considerable variability across adaptive programs, but in general they attempt to use adopted curriculum in the manner best suited to each student, teacher, and class. Within any program, teachers vary their use of materials and procedures so that students are treated in accord with their educational needs (Wang and Lindvall, 1984). The flexibility of adaptive programs enables teachers to provide more adequately for the needs of both special and general education students in regular classrooms.

Methods and Procedures

Our study quantitatively synthesized experimental and quasiexperimental, published, and unpublished research on the effects of adaptive education on student outcomes in naturalistic settings. We systematically collected research reports published from 1973 through 1982 by searching the *Current Index to Journals in Education*, *Resources in Education*, *Review of Education Research*, *American Educational Research Journal*, *Journal of Educational Psychology*, *Journal of Educational Research*, and *Journal of Experimental Education*. We also examined studies cited in the references of all these sources and established criteria for inclusion in the present synthesis. The study had to: be conducted in an ordinary elementary or secondary school classroom, have either contrasted groups or correlational results, and have sufficient quantitative data bearing on sample population studies to calculate effect sizes (Glass, McGaw, and Smith, 1981). In addition, the program studied had to contain at least one of the following characteristics of adaptive education:

1. Instruction is based on the assessed capabilities of each student.
2. Materials and procedures permit each student to progress in mastering the curriculum at a pace suited to his or her abilities and interests.
3. Periodic progress evaluations inform students of their mastery.

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4. Students assume responsibility for diagnosing their current needs and abilities, planning and pursuing individual learning activities, and evaluating mastery.
5. Alternative learning activities and materials are available to help students acquire academic skills and content.
6. Students have a choice in selecting educational goals, outcomes, and activities.

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7. Students help one another to pursue individual goals and cooperate in achieving group goals (Wang and Lindvall, 1984).

The search and selection procedures resulted in a collection of 38 studies. Of these, 24 are published articles, ten are unpublished reports, and four are dissertations. These studies represent approximately 7,200 students. Sixteen studies involve primary students (grades K-3), 11 include intermediate students (grades 4-6), and 11 focus on junior high and high school students. Math is the subject area in 11 studies, and ten studies involve reading. Language arts and science are each the focus of four studies while the remaining works include a variety of other subject areas.

Results

The results of our synthesis indicate strong and consistent effects for the adaptive instructional approaches. The mean study-weighted effect size for the 38 studies and 7,200 students was .45. This suggests percentiles on student outcomes of 67 for the experimental group and 50 for the control group. That is, students in adaptive

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programs scored on average at the 67th percentile, while students not in the adaptive programs (the control group) scored at the 50th percentile.

The mean study-weighted effect size for the 34 studies containing cognitive outcomes is .39, which suggests percentiles on student cognitive outcomes of 65 (experimental group) and 50 (control group). The mean study-weighted effect size for the 14 studies that focused on student affective outcomes is .60, while the mean study-

weighted effect size for the five studies that contained behavioral outcomes is .69. These correspond to percentiles of 73 for affective outcomes and 75 for behavioral outcomes. These results suggest that adaptive education has substantial effects on all three student outcomes and is especially beneficial in enhancing students' attitudes and behaviors.

The relationship of each conditioning or independent variable (characteristic of the reviewed study) to the mean study-weighted effect size was tested for significance using analysis of variance techniques. The results indicate that none of the variables have a statistically significant impact on the mean study-weighted effect size. This suggests that no one more than any other conditioning variable affects the overall student outcomes or the gains attributable to the adaptive education program, and that any one of them produces robust, consistent, and moderately large effects. In other words, the results do not differ significantly across categories of adaptiveness, outcomes, methodological rigor, social contexts, study characteristics, and subject characteristics.

Conclusions

There seems to be little doubt that adaptive education substantially affects student outcomes; strong and consistent effects were noted in our synthesis findings. The mean effect size of .45, or nearly half a standard deviation, is considerably larger than the average of several dozen syntheses of productive factors in classroom learning compiled by Walberg (1984). In fact, it is more than twice the average effect size (.20 standard deviations) found in classroom research of the past few decades. Such robustness and consistency are scientifically important because the results are apparently generalizable across a wide variety of conditions that have been investigated, as well as across grade levels and student characteristics such as ability, socioeconomic status, race, and gender.

The consistent positive effects reflected in the studies of the past decade of research on adaptive instruc-

Highlights of Research on Adaptive Education

A quantitative synthesis of a large number of research studies conducted over a ten-year period shows that adaptive instruction greatly improves student learning. This finding is quite consistent despite considerable differences among program features.

All programs included in the synthesized studies featured at least one of the following adaptive characteristics:

- Instruction is based on the assessed abilities of each student.
- Students work at their own pace.
- Students receive periodic reports of their mastery.
- Students plan and evaluate their own learning.
- Alternative materials and activities are provided.
- Students have a choice of goals and activities.
- Students help one another to achieve individual and group goals.

No one of these variables was more significantly associated than others with the positive results. Adaptive programs achieved similar outcomes despite differences in specific program features, social context, grade level, or type of students.

Adaptive programs produced positive results in students' cognitive outcomes but had even stronger effects on attitudes and behaviors.

tion are particularly noteworthy. Many school districts throughout the country are adopting approaches that stress whole-group instruction. Such programs unavoidably favor some students (such as the more or less able) over others. Our synthesis suggests that tailoring instruction to respond to the learning characteristics and needs of individual students can be much more effective in obtaining intended social and academic outcomes. □

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