

Comparison of a Full-Time Mainstreaming Program and a Resource Room Approach

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Abstract: A study comparing the effects of a full-time mainstreaming approach for handicapped students with a resource room approach for similar students is reported. Results of the study suggest that the full-time mainstreaming approach, known as the Adaptive Learning Environments Model, exceeds the resource room approach in attaining desirable classroom processes, student attitudes, and student achievement in basic skills.

■ This article reports a study designed to compare the effects of an educational approach, the Adaptive Learning Environments Model (ALEM), when used as a full-time mainstreaming program for exceptional students (learning disabled, socially and emotionally disturbed, visually impaired, and gifted), with the effects of a resource room approach for similar students. It is the second article published in this journal on an ongoing program of research investigating product and process outcomes resulting from use of the ALEM in a variety of school settings.

The study reported in this article focused on comparing student achievement, behavior, and attitudes, the incidence of desirable classroom processes, and costs under ALEM and resource room conditions. As background information, a brief description of the ALEM precedes a discussion of the study and its results.

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THE ADAPTIVE LEARNING ENVIRONMENTS MODEL

The overall goal of the ALEM is to furnish a demonstrably effective educational alternative that accommodates the instructional and special service needs of a broad range of individual students in regular class settings (Wang, 1980, 1981). The design of the program is aimed at providing for the learning needs of each student while adapting to the professional and financial resources of local schools.

The ALEM contains 12 critical design dimensions which, in combination, support (a) early identification of learning problems through a diagnostic-prescriptive monitoring system integrally related to the program's instructional component; (b) delabeling of mainstreamed "special" students and description of learning needs in instructional, rather than categorical, terms; (c) individually-designed educational plans that accommodate each student's learning strengths and needs; and (d) teaching of self-management skills that enable students to take increased responsibility for their learning.

In schools where the ALEM is in operation, instruction in basic skills for all students con-

sists of two major components. The first is a highly structured prescriptive learning component which uses built-in, diagnostic procedures to develop skills in academic subject areas. The second is a more open-ended, exploratory, learning component which promotes social and personal development through students' planning and management of their own learning. As a result of the combination of these two components, it is expected that each student will adopt an optimum pace for successfully acquiring skills in academic learning and in management of the learning environment. In turn, it is anticipated that students will acquire an increased sense of competence and self-confidence in their own abilities. At the same time, teachers are expected to be able to spend greater amounts of time providing instruction rather than managing students (Wang, 1980). For more detailed descriptions of the ALEM and its impact on student outcomes in both classroom processes and basic skills achievement, see Wang (1983) and Wang and Birch (1984).

THE STUDY

Setting

This study was conducted during the 1980–81 school year in one of the schools where the ALEM is used as a mainstreaming program for exceptional students. Data were collected on 179 students—108 regular and exceptional students in ALEM classes (kindergarten through third grade), and 71 regular and exceptional students in non-ALEM classes (first through third grades). All of the students in the study sample were randomly assigned to the ALEM and non-ALEM classes.

Each school day, the regular and exceptional students in the ALEM classes received instruction together in all subject areas, including reading and mathematics, on a full-time basis. Education specialists (e.g., speech therapists, special education teachers, reading specialists) were available to consult with, and provide support services for, regular teachers when needed. In contrast, identified handicapped students in the non-ALEM classes spent each morning (a.m. sessions) receiving instruction in reading and mathematics in a special education resource room. The resource room stu-

dents attended non-ALEM regular classes in the afternoon (p.m. sessions) for instruction in other subject areas, such as social studies, science, and language arts—an instructional program with content and materials identical to that provided for students in the ALEM classes.

Measures and Procedures

Classroom processes. The Student Behavior Observation Schedule (SBOS) was used to obtain information on several major categories of classroom processes (Wang, 1974). They are (a) the nature and patterns of interactions between teachers and students, (b) the nature and patterns of peer interactions, (c) the settings in which learning activities occurred, (d) the types of tasks or activities on which students worked, and (e) the manner in which time was spent by students. The SBOS has been used in a number of investigations of classroom processes; its inter-observer agreement has been found to be consistently above 85% (Wang, 1974, 1976).

