

We planned together for the use of such materials as phonographs, projectors, film strips, and tape recorders. We worked on materials for programs and social activities. I think we tried very hard to synchronize the program and were successful in having both teachers and children work well together.

Evaluation - We found both advantages and disadvantages in this program, but I feel that with experience and growth many of the problem areas will be taken care of. For three years we felt that the extreme difference in ages of first and third grade children was in some ways a problem, but this past year, with two grades, we realized that the span and spread of childrens ability and growth is always there and we did miss the mature influence and capable help of the older children. So what seemed a problem, only needed more understanding and time to work out the minor details; this is probably the answer to other disadvantages.

Record keeping and filing of material demands a great deal of time and makes extra work for the teacher.

The child keeps many records for himself, but that is part of the learning process for him; the teacher must still keep her own files and record charts for the purpose of knowing the child's progress, where he needs special help and as a check against his record.

I am converted to record keeping and to progress charts of the childrens' work, but I also feel that with the extra work for the teacher, it is easy to let this phase of the program get out of balance. Teachers need to be careful in budgeting time so that record keeping will not crowd out time needed for lesson preparation. Secretarial help is useful to the teacher, so that she may not shorten preparation time but if anything enlarge on it. Individualized teaching needs a great deal more time than the old plan, where all children are taught from the same page at one time.

All the children were accepted by the group. Age and achievement did not seem to make any difference in a social way. The independent and responsible way in which most children responded to their work was a joy to the teacher. The discipline problems that are caused by children having to wait for each other were not there. Children are anxious to continually move on, but they rebel sometimes against busy work, just work to keep them busy. Children were interested and happy in being able to go ahead with their work, and usually did so without urging from the teacher.

Cheating was practically unknown. Now and then a child would be too anxious to get the right answer the quickest way, but by constantly teaching them to understand the why of these new methods of learning, very few instances came up that could be called cheating.

I feel that we have met the individual needs of children better in this individualized program, and that they are better adjusted. The slow children of the room were not affected by the faster ones, in that way they felt insecure. To me the area of the most growth in all the children was not in the subjects taught, although the growth there was very good, but in the personality of the child. His ability to think better, adjusting socially, and going ahead independently, these areas that cannot be measured exactly, were changed the most, and growth in mental maturity toward self-independence. There was growth in the feeling of security and belonging in the child. The close individual work between student and teacher was very helpful to the child in helping him to feel at home.

Mrs. Jackson has in her report all the detailed statistical data of the test results and in a general way it is the pattern of both units. I will not attempt to give the same report here.

I want to say that to me this pattern of procedure in the classroom is a far better way to teach children and develop all their potentialities. I hope the program stays in the school.

The grouping of children and grades may change, but to me, the individualized plan for teaching children is, by far, the best approach to teaching.

I have been happy working in the small schools project, and am grateful to all those who have helped me and that I have worked with.

Materials and Resources - The Bicknell Elementary School building is new and is modern in most every respect. The teachers in the school really appreciate the fine equipment and all the new wonderful materials that are available for use in our school. Some of these items are:

Overhead projector
Movie projector
Slide and film strip machine
Tape recorders
Opaque projector
Ditto machine
Copying machine
Microscope
Record players
Primer typewriter
Movable blackboards
Flannel boards

Counting frames
Counting man
Number lines
Games and flash cards
Lincoln logs and blocks
Easels
Chart holders
Paper of all kinds
S.R.A. Reading labs.
S.R.A. Mathematics program
Spelling folders
Books (including many new
basic readers, supplementary
readers, and trade books.)

We also have television which will be ready for this coming year.

PROMISING PRACTICES FOR IMPROVING
INSTRUCTION IN SMALL SCHOOLS

Practice No. 4
Individualizing English in a Small High School

Bryce Valley High School
Tropic, Utah

A project of
The Western States Small School Project

Utah State Department of Public Instruction
Dr. T. H. Bell, Superintendent
Room 223, State Capitol Building
Salt Lake City, Utah

INDIVIDUALIZING ENGLISH IN A SMALL HIGH SCHOOL

Garfield County District

Russell Merrell,
Superintendent

Bryce Valley High School

Kerry D. Nelson,
Principal

Contributing Teacher(s):

Marian Shakespear
Dar Smith
Kerry D. Nelson

* * * * *

General Description -

(a) Problems to be Solved:

Many of our students were not getting adequate education in English. The slower students were getting farther behind as the years went by; the faster students were wasting much time and were getting lazy habits. The English teacher was so swamped with correcting she had little time for preparation and real teaching.

(b) Desired Outcomes:

Our aim, then, was to individualize our instruction, to give each student a program which would fit his individual needs and encourage personal responsibility. By using a lay person to assist in testing and correcting we hoped to relieve the teacher for her most important function, planning and teaching.

(c) Grades, Pupils and Teachers Involved:

This program involved all pupils in grades seven through twelve. Their approximate mental ages ranged from seven to twenty years. Our team was composed of two teachers, a study supervisor, and a lay person who tested and checked papers.

(d) Our School:

Most of our students come from low to medium income families. There are very few children whose parents are professional people. About a half of our students are brought in from surrounding communities by bus. It is a small school of about 155 students. The school population is fairly constant.

