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RESEARCH AND DEVELOPMENT ACTIVITIES IN R/I UNITS OF TWO ELEMENTARY SCHOOLS OF MANITOWOC, WISCONSIN, 1966-1967.

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ACTIVITIES OF RESEARCH AND INSTRUCTION UNITS IN TWO MANITOWOC, WISCONSIN, ELEMENTARY SCHOOLS DURING THE 1966-67 SCHOOL YEAR ARE REVIEWED. RESULTS OF TWO CONTROLLED EXPERIMENTS CONDUCTED IN THE UNITS ARE REPORTED AND EVALUATED. IN ONE STUDY THE PERFORMANCE OF 82 THIRD GRADE PUPILS FROM ONE SCHOOL HOMOGENEOUSLY GROUPED FOR ARITHMETIC INSTRUCTION WAS COMPARED WITH THAT OF THIRD GRADE PUPILS IN A CLASS OF ALL ABILITY LEVELS. THE THREE HOMOGENEOUS GROUPS (HIGH, AVERAGE, AND LOW ABILITY) AND THE CONTROL GROUP (HETEROGENEOUS) WERE TAUGHT WITH THE SAME TEXT FOR 16 WEEKS. EACH TEACHER TAUGHT EACH OF THE FOUR GROUPS FOR A PERIOD OF 4 WEEKS. ALL PUPILS WERE TESTED ON THREE ARITHMETIC TESTS. RESULTS SHOWED THAT STUDENTS OF AVERAGE ABILITY-ACHIEVEMENT PERFORM BETTER IN HOMOGENEOUS GROUPS, STUDENTS OF LOW ABILITY-ACHIEVEMENT PERFORM BETTER IN HETEROGENEOUS GROUPS, AND HIGH ABILITY-ACHIEVEMENT STUDENTS PERFORM WELL UNDER EITHER GROUPING CONDITION. INDIVIDUALIZED AND TRADITIONAL SPELLING INSTRUCTION AT THE FOURTH GRADE LEVEL WERE CONTRASTED IN THE SECOND EXPERIMENT. FIFTY-SEVEN SUBJECTS WERE SEPARATED BY SEX AND RANKED BY SPELLING ABILITY. ONE-HALF OF EACH GROUP SERVED AS CONTROLS AND USED THE TRADITIONAL CURRICULUM. THE EXPERIMENTAL GROUP FOLLOWED A COMMERCIALLY DEVELOPED INDIVIDUALIZED PROGRAM. SPELLING LESSONS WERE GIVEN 15 MINUTES A DAY FOR 15 WEEKS. THE TEACHERS ALTERNATED CLASSES EVERY 3 WEEKS. EFFECTS OF THE INSTRUCTIONAL PROGRAMS WERE NOT SIGNIFICANTLY DIFFERENT FROM EACH OTHER. HOWEVER, STUDENTS PARTICIPATING IN THE EXPERIMENT GAINED 2 1/2 TIMES THE EXPECTED GAIN ON A STANDARDIZED SPELLING ACHIEVEMENT TEST. THE TEACHERS FELT THAT PARTICIPATION IN THE EXPERIMENT PROVIDED MOTIVATION FOR THE STUDENTS AND PROBABLY ACCOUNTS FOR THE ACHIEVEMENT GAINS. (AA/RS)

RESEARCH AND DEVELOPMENT ACTIVITIES IN R&I UNITS OF TWO ELEMENTARY SCHOOLS OF MANITOWOC, WISCONSIN, 1966-1967

WISCONSIN RESEARCH AND DEVELOPMENT

CENTER FOR COGNITIVE LEARNING

Technical Report No. 35.

RESEARCH AND DEVELOPMENT ACTIVITIES IN R & I UNITS OF TWO ELEMENTARY SCHOOLS OF MANITOWOC, WISCONSIN, 1966-1967

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PREFACE

A major objective of the Wisconsin Research and Development Center for Cognitive Learning is to develop an environment in local school buildings and systems which facilitates both student learning and research, development, and innovative activities. This report is concerned with the description and evaluation of such facilitative organizations and their activities in several elementary schools in the Manitowoc Public School system. The report further demonstrates how instructional and supervisory personnel in the public schools, working with personnel at the Center who possess specialized knowledge in various disciplines, cooperate to extend knowledge and improve educational practice through research and development activities.