The SBOS was administered in October and April of the 1980–81 school year for the a.m. sessions of the ALEM and non-ALEM classes. Additional observations of the handicapped students in both sets of classrooms were conducted. These observations focused on the frequency of teacher-directed activities, independent work, and time on-task. They investigated the extent to which significant changes in classroom behavior occurred between October and April for the two groups of students, both when they functioned in the respective programs during the a.m. sessions and when they participated in the same district-based program in the p.m. sessions.

Student achievement in basic skills. Standardized achievement test scores in mathematics and reading were used to measure student achievement in basic skills.

Student attitudes. The Perceived Competence Scale (PCS) for children (Harter, 1982) was used to assess students' perceptions of their own cognitive, social, and physical competence, and their own feelings of self-esteem. The PCS uses a structured rating scale format. Students are given descriptions of hypotheti-

cal children and are asked to choose the ones most like themselves. They also are asked to describe how similar they think they are to the hypothetical children. The PCS was administered during May 1981 to all first-, second-, and third-grade students in the ALEM and non-ALEM classes.

Program costs. To determine the cost-effectiveness of the ALEM, the actual and projected costs of installing, maintaining, and extending the program were compared to the costs of maintaining the regular and special education programs in the school where the study was conducted. Information for the analysis was provided by the school district.

Results

The following summary of results compares the effects of the ALEM and resource room programs in terms of classroom processes, student attitudes, student achievement in basic skills, and program costs.

Classroom processes. Results from the two different sets of classroom observations carried out in the study are summarized below. Included are summaries of (a) results from the analysis of the SBOS data for students in the ALEM and non-ALEM classrooms during the a.m. sessions, and (b) comparisons of the classroom behaviors of the two groups of mainstreamed handicapped students.

Comparison of classroom processes for students in the ALEM and non-ALEM classrooms during the a.m. sessions. A comparison of the classroom process data collected for all students in the ALEM and non-ALEM mainstreaming classes during the a.m. sessions showed statistically significant differences ($p < .05$) between the two groups of students in all the classroom process variables included in the study. For example, students in the ALEM mainstreaming classes initiated interactions with teachers more often (32.4%) than students in the non-ALEM classes (4%). Also, they interacted with their teachers significantly more for instructional purposes (95.2% vs. 88.1% for the non-ALEM students), and they interacted more frequently with peers for instructional purposes (45% vs. 13% for the non-ALEM classes).

Students in the ALEM classes spent less time on teacher-prescribed activities (63.6% vs. 91% for the non-ALEM students) and more time on self-selected exploratory activities (26% vs. 5.5% for the non-ALEM classes). At the same time, students in the ALEM situation spent nearly equal percentages of time in group settings (group interactive, 22.3%; group parallel, 25.1%; total, 47.4%) as in individual settings (52.6%). Data on this variable are comparable to the findings for students in the non-ALEM classes. They were observed to spend 54.9% of their time in group settings and 45.1% in individual settings. It is interesting to note, however, that students in the ALEM classes were observed to spend more time on-task (90.1%) than students in the non-ALEM classes (80%). (It should be pointed out here that because handicapped students in the non-ALEM classes received instruction in the resource room during the morning sessions, they were not present when the classroom process data for the non-ALEM regular classes were collected.)

The data described above suggest not only that adapting instruction to student differences in regular class settings is feasible, but also that it is likely to lead to the creation of classroom environments that facilitate attainment of the kinds of desirable classroom processes characteristically attributed to the group-based, "direct instruction" approach in the effective schooling literature (e.g., National School Public Relations Association, 1981; Good, 1983). For example, some of the major criticisms of the individualized instructional approach have been a disproportionate amount of time spent by students working in individual settings, comparatively low on-task rates, high rates of disruptive behavior, and a large percentage of teacher time spent interacting with students on management rather than instructional matters (e.g., Brophy, 1979). In contrast to these criticisms, the data from this study reflect the kinds of classroom processes highlighted in the literature on instructionally effective classes.

Comparison of classroom processes for the ALEM and non-ALEM handicapped students. To further investigate the impact of the ALEM on the classroom processes of mainstreamed handicapped students, data from the additional classroom observations of handicapped students in the ALEM classrooms and the re-

source room were analyzed. Table 1 summarizes the comparison of the changes in the observation data collected in October and April. Separate analyses were conducted for the a.m. sessions, when the two groups of students were in different programs, and the p.m. sessions, when the same district-based program was used for both groups. (As noted earlier, the resource room students returned to their non-ALEM regular classrooms in the afternoon, while the ALEM students remained in the same classrooms during the p.m. sessions.) The table includes the mean percentages of the observed behaviors for October and April as well as the changes in percentage points for each group.