Preparation - The organization of the Western States Small Schools Project gave us the backing we needed to initiate our new program. A workshop at Utah State University oriented us, giving us ideas and information gained from similar experiments in other schools. We used many of these suggestions relative to format and materials.

Practice - We started our program using two study rooms, a small testing room and the library. We later tore out two partitions, making one large study room. In the corner of this room we made a testing center, supervised by a lay person who administered the tests and checked papers. The library was used for group discussions and as a research center. The principal, Mr. Nelson, supervised independent study. Two teachers, Mrs. Shakespear and Mr. Smith, were available to the students for consultation, oral reporting and group discussions. The junior high section met the first hour and were followed by the senior high group.

During the first week, each student was given his course outline, his own graph for his personal record (his expectancy level was indicated on his graph), and a list of the materials he would need. Each program was explained in an individual conference between student and teacher.

As a student completed a unit of work, he requested a test, or, in some cases, an oral discussion. If he passed the test, he would record the test results on his graph. If his score did not come up to his expectancy, he would come to the teacher for discussion of the test material. When he felt prepared, he would then take another test covering the same material.

The teacher scheduled individual or group conferences when tests indicated a need.

At the end of each six weeks, a throw-away report card indicating student progress was issued to the student. No grade was given.

The student's work was evaluated at the end of the year. If the student had completed his course, he was given a full credit. If he had not completed his outlined course, he was given that fraction of credit that he had earned. In some cases additional credit was given, for additional work.

Evaluation -

(a) Student Reaction:

Student attitude toward the program was generally favorable. Greater student responsibility was noted. Slow students showed renewed interest. Student achievement was as good as, or better than that noted in the conventional program.

(b) Teacher and Administrator Reaction:

Teachers and administrators were enthusiastic about the program. Some relief from paper correcting and supervision left the teacher more time for actual planning and teaching. Having two teachers, working as a team, gave the advantage of utilizing the strengths of each. The challenge of the experiment was stimulating and revived enthusiasm and interest. The fact that students initiated most of the requests for help when they felt the need for help made them much more receptive and teachable.

(c) Parent Response:

We have had general approval from parents who were acquainted with our program.

(d) Other Observations:

We have not yet achieved the degree of success in speech we would

like. We could do this with more planning time for speech units. We felt that our writing reached a higher level of organization this past year. Literature units need to be expanded. We hope to initiate two regular study and discussion groups aside from the regular program, one for college-bound seniors, another for students who lack initiative, whose progress is sub-standard.

Materials and Resources -

Literature:

Library Books (Classics, travel, biography, etc.)
Literature Units (Teacher-made, student-made)
Scholastic Literature Units (Scholastic Book Services)
Literature Sampler (Learning Materials, Inc., Encyclopedia Britannica, Inc.)
Anthologies (On hand from previous years)
Films (Borrowed)
Tapes (Teacher-made, student-made)
Records (Scott, Foresman and Company) (L. W. Singer)
Paperbacks

Language:

2200 (Harcourt, Brace and World)
2600 (Harcourt, Brace and World)
3200 (Harcourt, Brace and World)
MacMillan Programmed English (MacMillan)
E-F Series (California Test Bureau)
Warriner's Complete Course (Harcourt, Brace and World)
Text Books (Accumulated throughout the years, used for reference and review)
Auditory Unit (Teacher-made)

Spelling:

SRA Laboratory, Spelling (Science Research Associates)

Writing:

A Programmed Approach to Writing (Ginn and Company)
Writing: Unit Lessons in Composition (Ginn and Company)
Beginning Writing Unit (Teacher-made)

Study Skills

How To Study (American Guidance Service, Inc.)

Reading:

Basic Reading Skills (Scott, Foresman Company)

SRA Reading Lab (Science Research Associates)

Reading the Sure Way, Record and Book (The Institute of Audiographic Arts, Studio City, California)

PROMISING PRACTICES FOR IMPROVING
INSTRUCTION IN SMALL SCHOOLS

Practice No. 5
Individualizing and Non-Grading Math
in a Small High School

Bryce Valley High School
Tropic, Utah

A project of
The Western States Small School Project

Utah State Department of Public Instruction
Dr. T. H. Bell, Superintendent
Room 223, State Capitol Building
Salt Lake City, Utah

INDIVIDUALIZING AND NON-GRADING MATH IN A SMALL HIGH SCHOOL

Garfield County District

Russell Merrell,
Superintendent

Bryce Valley High School

Kerry D. Nelson,
Principal

Contributing Teacher(s)

Mayo Rich
Afton Pollock
Kerry D. Nelson

* * * * *

General Description -

(a) Problems to be Solved:

In the past some students entering schools of higher learning did not have all the math they needed to compete with students from larger schools. We realized that in our situation we did not have teachers available for extra math classes. Individualization was difficult, and many slow students felt little success or interest in mathematics.

(b) Desired Outcomes:

We hoped that by instituting a consecutive non-graded program to make it possible for students to learn as much math as their time and capabilities would allow. We hoped to encourage all students to take personal responsibility and to gain a feeling of success in their work. By using a lay person for testing and checking, we desired more teacher time for actual teaching.