Many people, other than the R & D personnel and unit leaders denoted as authors, contributed their skills in planning, executing, or evaluating the activities reported herein. In the Manitowoc Schools Miss Helen Hoyer, Supervisor of Elementary Education, Dr. Norris Sanders, Supervisor of Educational Research and Director of Title III, and Vernon Childs, Assistant Superintendent, generously gave of their time to aid in the planning of the experiments.

Professor Herbert J. Klausmeier, Principal Investigator of Project MODELS, initiated the idea of R & I Units and assumed primary responsibility for the conceptualization of the total R & I program and for the broad implementation strategies in the local schools. Professor Klausmeier wrote the introductory and concluding sections of this report. Mrs. Doris Cook assumed primary responsibility for working with the building personnel during the year. She, Dr. James Wardrop, and Mrs. Mary Quilling served as consultants for the experiments reported. Other Center personnel who assisted in data collection and analyses include Mrs. Barbara Kennedy, Mr. James Bavry, and Mr. Louis Pingel. The authors acknowledge with appreciation the contributions of the above.

Thomas A. Romberg
Director, Programs 2 and 3

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ABSTRACT

Activities of R & I (Research and Instruction) Units in two Manitowoc, Wisconsin, elementary schools during the 1966-1967 school year are reviewed. Results of two controlled experiments conducted in the Units are reported and evaluated. In one study the performance of third-grade pupils homogeneously grouped for arithmetic instruction was compared with that of third-grade pupils in a class of all ability levels. Results showed that students of average ability-achievement perform better in homogeneous groups, students of low ability-achievement perform better in heterogeneous groups, high ability-achievement students perform well under either grouping condition. Individualized and traditional spelling instruction at the fourth-grade level were contrasted in the second experiment. Effects of the instructional programs were not significantly different from each other; however, students participating in the experiment gained two and one-half times the expected gain on a standardized spelling achievement test.

I

INTRODUCTION

Securing more efficient pupil learning in the cognitive domain continues to be the main focus of the research and development activities conducted jointly by the Wisconsin R & D Center for Cognitive Learning and several school systems as part of Project MODELS. One possible means for accomplishing this is to replace the graded, self-contained classroom with a research and instruction unit (R & I Unit) in which various instructional activities may be performed more effectively. One R & I Unit was organized in each of two elementary schools of Manitowoc during 1966–1967. In each unit the attempt was made (1) to provide excellent instruction for children, (2) to carry out research which is essential for improving instruction, (3) to develop new instructional procedures, materials, or ideas for improving instruction, and (4) to bring into the Unit promising educational innovations. The R & I Units are hypothesized to be more effective than self-contained classrooms in achieving these purposes. In order to be more effective, the role of the building principal, Unit leader, classroom teacher, and teaching aide are being refined, and new relationships involving representatives of the central staff, the school building, and other agencies are being established. Thus, the concept of improving instruction through research and development in R & I Units is complex, involving an attempt to utilize time, space, equipment, supplies, instructional methods, instructional personnel, subject-matter content and sequence, and evaluation procedures in a more effective manner to achieve an efficient total educational program for each child.

When dealing with a total program, more time is required to get the various components integrated. However, the possibility for making significant improvements is also large. During the first year, the major effort is necessarily upon achieving a smoothly operating instructional unit and gaining familiarity with research, development, and innovative procedures. While this is being done, large gains in student learning should not be expected. Once the instructional staff and children operate as a unit and better materials and methods are developed, researched, and utilized, we may anticipate substantial improvement in student learning.

The two main instructional phenomena dealt with in the Units centered on individualizing instruction and motivation. Generalists from the R & D Center worked with the staff of the schools. Subject-matter consultants from the R & D Center or the central staff of the local school participated in decision-making where subject-matter specialization was called for in connection with the program of individualization.

The approach to individualization employed in the R & D Center is one of arranging a program of instruction for each child that will meet the various objectives of the educational program. This, in turn, calls for some instruction on a one-to-one basis, some small-group, and some large-group instruction.