To investigate the extent to which program differences resulted in differences in observed student behavior changes from the beginning to the end of the school year, a series of t tests was performed. The results are summarized in Table 1. As shown in the table, the handicapped students in the ALEM classrooms showed a significant decrease (8.1 percentage points) in the mean percentage of time spent on teacher-directed activities. In addition, significant gains were observed in these students' rates of on-task behavior (from 69.1% in October to 88.2% in April), and increases (of 27.1 percentage points) were observed in the percentage of time the students spent working independently (either in groups or in individ-

TABLE 1
Changes in Behavior of Handicapped Students in ALEM Classrooms and Resource Room Between October and April

Observation Period/ Behaviors	ALEM Classrooms						Resource Room					
	October		April		Change in Per- centage Points	Proba- bility from t- test	October		April		Change in Per- centage Points	Proba- bility from t- test
	$\bar{X}\%$	S.D.	$\bar{X}\%$	S.D.			$\bar{X}\%$	S.D.	$\bar{X}\%$	S.D.		
A.M.												
Teacher-Directed Activities	12.9	12.3	4.8	2.5	-8.1	<0.1	40.3	13.3	22.5	11.9	-17.8	<.01
Independent Work	56.2	13.8	83.3	2.8	27.1	<.01	34.2	14.9	48.7	11.9	14.5	<.01
On-Task	69.1	6.7	88.2	4.2	19.1	<.01	74.4	8.0	71.2	15.3	-3.2	N.S.
Non-ALEM Mainstreaming Classrooms												
P.M.												
Teacher-Directed Activities	25.2	10.4	29.1	23.4	3.9	N.S.	27.5	19.0	44.5	37.0	17.0	N.S.
Independent Work	37.3	22.3	67.3	24.2	30.0	<.01	31.1	19.8	28.2	24.9	-3.5	N.S.
On-Task	62.5	13.3	96.3	4.2	33.8	<.01	58.7	15.9	72.7	22.1	14.0	N.S.

Note. Comparisons were based on the number of children for whom both October and April data were available; 11 handicapped students were included in the ALEM data set, and 11 were included in the resource room data set.

Note. This table is taken from Wang, M. C. (1982). *Effective mainstreaming is possible—Provided that . . .* (LRDC Publication Series 1982/13). Pittsburgh PA.: University of Pittsburgh, Learning Research and Development Center.

ual settings). It is noteworthy that when the ALEM students participated in the school district's regular education program during the p.m. sessions, similar patterns of changes between October and April were observed in on-task behavior and independent work. Only a slight increase was observed, however, in teacher-directed activities. These results suggest that gains in on-task behavior and independent work made by the ALEM students throughout the school year were transferred to situations in which the ALEM was not in operation. Furthermore, the contrast in the change patterns for teacher-directed activities in the a.m. and p.m. sessions probably is more a reflection of program differences than differences in student behavior.

In contrast to the data from the ALEM classrooms, the data from the resource room on changes in student behavior suggest a very different pattern. Although significant changes ($<.01$) in the percentages of the observed frequencies of teacher-directed activities and independent work were noted for the handicapped students while in the resource room, similar behavior changes were not noted for these students when they functioned in their regular mainstreaming classrooms during the p.m. sessions. It is also interesting to note the differences in the changes (between October and April) in the on-task behavior of the ALEM and resource room students during both the a.m. and p.m. sessions. The magnitude of change was significantly less for the resource room students (-3.2 percentage points in the a.m. sessions and 14 percentage points in the p.m. sessions), compared to the change for the ALEM students (19.1 percentage points in the a.m. sessions and 33.8 percentage points in the p.m. sessions).

The data for the p.m. sessions are particularly noteworthy because the same school district program was used for both groups of students. For example, although the October data for the p.m. sessions essentially showed no significant differences between the two groups, significant differences were observed in the April data. The ALEM students showed significant increases in independent work and on-task behavior during both the a.m. and p.m. sessions, while the data for the resource room students did not reflect similar changes in these areas from October to April. Another major difference between the two groups had to do with their observed teacher-directed ac-

tivities and independent work in April during the p.m. sessions. Basically, the resource room students were observed to engage more in teacher-directed activities (44.5% vs. 29.1%), while the ALEM students were observed to engage more in independent work (67.3% vs. 28.2%) and on-task behavior (96.3% vs. 72.7%).