(c) Grades, Pupils and Teachers Involved:

All junior high students and about 70% of the senior high students were involved in the new program. The junior high met as a group the 3rd period of the day and were followed by the senior high students. A few students who did not find this time convenient or who wanted additional math arranged for another period during the day. Kerry D.

Nelson, our principal, was assigned the responsibility of the remedial group. Afton Pollock took the responsibility of the junior high course offerings and May Rich the senior high courses. A lay person was in charge of testing and paper checking. We had about 155 students in our school.

(d) Facilities for Teaching:

At the beginning of the year we used one large room containing two teacher stations and a testing area and another smaller room for the remedial students. We later moved all students into the large room, leaving the smaller room available for group discussions.

Preparation - Lacking precedent for a non-graded, individualized math that would fit our particular needs, we found it necessary to do a great deal of individual thinking and planning. The advent of the W.S.S.S.P. gave us the backing we needed. Several sessions with the directors of the project and other outstanding educators supplemented our own ideas and helped us to get the project underway.

Practice - At the beginning of the year, from test results and previous work of students, we determined each student's expectancy level and placed him in the material best fitting his needs.

The student used programmed materials and was instructed to proceed as fast as he could consistent with understanding. The student requested a test at the completion of each unit of work. If he did not pass this test he was required to do more work in that unit and consult with his teacher.

Upon satisfactory completion of a course, the student could move to another. He could earn as many credits as he was capable of earning in each year.

The course offerings were:

Remedial Fundamentals
E-F Series (Addition, Subtraction,
Multiplication, Division)
7th Grade Math
Modern Junior High Math

Basic Math
Basic Math (Problem Solving)
Modern Algebra I and II
Consumer's Math
Modern Trigonometry
Plane Geometry
Solid Geometry
Analytical Trigonometry
Sets, Functions and Inequalities
Verbal Problems
Language of Algebra
Introductory Calculus

A throw-away report card, showing progress of the pupil was issued each six weeks. The teacher kept the record of student progress.

Evaluation - Students taking the ACT Test for college entrance averaged between the 78th to 80th percentile. Students completed more units of work than under the traditional method. One student completed all course offerings; six others completed all but one or two. Greater interest was apparent throughout the school. We received favorable reports from our college students who had participated in the program in prior years. As teachers and administrators, we feel we are doing more for the individual student than we have done before. We believe in the program and are continuing our efforts to improve it. Parents are generally favorable to the program.

Materials and Resources -

Remedial Mathematics (Teacher-Made)
E-F Series (California Test Bureau)
SRA Modern Algebra (Science Research Associates)
SRA Modern Algebra (Temac, Encyclopedia Britannica Press)
Basic Mathematics Problem Solving (Addison-Wesley)
Temac (Encyclopedia Britannica Press) All other titles
listed on previous page were Temac materials.

**PROMISING PRACTICES FOR IMPROVING
INSTRUCTION IN SMALL SCHOOLS**

**Practice No. 6
Modern Mathematics in an Individualized
Program**

**Escalante Elementary School
Beryl, Utah**

**A project of
The Western States Small School Project**

**Utah State Department of Public Instruction
Dr. T. H. Bell, Superintendent
Room 223, State Capitol Building
Salt Lake City, Utah**

MODERN MATHEMATICS IN AN INDIVIDUALIZED PROGRAM

Iron County District

Ianthus Wright,
Superintendent

Kscalante Elementary School

M. K. Campbell,
Principal

Contributing Teacher(s)

Leda A. Jolley
George M. Jolley
Frank J. Petty (1 yr.)
M. Kay Campbell

* * * * *

General Description -

(a) Problems to be Solved:

The problem to be solved was that of individualizing our mathematics program, and at the same time introduce modern mathematics on a full-scale basis to grades one through six.

(b) Desired Outcome.

(c) Grades, Pupils and Teachers Involved:

This project took place in a three-teacher school with two grades under each teacher. The enrollment is approximately sixty students housed in a building with four classrooms, one being used as a special activities room.

As we visualize modern mathematics and individualization of mathematics, they might be incorporated into almost any school situation, with the possible exceptions being those conditions where the teacher is responsible to too many students, and also where the teachers are either unable or unwilling to participate in a program designed to prepare them for the changes. A desirable ratio might be approximately one teacher to twenty students.

Preparation - Though this report is being written in the absence of our faculty, I sincerely believe a consensus would be that no step in introducing any new program is more important than adequate teacher preparation.

An article which appeared in "The Arithmetic Teacher," April 1964, written by Clyde G. Corle, stated that ". . . changes which require a reorientation of our intellectual processes come slowly and painfully." Corle suggests at least twelve hours of college credit for adequate teacher preparation in new math before a school is ready to adopt a full-scale new math program. We feel this might be cut down some but not a great deal. We consider our attitude and participation in this new program as being healthy and effective. This might properly be attributed to the following preparatory phases: 1-Three different W888P workshops. 2-Personalized consultant help from a qualified instructor of the Brigham Young University (Dr. Richard Brown visited our school periodically during one school year). 3-An extension course in current mathematical ideas offered by the Brigham Young University. 4-Mathematics conferences sponsored by the Utah Education Association.

A variety of new materials were obtained which helped to clarify new ideas as well as develop more depth of understanding.