In instruction on a one-to-one basis, the child proceeds at a rate appropriate for him. This type of individualized work with the teacher and independent study are required to meet those objectives concerned with the acquisition of independent skills. Some educational objectives require instruction in small groups. Pupils may be brought together in groups of 3 to 15 or more to work on specific activities of a fairly homogeneous type; for example, 5 to 15 children from a total group of 100 may be brought together for specific instruction related to acquisition of certain concepts or processes in arithmetic. Small groups also may be brought together to deal with the same word recognition skills. Small groups may be formed on the basis of interest, friendship, neighborhood, residence, and the like on social studies in connection with achieving certain objectives related to communication skills and attitude development. The extent to which large groups of 75 to 150 children may be brought together effectively has not been tested systematically. It is known that large numbers of students may

engage in individual study activities simultaneously in large groups. In the Units in the elementary school, the principal reason for bringing all the students within the Unit together into the same group for part of the instructional day is to achieve better utilization of teacher time. Children participating in independent study or some other large group activity can proceed without all of the instructional staff of the Unit being present. This, in turn, frees part of the instructional staff during that period of time for planning, conferring, and executing other activities essential for making the small-group and one-to-one instructional activities work effectively.

Attention was also given throughout the year to research and development regarding motivation. Getting a larger number of students to want to learn and also to behave well is a continuing responsibility of R & I Units. We appear to have sufficient knowledge about the means of controlling behavior of young children so that few discipline problems should emerge in the elementary school. Devising procedures for applying this knowledge and testing out some of the procedures is a continuing activity in R & I Units. From the preceding it may be properly inferred that no systematic attempt was made to improve instruction in any one subject-matter field in each Unit. This will be done more systematically in 1967–68.

II

RESEARCH AND DEVELOPMENT IN THE UNITS

The staff of the Manitowoc Public Schools expressed interest in establishing R & I Units during the spring of 1966. They had been thoroughly acquainted with teaming through participation in the Wisconsin Improvement Program. They saw, however, additional opportunities within Project MODELS to become familiar with research and development strategies. They also saw an opportunity for preservice teacher interns from the WIP to participate in the new type of organization and in research and development activities.

A curriculum development program set up under Title III of ESEA moved Manitowoc schools very rapidly toward designing a model instructional program. The R & I Unit provided an opportunity to implement and evaluate some phases of this program.

INDIVIDUALIZATION IN SPELLING, GRADE 4, McKinley School

McKinley School was the setting of a fourth grade R & I Unit which included 57 students. This R & I Unit, Miss Constance Espeseth, Learning Specialist, and Miss Pamela Carlson, teacher, was one of the first Units in Manitowoc to conduct a research project, one in spelling. This was in part due to the enthusiastic support of Miss Constance Foley, principal of McKinley School, and Miss Helen Hoyer, director of Elementary Curriculum of Manitowoc Public Schools.

In addition to the experiment with the spelling program, the two teachers cooperatively planned and teamed in social studies and science. Each teacher assumed the primary responsibility in one subject area for the appropriate materials, tests, films, field trips, laboratory experience, etc. In the Unit meetings, specific instructional responsibilities were agreed upon. Many of the new concepts in social studies and science were tried out in this Unit. In turn the staff of this Unit shared their experiences and results with teachers in the Title III program.

Next year this Unit will be used as an environment for test development and evaluation of the new social studies and science curriculum.

In an attempt to determine whether a commercially distributed individualized spelling program would lead to better achievement than a traditional spelling workbook, the staff of this R & I Unit conducted an experiment employing the two approaches. One group received the traditional spelling curriculum as outlined in Goals in Spelling by Kottmeyer and Ware. The other group worked on an individual basis using the SRA Spelling Word Power Laboratory. Specific questions to be investigated dealt with the relative effectiveness of the two treatments and the performance of boys and girls in spelling.

Subjects and Procedures

Subjects in this experiment were the 57 pupils in the fourth grade at McKinley School. They came from a predominantly lower middle class background. The average grade equivalent score for the groups on the Spelling subtest of the Iowa Tests of Basic Skills, given in September, was 4.4. Ss were separated by sex and ranked on the basis of their scores on this test. One-half of each group was then randomly assigned to each of the treatment conditions. Treatments were administered 15 minutes daily for 15 weeks. The teachers taught each group for 3 weeks, then exchanged groups.