Overall, the comparison data on classroom behaviors suggest two major findings. First, compared to the non-ALEM students, the ALEM students were observed to engage less in teacher-directed work, more in independent work, and more in on-task behavior. Second, positive changes in behavior from October to April during the a.m. sessions were transferred to the p.m. sessions only for the ALEM students. In other words, the effects of the resource room program were not generalized to the district's regular program, while transfer effects were observed for the ALEM students.

Student achievement in basic skills. Raw scores on the Stanford Achievement Test in mathematics and reading were compared for the handicapped, regular, and gifted students in the ALEM and non-ALEM classes. A number of comparisons were made. First, the scores of the ALEM handicapped students were compared with those of the non-ALEM handicapped students. In the fall, the ALEM handicapped students scored slightly lower (25 in reading; 29 in mathematics) than their non-ALEM handicapped peers (32 in reading; 34 in mathematics). However, by spring, the ALEM students had made greater gains in reading (21 vs. 7) and nearly comparable gains in math (18 vs. 17).

A second comparison was made between ALEM regular students and non-ALEM regular students. The initial and final achievement scores of both groups were comparable. In the fall, the scores in reading were 48 for the ALEM students and 49 for the non-ALEM students. In mathematics, the scores were 43 for the ALEM students and 42 for the non-ALEM students. The spring scores in reading were 62 for the ALEM students and 64 for the non-ALEM students; in mathematics, the scores were 59 for the ALEM students and 60 for the non-ALEM students.

Finally, the achievement scores of ALEM gifted students and non-ALEM gifted students were compared. As with the scores of regular students, the reading and mathematics scores

for the two groups of students in both fall and spring were comparable. The reading score for the gifted ALEM students increased from 55 in the fall to 93 in the spring, and a similar increase was noted for the non-ALEM students (from 59 to 90). Both groups of gifted students also experienced gains from fall to spring in their mathematics scores: ALEM students scored 48 in the fall and 87 in the spring; non-ALEM gifted students scored 49 in the fall and 90 in the spring.

It seems especially important to note that the achievement data should be interpreted in light of the staffing resources for the two groups of classrooms. The 11 handicapped students in the resource room received instruction in mathematics and reading from one teacher and one aide (a student-teaching staff ratio of 5.5 to 1). In contrast, the teaching team in the ALEM mainstreaming classes, with an average of 45 students, consisted of two teachers and one instructional aide (a student-teaching staff ratio of 15 to 1). The ALEM teaching staff worked not only with the regular and gifted students, as did the staff of the non-ALEM classrooms, but also provided reading and mathematics instruction to the mainstreamed handicapped students, while the non-ALEM handicapped students received reading and mathematics instruction in resource rooms from special education teachers.

Student attitudes. An important goal of schooling in general, and assessment of the ALEM's efficacy in particular, is documentation of social and attitudinal outcomes (Glazard, 1981; Reynolds & Birch, 1982; Strain, 1982). It has been hypothesized that exceptional students in adaptive instruction programs like the ALEM—full-time mainstreaming programs aimed at adapting to individual social and learning needs—are likely to develop positive perceptions of academic and social competence as well as overall feelings of self-esteem. To investigate the impacts of the two programs on students' self-perceptions, the data from Harter's (1982) Perceived Competence Scale for children were analyzed.

Overall, the data suggest three major findings. First, the handicapped students in the ALEM classes tended to rate their cognitive competence, social competence, and general self-esteem significantly higher than did the handicapped non-ALEM students. Second, regular students in both the ALEM and non-

ALEM classes rated themselves at about the same levels in social competence and general self-esteem. However, the ALEM regular students scored slightly higher in cognitive competence. Finally, handicapped students in the non-ALEM classes showed consistent patterns of lower self-ratings on all three scales than the regular students in the same classes. This pattern was reversed, however, in the ALEM classes, where the handicapped students' self-ratings and those of the regular students were almost identical on the social competence and general self-esteem rating scales. In fact, the mean ratings of the handicapped students were slightly higher than those of their regular peers.