Practices - The new practices now used in our school are basically modern mathematics in an individualized program (I am assuming these terms are appropriate and do communicate). This instruction revolves around three types of communication. First, a one-to-one correspondence which is the most commonly used. Second, a small group situation in which students with common mathematical needs are brought together for a given amount of time. This requires a systematic record keeping arrangement which helps identify problems. Third, an entire class, of blanket type instruction and testing which is least frequently used. This serves the purpose of needed convenience as well as uncovering weaknesses which might be overlooked in the two foregoing types of instruction.

Evaluation - The comments and feelings of students, faculty and parents along with the testing results of the past project clearly bear out that this project under the WSSSP has made a positive improvement in the quality of teaching, the academic improvement of the students, increase in needed facilities and equipment, and general attitude of most people associated with our school. As near as we can ascertain, the most marked improvement in mathematics in the Escalante Valley School has been made under this project. We hope this may serve as a helpful contribution in raising the quality of instruction and student progress in rural schools.

I am unable, at this time, to provide any statistical information on our project. This is due to the fact that I received the request for this report after I had left for and was actively engaged in summer school at Provo, however, since the testing scores will be the subject matter for a masters project, more information and statistical data will be available in the fall of 1965.

In the first year of our project, we individualized our reading program. This was done under approximately the same in-service and advisory system as described in our mathematics project. During this phase an unused classroom was converted into a badly needed and relatively well stocked library.

It is our desire to have another opportunity of participating in a similar program to further improve our facilities, equipment and instructional abilities in the language arts area.

Active support and assistance from the advisory and administrative personnel of the Iron County School District has been appreciated.

PROMISING PRACTICES FOR IMPROVING
INSTRUCTION IN SMALL SCHOOLS

Practice No. 7
Individualizing Instruction in High School
Language Arts

Milford High School
Milford, Utah

A project of
The Western States Small School Project

Utah State Department of Public Instruction
Dr. T. H. Bell, Superintendent
Room 223, State Capitol Building
Salt Lake City, Utah

INDIVIDUALIZING INSTRUCTION IN HIGH SCHOOL
LANGUAGE ARTS

Beaver County District

Paul Lefevor,
Superintendent

Milford High School

Jesse E. Long,
Principal

Contributing Teacher(s):

Alice Elmer
Lora Johnson
Dee R. Goble
Nelda Memmott (Remedial Teacher)
Jesse E. Long
Joyce Joseph (Student Teacher)
Frances Goble (Lay Reader)
Pauline Rummler (Secretary and Clerk)

* * * * *

General Description -

(a) Problems to be Solved:

Improvement in our language arts curriculum to enable us, in a small school, to reach the slow learner as well as accelerate and provide more challenges of the fast learner. The conventional classroom has not enabled us to accomplish the above objective.

(b) Desired Outcome:

We, the Milford High School Language Arts Teachers and Supervisory Staff, endorse a program that will give the students a chance to achieve and progress in an atmosphere conducive to the development of their abilities and satisfaction of their needs. It should, in some way, give a feeling of security and a feeling of accomplishment. It should be geared to the individual student so that his means of communication may be broadened and his interests aroused to do a better job of learning for himself, rather than for the teacher and the grade.

Character is the aim of true education; language arts is but one means used to accomplish this desired end.

1. To develop basic skills, understandings, and attitudes of communication through experiences in speaking, reading, writing, listening and literature.

- (a) Provide a developmental reading program for all secondary students.
- (b) Encourage use of spelling and vocabulary skills at each level of learning.
- (c) Provide experiences in self-expression for each student.
- (d) Instill in each student the desire to attain self-discipline.
- (e) Provide the opportunity for each student to develop the ability to think critically and analytically.
- (f) Provide experiences in literature that will enhance each student's appreciation for aesthetic values and human relations.
- (g) Encourage students to organize and complete the major part of their school work during the regular class periods.
- (h) Stimulate students to read independently outside of the regular literature program for self-improvement.
- (i) Realize that the reading of literature is a creative process in which the reader lives in imagination in a wider world and comes back to his own world with enriched experiences, deepened sympathies, and new insight and understanding.

(c) Grades, pupils and teachers involved. Describe school and situation into which practice must fit:

We decided that since the art of communication is of extreme importance in our modern society that we would individualize our language arts department first. In our school this involved having a section for grades seven to nine individualized, involving 101 number of students in one class period, and grades ten to twelve involving 131 students in one

class period. We used the staff of three full time teachers, two part-time teachers, principal, and a lay reader as a teaching team.

Our high school physical plant is fifty years old, consisting of three and a half floors. We had a remodeling program on our bottom floor enabling us to have one large instruction room capable of holding 120 students, three other smaller classrooms and the library all on the bottom floor of our building and closely accessible to each other. We feel that the facilities considering the age of our building lend themselves to an ideal atmosphere of learning in an individualized program.