The control group used the traditional curriculum as outlined in Goals in Spelling. This approach emphasized the development of spelling concepts through discrimination of printed symbols in both reading and writing. Students were encouraged to make generalizations—both phonetic and structural—from basic principles. The weekly lessons also included dictionary skills, handwriting and interesting-word study.

The experimental group followed the commercially-developed individualized program SRA Spelling Word Power Laboratory. This program allowed each pupil to proceed at his own rate. By means of a placement guide, each student began at a point where he could meet a reasonable

degree of success and move ahead as fast as his capabilities permitted. Both treatments included weekly exercises which emphasized ability to transfer spelling into other writings.

Data Gathered

Pre-experimental data included scores on the Spelling subtest of the ITBS and on a 40-word spelling test constructed by the teachers. For this latter test, 20 words were randomly selected from the word lists of each of the two treatments.

A similar teacher-made test was given midway through the experiment, each word being similar to or employing a spelling principle similar to that of the pretest words.

At the conclusion of the experiment, the 40-word pretest and the Spelling subtest of the Iowa Tests of Basic Skills were readministered. Additionally, the students were given a paragraph which included misspelled words and contradictions. They were asked to change whatever words they thought would make the paragraph better. The papers were scored for three quantities: spelling errors corrected, contradictions corrected, and dictionary usage. To assess this latter skill, four examples of wrong word usage were inserted into the paragraph, and the students were asked to make corrections.

Results and Discussion

Analyses of variance of the seven measures employed in this experiment revealed no significant Group differences or Group × Sex interactions. Significant sex differences were found on six of the seven measures (all but the "contradiction" score from the proofreading task), all favoring females.

Means for the two treatment groups are presented in Table 1.

When pretest scores on the 40-item recall test were covaried out of the remaining variables, the only one significant Group effect was that obtained in the analysis of the recall test. In this case, a significant ($p < .01$) difference was found favoring the experimental group. The analysis is summarized in Table 2. The adjusted difference in means showed that the experimental group averaged 2.19 points higher than the control group in this case.

Although group differences were not significant in most cases, consideration should be given to the gains made by students in both groups during the school year, as indicated by grade equivalent scores, pre and post, on the Spelling subtest of the ITBS. The means and gains are presented in Table 3.

Table 1

Group Means for Measures Used

Measure	Groups Exp.	Cont.
Teacher-made, pretest	23.11	23.85
Teacher-made, midterm	28.29	30.69
Teacher-made, posttest	32.32	31.92
Iowa Spelling, posttest*	5.99	5.82
Proofreading: Spelling	4.46	4.92
Proofreading: Usage	1.96	2.04
Proofreading: Contradictions	0.68	0.69

*Grade equivalent scores

Table 2

Summary of Analysis of Covariance of Recall Test Scores

Source	df	MS	F
Group	1	58.69	9.47**
Sex	1	8.94	1.44
G × S	1	5.05	<1
Error	48	6.20	

**$p < .01$

Table 3

Pre- and Posttest Means and Gains for Experimental and Control Groups on Spelling Subtest of ITBS (Grade equivalen' scores)

Group	Pretest	Posttest	Gain
Experimental	4.4	6.0	1.6
Control	4.4	5.8	1.4
Total	4.4	5.9	1.5

Thus, although there was no significant differential effect due to treatment, the experiment resulted in an average overall gain, in seven months, of 1.5 years. The publisher's

manual for the ITBS indicates a median improvement of 0.6 years during this interval of time. Thus, the total spelling program of this Unit led to an increase in achievement two and one-half times as large as is normal. (A grade equivalent of 4.4 in the fall is at the 58th percentile, while a grade equivalent of 5.9 in the spring is at the 74th percentile for fourth graders.)

The teachers involved in this experiment felt that the variety of instruction plus the novelty of teachers rotating provided good motivation for both teachers and pupils. This probably helps to account for the higher level of achievement for the entire class.

The teachers also felt that the majority of the pupils need the stability of a basic text in spelling and that the higher achievers in spelling could profit the most from the SRA Spelling Laboratory as they could progress at a faster pace without very much teacher guidance.