Program costs. In a preliminary examination of the cost effectiveness of the ALEM in providing special education services for exceptional and non-exceptional students in regular classes, the costs of installing and maintaining the ALEM in School District A were compared to the cost of maintaining the district's conventional regular and special education programs. (The school which provided the setting for this study is located in School District A.) Results of the comparison are summarized in Table 2. The table shows the projected implementation and maintenance costs involved in initial installation of the ALEM and extension of the program to seven kindergarten through third-grade classes in two schools over a three-year period. Also noted are the costs of maintaining School District A's regular and special education programs, as well as the total cost of serving all students in the district through the ALEM and the conventional programs.

As noted in the table, the total cost decreased significantly from 1979–80, one year before the ALEM was installed. Despite the considerably greater ALEM start-up cost, the district realized a reduction of close to \$20,000 in total spending during the first year (1980–81). By the third year (1982–83), when seven kindergarten through third-grade classes were implementing the ALEM, School District A's total ALEM and special education costs were expected to be reduced from the 1979–80 total by a little more than 50%. It should be noted that the reduced cost figures for the ALEM reflect the savings which resulted from using the ALEM as a full-time mainstreaming program and redeploying the district's current special education personnel and facilities.

It is emphasized that these cost comparisons are made from a very limited base of hard data, and they include linear projections which must be considered quite tentative. However, even if the ALEM costs were underestimated by as much as 50% or 75%, the results still are encouraging from the cost/quality point of view. Of course, quality, as reflected in students' academic and personal-social growth, must be the overriding consideration in any program.

SUMMARY AND DISCUSSION

Preliminary results from the two studies on the ALEM reported in this journal suggest the feasibility of restructuring regular education programs to much more adequately serve students with diverse learning characteristics and needs, including many of those students who currently are served by compensatory and special education pull-out programs. Realization of this vision requires restructuring both the educational system and the present fiscal reim-

bursement and accounting systems to ensure the provision of adequate financial and administrative support for program implementation. The data presented in Table 2, for example, provide a case-in-point. The start-up costs of implementing an adaptive school program might be considerably greater than most districts' ordinary basic education costs. Thus, districts need the flexibility to creatively use all of their available resources in the initial provision of "special" education services in regular classes for every student who needs them. It is our contention that widespread implementation of effective mainstreaming is unlikely without concomitant restructuring of schools' present educational systems and financial support/fiscal management structures.

While the limited data presented in this paper must be interpreted with caution, they do suggest a feasible and promising alternative. The time seems to be ripe for pursuing intensive efforts aimed at identifying ways of capitalizing on the technological and educational programming advancements, as well as

TABLE 2*
Comparisons of the Projected Costs of Implementing the ALEM as a Mainstreaming Program and Implementing the District's Traditional Regular and Special Education Programs School District A

School Year	ALEM			Traditional Program			
	Number of Classes	New Implementation Cost	Maintenance Cost	Number of Classes	Maintenance Cost (Regular Education)	Special Education Cost	Cost to School District
1979-80	0	0	0	7	\$2,128	\$60,000	\$62,128 ^a
1980-81	4	10,700 ^b	0	3	1,265	30,000	41,965
1981-82	7	8,700	6,600	0	0	15,500	30,800 ^c
1982-83	7	0	14,500	0	0	15,500	30,000

Note. The projected costs presented here are based on current costs and do not provide for inflation.

Note. This table is taken from Wang, M. C. (1982). *Effective mainstreaming is possible—Provided that . . .* (LRDC Publication Series 1982/13). Pittsburgh PA.: University of Pittsburgh, Learning Research and Development Center.

^a This figure represents the cost (excluding the salaries of regular and special education teaching staff) to the district of maintaining a basic education and resource room program for the education of regular and exceptional children. The current enrollment figure of 22 exceptional children was used. This figure accommodates two resource rooms to support the regular education program for exceptional children.

^b Implementation figures for the ALEM include the cost of aides and curricula, while the figures for the traditional program include only curricular cost.

^c This figure includes the full-time salary of a special education teacher who would function as the education specialist for the ALEM classrooms.

the social and political supports, for providing "special" education services in regular school and class settings. One realistic possibility for the 1980's would involve building on the state of the art of current school improvement efforts to provide instructional-learning experiences that are adaptive to the special learning needs of diverse students. Additional reports of findings are projected from ALEM installations in several different states. From this larger database, it is planned to further test the range and adaptability of such approaches to merging the best in regular and special education.

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