Preparation -

(a) Description of Teaching Orientation:

In February of 1964 several staff meetings were held involving the district curriculum supervisor, the English teaching staff and the administration. It was decided at this time we would begin analyzing other small schools in our area already involved in individualized instruction. We arranged for our staff members and administrators to visit Parowan High School, Cedar City High School, Panguitch High School, Bryce Valley High School, and Virgin Valley Nevada High School. After the visits we held additional staff meetings to analyze the existing programs of each and how we could establish a program to fit our own needs. The spring of 1964 we conducted an extensive testing program of all students. We checked their records thoroughly and recorded pertinent information for each student. We decided to have our language arts teachers report back to school the last week of July during the summer of 1964, this would give them four weeks to work together as a team and complete the curriculum planning we had worked on during the spring of the year. The staff also attended the Western State Project Workshop,

held at Brigham Young University. A series of meetings with parents to discuss the new program with them, and to orient them on the anticipated changes took place during the spring of 1964. By the time our students reported for school August 31, 1964, we had the curriculum pretty well completed, purchased many varied types of language arts materials and were ready to begin an extensive orientation period orientating each of our students into a new program of individualized language arts instruction with team teaching. We had excellent support and encouragement from our Board of Education, District Superintendent of Schools, and our District Curriculum Supervisor. It took almost one year of thorough preparation before we launched ourselves into this new program.

Procedures - Our junior high school Language Arts group meet first period in our large classroom facility and an immediate adjacent classroom. For convenience of roll check, each student has an assigned seat - it takes one minute for complete roll call. Instructions for the day are listed on the chalk boards in the classroom area. From these instructions the students determine individually whether they will be in a discussion group, working individually on regular work or in a testing situation. Each student has been counseled independently, with a counselor, and has arranged a program to meet his individual needs. This program is a part of a schedule kept in a folder with all other materials used by the student. They have to complete grammar, literature, composition, spelling and reading units during the year designed on their individual level. When the students have completed prescribed work and ready for testing or discussion or counseling, they indicate this in writing and place in the teacher preparation box. Students have freedom of movement to pursue the work that may be involved in their daily program. Rather than have students

assigned to group levels, we have attempted looking at the student individually and set up a complete program for the student as an individual. Because of our enrollment and the program we have been able to succeed fairly well in the project. All of our spelling tests and many of our discussions have been previously taped by the teachers and the tape recorder replaces the teacher in this activity. Our senior high school meets the second period of the day and follows somewhat the same activity.

We have duplicated unit outlines for all levels of work for the student to follow - each student does his own recording, but the teachers also keep a record for grading and counseling purposes. The teachers and lay reader do all checking. Our team planning period for the teacher is of utmost importance in keeping things organized and taking care of all checking of materials and program organization.

Evaluation - After being in the language arts program for one year, I feel that the following comments to be pertinent in evaluating our last years' program:

- (1) We feel that we were able to reach more students with the new program of individualized instruction than we did in the conventional classrooms.
- (2) The National Merit Scholarship Examination and the American College Testing Program of last year has indicated to us that we did make some gain with our junior and senior students in efficiency. We will conduct achievement tests this fall on all grade levels which will enable us to determine other class areas.
- (3) I am completing counseling with our next year seniors and all of them agree that the program has helped them. Some stated they prefer the conventional classroom because they feel more comfortable in always being directed. By far the majority do not wish to change back to the other program.

- (4) We now have Language Arts in two periods rather than nine and this has enabled us to free teachers for other teaching assignments which have broadened our curriculum offering.
- (5) We have some school patrons who have reservations concerning the success of the program. The majority are with us and feel that once we have it successfully in operation it will be an asset.
- (6) The success of our program is contributed to the fact that we had a team of hard working teachers willing to put in the extra mile and work towards improving the program.
- (7) We have found that we need to do a better job of orientation, and a preparation has been made to improve this problem.
- (8) We need to do a better job of student orientation on how to study and accept the responsibility for self-discipline.
- (9) We had a shortage of some materials but have been able to correct this for the coming year.
- (10) We have eliminated most of our dropout problems, because the slow learner has a program designed to help him.

Materials and Resources -

(1) Harcourt Brace and World Publishing Company

- a. English Grammar Composition 7 - 12 Warriner et al.
- b. English 2200, 2600, 3200 series, author Bulmenthel.
- c. Literature Companion Series - six levels.
- d. Laureate Literature Series 7 - 8th grade levels.

(2) Science Resource Associates

- a. Reading labs (all levels)
- b. Spelling labs (all levels)
- c. Contemporary Transparency lab.
- d. Vocabulary lab
- e. Literature lab

(3) California Testing Bureau

- a. C - D and E - F Language Arts Materials.

(4) Scott Foresman

- a. Complete Literature Series 7 - 12.**

(5) Ginn and Company, Author Gordon

- a. Introduction to Literature**
- b. Study of Literature**
- c. A Program Approved to Writing**

(6) MacMillan Company

- a. Sullivan - Program English**

We use several series of records, tape recordings and television.

**PROMISING PRACTICES FOR IMPROVING
INSTRUCTION IN SMALL SCHOOLS**

**Practice No. 8
Individualizing Instruction in High School English**

**Wayne High School
Bicknell, Utah**

**A project of
The Western States Small School Project**

**Utah State Department of Public Instruction
Dr. T. H. Bell, Superintendent
Room 223 - State Capitol Building
Salt Lake City, Utah**

INDIVIDUALIZING INSTRUCTION IN HIGH SCHOOL ENGLISH

Wayne County District

Arthur H. Lee,
Superintendent

Wayne High School

Sammy N. Newton,
Principal

Contributing Teacher(s):

Mark E. Larsen
Myrra W. Newton
David Kjar

* * * * *

General Description -

(a) Problem to be Solved:

What kind of English program will highly motivate students to develop their communication skills, to learn to understand the way language functions, and to appreciate and enjoy literature.