HOMOGENEOUS GROUPING IN MATHEMATICS, GRADE 3, Jackson School

The third grade Unit at Jackson School included 85 students from middle-class backgrounds. The staff included Miss Carolyn Grout, Unit leader, teachers Mrs. Shirley McCarthy and Miss Marilyn Moyer, and interns Shirley Jensen and Carol Gresham. Mr. Eugene Krejcarek was the principal.

The Unit leader attended the eight-week Summer Institute in 1966, and during this time made initial plans for an experiment in mathematics which will be described later. In addition to this, the teachers of this Unit jointly assumed responsibility for the intern assigned to their Unit under the Wisconsin Improvement Program. They also cooperatively planned and teamed in reading, social studies, and science.

Regular weekly meetings were held. In addition, all of the staff was actively involved in the Title III Curriculum Development program, and this Unit became a setting for trying out new materials in science and social studies.

In an attempt to improve instruction in arithmetic and make greater provision for the considerable range of individual differences in this third-grade Unit, the members of the Unit undertook an experiment to compare the performance of students in homogeneous groups with others in heterogeneous groups. Specifically, they were concerned with how well students would perform on arithmetic achievement tests given after 16 weeks in either homogeneous or heterogeneous groups.

Subjects

Subjects in this experiment were the 82 children in the third grade at Jackson School. The students came from predominantly middle-class families. The mean IQ of the group was 103.6, with a range from 82 to 131. For each student, scores were combined by adding twice the score on the arithmetic test to the IQ score. The total group was then divided into thirds on the basis of these combined scores, and each resulting group stratified according to sex. One-fourth of each sex and achievement-ability group was then randomly assigned to serve as controls. The number of students in each group at the conclusion of the experiment, along with means and ranges of the groups on the two measures, are presented in Table 4.

Students in all groups used Seeing Through Arithmetic, Scott Foresman, Grade 3, as the basic text. Students in the low ability-achievement group, however, received supplementary instruction using manipulative aids and were allowed to progress at a slower rate. Students in the high ability-achievement groups received added enrichment lessons in addition to their regular textbook work.

Table 4

Group Sizes and Means and Ranges on the Two Tests Used for Grouping

Groups	N	IQ		Arithmetic Test	
		Mean	Range	Mean	Range
Experimental: High	17	115.6	104-131	47.2	41-55
Experimental: Average	23	102.0	88-114	40.5	30-49
Experimental: Low	18	94.3	82-105	30.8	23-40
Control: Heterogeneous	24	103.0	84-131	39.4	19-50

Design and Procedures

During the 16 weeks of this experiment, each teacher taught each of the four groups for a period of four weeks. In order to facilitate the teachers' transition from one group to another, each kept a daily log of activities which was passed along to the next teacher at the time they changed groups.

In addition to the second-grade Arithmetic test, the following objective-test data were collected:

1) A teacher-made arithmetic test, given in February. This test was intended to cover that part of the third-grade arithmetic curriculum which had been taught first semester.
2) Cooperative Primary Tests, also given in February.
3) Seeing Through Arithmetic Test, third-grade form, given in June.

Since the experiment was concluded in February when the students were regrouped into four levels of ability, only the first two of these measures are directly relevant to the experimental treatment.

Results and Discussion

An analysis of variance was performed on scores from the first two above-mentioned tests, both given in February. Since the students had initially been stratified according to sex and to achievement-ability, lines appear in the ANOVA table for these factors and for their interaction. A summary of results from both analyses appears in Table 5.

The highly significant Group effect for both variables reflects in both cases the superiority of students in the High group over the others. The means for this effect are presented in Table 6.

The significant Treatment × Groups interactions were quite similar for the two tests. In both cases, the students of average ability-achievement did better under conditions of homogeneous grouping, while students of low ability-achievement performed better in the heterogeneous group. The means for these interactions are presented in Table 7.

The significant Treatment × Sex interaction (for the Cooperative Primary Test) was not consistent with results on the teacher-made test and thus will not be discussed here.

Another result obtained from this experiment was the analysis of the teachers' daily logs by the Manitowoc central staff and the members of the Unit. A summary of this follows.

The logs were useful in identifying the instructional strategies used by the teachers and also in suggesting procedures that might be most appropriate for each of the homogeneous groups. Following are random observations based on study of the logs for the high ability-achievement groups.