(b) Desired Outcomes:

1. A program which will encourage each individual student to work at a rate of speed which is most productive for him.
2. A program which will encourage the student to participate in the evaluation of his needs and the selection of his objectives in the course, and which will assist him in attaining these objectives.
3. A program which will require every student to interact as both speaker and listener in discussions of the literature read.

(c) Grades, Pupils and Teachers Involved:

Eleventh and twelfth grade students enrolled in English on a non-graded basis were included. This involved four classes and three teachers. The ungraded basis provided for a more flexible schedule offering five periods where English could be taken.

Preparation - Various English materials (listed below) which were designed to permit students to progress through them at individual rates of speed, were purchased. The teachers prepared study guides; these were in the areas of history of the English language, critical reading and listening, how to write a research paper, literature and others. The literature units consisted of some units on a theme with reading to be done and questions to be answered, other units on unrelated reading materials at various ability levels, also with questions. Books containing the material to be read were "rounded up" from various sources, library, private collections, paperbacks, etc., and centrally located. An individual progress record for each student was prepared.

Practice - At the beginning of the year the students in each class were divided into reading groups of four or five per group and assigned a literature unit with its accompanying study guide. These groups were assigned reading on the basis of the S T E P Reading scores. The students with the highest reading scores were given the units on themes. The next group was given a unit with a novel and short stories which were fairly easy reading, had high adolescent appeal, high literary merit, and with an adventurous, outdoor setting. Most of this group were boys and the purpose of the unit was that they might end the year with a rewarding experience with literature and thereby receive increased motivation toward future undertakings in the class and elsewhere. A third group was selected because their behavior at school had distinguished them as being among those students most alienated from school and society. They were required to read a novel in which the central theme dealt with the struggle of one adolescent who is on the outskirts of society to determine the relationship of his own values to those of society and its institutions when the two are often in conflict. The purpose for this novel was to focus the attention of these individuals on a problem which might lead them to examine their own social

relationships. A further purpose was to attempt to reinforce their own self-esteem through identification with the highly admirable central character of the novel.

In addition to being assigned to a literature study group, each class was oriented to the entire range of study materials and readings available to them and each student with the teacher determined what he should be able to accomplish during the year (many students accomplished more than they had anticipated they could). The students had needs for certain areas of study and spent time on those areas.

Each student was required to periodically complete a lesson in the Ginn Unit Lessons in Composition book. These books were purchased and assigned on ability levels.

Many students completed Sullivan's Programmed English as a review of grammar.

Units on History of the English Language, Critical Reading and Listening, How to Write a Research Paper, were based on material in Your Language, Book 6. Punctuation units, spelling units were also available to those who needed them.

Evaluation - No objective evaluation of this program has been attempted. However, both student reaction, as it has been voiced and observed through classroom behavior, and teacher reaction support the conclusion that this program has been sufficiently satisfactory to the participants so that they wish to continue some form of it next year.

Student opinions expressed midway through the year were that they did not prefer to return to a program wherein all students would work on a single assignment. One student said, "I have really enjoyed this class in every way. I especially like the way we worked individually so that each student could work

on what he needed most rather than on an assigned subject which he felt he did not need." Many students commented that they had learned more this year than any year since they were in the 7th grade.

Teacher Opinion: This program seemed encouragingly successful, both in allowing each student to work at his own rate of speed and in motivating him to work at his best rate of speed. (We were amazed at the range of variability.) The use of the Individual Progress Record and the allowance of freedom for the student to select his own objectives and study materials were essential contributors to this success.

The program seemed somewhat successful in encouraging the student to participate in the evaluation of his needs and in the selection of his objectives and in assisting him to attain those objectives. However, much improvement remains to be made. Study guides and materials in sufficient variety and level of skill were not available to the student. And equally as serious, students lacked valid means by which to determine their extent of progress through the year.

The discussion sessions held in connection with the literature units were very successful. Since there were usually fewer than seven in a group, everyone participated as both speaker and listener. However, certain factors did operate to reduce the extent of success below what it might have been. For one thing, these sessions were not held often enough. Also, too little provision was made to permit students to have a discussion session as they felt the need for it.

Materials and Resources -

Classroom
Office
School Library

State Bookmobile Library
Public Library

Programmed English - MacMillan
Unit Lessons in Composition - Ginn
A Programmed Approach to Writing - Ginn
TMI - Grollier Self-Tutoring - Spelling
TMI - Grollier Self-Tutoring - Punctuation
Programmed Vocabulary - Lyons & Carnahan

Teacher-made study guides:

Literature anthologies
Short story collections
Paperback novels

Your Language Book 6
Other language references

**PROMISING PRACTICES FOR IMPROVING
INSTRUCTION IN SMALL SCHOOLS**

**Practice No. 9
Expanding Mathematics Study Opportunities
in Small High Schools**

**Wayne High School
Bicknell, Utah**

**A project of
The Western States Small School Project**

**Utah State Department of Public Instruction
Dr. T. H. Bell, Superintendent
Room 223, State Capitol Building
Salt Lake City, Utah**

EXPANDING MATHEMATICS STUDY OPPORTUNITIES IN SMALL HIGH SCHOOLS

Wayne County District

Arthur H. Lee,
Superintendent

Wayne High School

Sammy Newton,
Principal

Contributing Teacher(s):

Ernest H. Jackson
Mark Larsen

* * * * *

General Description -

(a) Problems to be Solved:

Wayne High School has the problem, with its limited staff, of offering a broad curricular program which will meet the needs of all its students. This project was initiated to improve these offerings in the area of mathematics.

By national averages, mathematics enrollment in grades nine through twelve in Wayne High School has been low. The only offerings in these grades were elementary algebra, plane geometry, and consumer's mathematics. There was one teacher with training to teach algebra, geometry, and higher courses in mathematics. Approximately one-half his time was used in teaching science and eighth grade mathematics.

It was proposed that program flexibility be increased to avoid schedule conflict, and that the curriculum be extended. This was to be done by organizing multiple classes in mathematics for several periods per day. It seemed to the personnel involved in the project that programmed materials would lend themselves well to a multiple class situation.

(b) Desired Outcomes:

The objectives of the program were, (1) to increase mathematics

offerings and to make it possible for more students to enroll in mathematics courses in Wayne High School, (2) to compare the effectiveness of TEMAC programmed texts in a multiple class situation in promoting student progress in mathematical knowledge with the effectiveness of more conventional methods of presenting mathematics, and (3) to discover effective methods for using programmed materials.

(c) School Situation-

Wayne High School is a combined junior - senior high school with grades seven through twelve. It has an average enrollment of about two hundred sixty students and serves a population of about sixteen hundred persons, the entire population of Wayne County, Utah. Most of the students are brought in by bus, some from as far as seventy five miles.

Limitations in size make it difficult to schedule conventional classes so as to avoid conflict; and it is not economically feasible to hold conventional classes for the small groups of students who want to study such courses as intermediate algebra and trigonometry; however the administration and the mathematics instructor consider the needs of these students important.

Preparation - The instructor was oriented in the use of programmed materials at a one day workshop sponsored by Encyclopedia Britannica Films in Salt Lake City in the summer of 1961, and received additional help with programmed materials and the problems of small schools at the following workshops sponsored by the Western States Small Schools Project: Brigham Young University, Provo, spring of 1962 and summer of 1964; Utah State University, Logan, summer of 1963; and at Albuquerque, fall of 1963.

Materials used have been TEMAC programs in the subject matter areas mentioned in the text of this report, and SCAT, STEP and COOP tests.

Administration has made the project possible by arranging time in the schedule to carry out the project, arranging time for testing and counseling of students, arranging for the acceptance of the project by the WSSSP, arranging for consultant help, maintaining liaison with WSSSP, permitting the instructor to attend workshops on school time, sending administrators and faculty members to workshops, and handling the business part of the project.

Practice -

Organization:- The project was organized to take care of the functions of testing, guidance, and instruction.

Under the administration of the school guidance counselor pre and post tests were administered to students in the experimental program, using Cooperative Achievement Tests in the appropriate subject areas; also in March 1963 and each March thereafter SCAT and STEP tests were administered to all students in the high school, excluding the 1964 twelfth grade. Where available scores on other tests were used in the guidance of students.

During the 1961-62 school year thirty-two students met in the chemistry laboratory and studied geometry and second year algebra using TEMAC texts.

In 1962-63 programmed mathematics was offered two periods during the day. One section consisted of twenty students and another of sixteen; both met in a small classroom. In addition two students were permitted to study on their own. The offering during the year was increased so that it included first year algebra, second year algebra, geometry, trigonometry, and modern algebra.

During the 1963-64 school year programmed mathematics was again offered two periods during the day. The sections contained thirty-one students each and met in a large classroom. In addition, seven students met in a group in another room during another period and studied the materials without the supervision of a teacher except when taking tests. Also, one other student studied the materials during a fourth period with a teacher's help available to him.

The course offering was enlarged to include a general mathematics course for those students who could not profit from algebra.

The same subject matter was offered in 1964-65 to one hundred six students. These were divided into four sections meeting in different periods of the day. The size of the sections varied from nineteen to thirty-nine.

Each student was issued a TEMAC programmed mathematics textbook and supplement and allowed to progress at his own rate. When available, teacher help was given at the request of the student. Each student made a weekly report of his progress, and took tests at the places indicated in the teacher's manual. Tests were checked by the instructor and, if deemed advisable, discussed with the student. If the test showed that the student had failed to master the unit of subject matter he was given suggestions for review and later tested on the same material using a different form of the test. When the area was reasonably well mastered, the student was permitted to progress on to the next unit.

There was some attempt to hold small group discussions under teacher supervision. This became more difficult as more subjects were added, and the difficulty was further increased as the year progressed and there was greater spread in student accomplishment. Usually by the end of the year all discussion was on an individualized basis.

In 1962-63 students were given a ten day how-to-study course before being issued their TEMAC materials. There has been no evaluation of this innovation since no careful records were kept the previous year.