1. The problem of helping the students who don't understand the instruction doesn't show up nearly as often as with other groups. The teachers still watch individual progress.

Table 5

Summary of Analysis of Variance of Teacher-Made Test and Cooperative Primary Test

Source of Variation	df	Dependent Variable: Teacher-made MS	Teacher-made F	C.P.T. MS	C.P.T. F
Treatment (T)	1	8.59	< 1	13.09	< 1
Sex (S)	1	7.74	< 1	74.34	2.40
Past achievement-ability (G)	2	576.35	14.26***	490.46	15.82***
T × S	1	149.12	3.69	161.19	5.20*
T × G	2	385.23	9.53***	147.83	4.77*
S × G	2	14.59	< 1	3.11	< 1
T × S × G	2	73.74	1.82	13.98	< 1
Error	67	40.42	-	30.99	-

*p < .05
***p < .001

Table 6

Group Means for Teacher-Made and Cooperative Primary Tests

Group	Teacher-made	C. P. T
High	37.8	45.6
Average	30.1	37.7
Low	29.0	38.9

Table 7

Means for Significant Treatment × Group Interaction

Group	Teacher-made Test		C. P. T.	
	Exp.	Cont.	Exp.	Cont.
High	37.4	38.6	45.9	45.0
Average	32.4	21.3	39.2	32.2
Low	27.1	32.5	37.9	40.7

2. Rapport with the class is important to the teacher. However, motivation doesn't seem to be as large a problem.
3. There are only a few examples of inductive-deductive introductions of new material. (The book consistently uses the expository approach.)
4. There isn't much use of high level thought processes of synthesis or evaluation. (An exception is one exercise in which students make up problems.)
5. The main difference in teaching strategy between this group and others is the faster rate of speed through the book.

The logs on the low group contained these notations:

1. The low group doesn't seem terribly slow.
2. Visual aids may be motivational for the high group, but for the low group they seem imperative for understanding.
3. The biggest problems seem to be remedial and motivational. Apparently this particular low group is easy to control.
4. In comparison to the other two groups there seems to be more collective work as opposed to individual study.
5. With this group, as with every other, there appears to be a wide range of ability and motivation. A few appear to enjoy a challenge, while many need reassurance.

The logs of the control and average groups did not reveal such behaviors. Apparently the discipline problem loomed larger in these two groups. It was noteworthy that the control and average groups maintained about the same rate of progress through the book.

The general impression was that instruction proceeded satisfactorily in all groups. However, the instruction always seemed to be based on exposition and seldom got into application, synthesis, and evaluative processes. Certainly the better students need the stimulation of higher level processes, and perhaps even the lower students would find variety motivational if the problems were easy enough for success.

It seems that the strength of the instruction in all groups is in getting the majority of the students to understand the basic material presented in the text. Some students in all groups could go beyond the interpretive thinking presented in the text into problems calling for application, synthesis, and evaluation.

III

CONCLUDING STATEMENT

The main purposes of R & I Units are to provide excellent instruction for children and to carry out research and development activities that are essential to improving instruction. During the 1966–1967 school year, two R & I Units were started in Manitowoc to achieve these purposes. The major emphasis was on individualization of instruction.

Individualization was found to work well in spelling in the Grade 4 Unit. In addition, both the experimental (individualized) group and the control group gained much above the expected 6 year in spelling, the experimental group gaining 1.6 years and the control 1.4 years. Apparently, the effect of the experiment resulted in better instruction and improved learning for both groups.

The results of the third-grade experiment in mathematics showed no significant differences between experimental and control groups, totally. However, children of average ability-achievement performed much better and children of lower ability-achievement less well in homogeneous groups than in a heterogeneous group; those of high ability-achievement performed equally well in either setting.

The preceding results indicate that the R & I Units performed both the instruction and research functions well. In addition, major effort was directed toward improvement of instruction in social studies and to a lesser extent in science. The staff was enthusiastic about the result of the developmental work.

In order that a more concentrated effort could be directed toward a more complete program, the decision was made to have both Units in the same school during 1967–68 and to concentrate on social studies under the leadership of Dr. Norris Sanders. The R & I Units can become the principal organization for ongoing research and development designed to improve learning in the social studies.

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