Time goals:- The percentage of students who completed their courses in 1963 was disappointing. Some students did well and worked to capacity. Too many took advantage of what they considered their privilege to work as slowly as they wanted.

There was introduced during the 1963-64 school year a policy of student set goals as to the amount of material to be covered and the quality of work necessary to receive a passing grade. This was accomplished as follows: First, a form was devised, part of which constitutes the following page of this report. With this form the student is able to plot each day of the school year against the number of hundreds of frames he has completed in his course. At some time during the first three weeks of school each student met privately with the school counselor. They discussed scores on standardized tests, past achievement of the student, and such other predictive material as the counselor may have had in his office. After the discussion the student in consultation with his counselor set a reasonable goal as to the amount of credit he might be expected to earn. The rate that he must work to attain the goal was indicated as a graph on the form and was filled out in duplicate. One copy remained with the student and the other was given to the instructor. The counselor also indicated to the instructor the quality of work which might be expected from the student. This was determined with the help of a scale developed by the Brigham Young University. As the student progressed he plotted his achievement against the date. The instructor's copy was kept up-to-date from the student's weekly report of progress. A glance at the form was all that was necessary to see whether the student was progressing at a rate which would enable him to reach his goal.

Control groups:- Forty-five ninth grade students were given SCAT and STEP tests in March of 1963 and again in March of 1964. Unfortunately in 1963 they were scored against beginning of the year norms and in 1964 against end of year norms. Under these circumstances the students would be expected to lose a few percentile points.

Of these students, nine were enrolled in TEMAC first year algebra; seventeen were enrolled in a conventional first year algebra class using Nichols and Collins,

Course _____
Date ended _____

Test scores

Cumulative test scores

Expectancy score

First quarter _____
Second quarter _____
Third quarter _____
Fourth quarter _____

↑ Frames

1 2 3 4 5 6 7 8 9 10 11 12

Week ~~1~~
-93-

Modern Elementary Algebra as a text. The remainder were not enrolled in any mathematics course during the year. The programmed class and the conventional class were both taught by the same instructor.

For purposes of getting some comparison between the effectiveness of the experimental program and that of a conventional class, three groups from the ninth grade were equated as nearly as possible on mathematical ability using the quantitative section of SCAT as a measuring device.

The experimental group consisted of all members of the ninth grade who were enrolled in the TEMAC first year algebra course.

The first control group consisted of nine students picked from the conventional modern algebra class.

The second control group consisted of six students who were not enrolled in a mathematics class.

Growth was measured by the difference between the 1964 and the 1963 STEP scores.

Evaluation - Attempts to determine the results of the project have been made from, (1) enrollment trends, (2) rate of student progress, (3) results on standardized tests as compared to national norms, (4) results of standardized tests given to experimental and control groups, (5) comparison of student progress from one year to the next when a variable is introduced, (6) student opinion, and (7) the instructor's subjective judgment, based upon his observation of the program.

Results of the project, in terms of its objectives, are summarized numerically in the tables which appear in this section.

Enrollment trends:- Mathematics enrollment trends obviously are affected by many variables including, subject matter requirements, interests, home and community backgrounds, vocational and educational plans, abilities, curriculum

offerings, etc. Any tentative conclusions which may be drawn from the relationship between new curriculum offerings made possible by this project and mathematics enrollment is based on the assumption that other factors have remained relatively constant during the time of this project and the period immediately preceding it. Trends in mathematics enrollment in Wayne High School during the years of this project and for some time before are summarized in Table 1.

Table 1. Trends in mathematics enrollment, grades nine through twelve, Wayne High School 1958 to 1965

Year	Total enrollment grades 9 - 12	Mathematics enrollment	Percent enrolled in mathematics
1958-59	174	72	41
1959-60	161	86	53
1960-61	170	71	42
1961-62 ^a	170	77	45
1962-63	168	88	52
1963-64	175	129	74
1964-65	178	120	67

^aIntroduction of TEMAC programs

Mathematics enrollment in the school has tended to increase since the beginning of the project. Although enrollment in programmed classes increased during the 1964-65 school year, enrollment in conventional classes decreased enough to result in the lower percent of students taking mathematics.

Any enrollment in such courses as second year algebra and trigonometry has been made possible by the project, since such courses were not previously offered.

The writer feels that the general increase in percentage of students studying mathematics is desirable, but decrease in enrollment in conventional classes is undesirable until such time as programmed classes are shown to be more effective.

Results measured by standardized tests:- Mean scores and variability on standardized tests are given in Tables 2, 3, 4, 5 and 6. The scores given are for appropriate subject areas on the Cooperative Achievement Tests, for the mathematics section of the Sequential Tests of Educational Progress, and the quantitative section of the School and College Ability Tests.

Table 2. Mean scores and variability on certain standardized tests at the completion of a course in TEMAC elementary algebra and/or at the end of 36 weeks spent in the course

COOP					STEP				SCAT			
Year	%tile	Range	S.D. ^a	SS ^b	Range	%tile	Range	S.D.	%tile	Range	S.D.	
1963	37	2 -88	31.8	11	3 -20	45	4 -96	34.9	40	5 -84	31.8	
1964	57	1 -98	24.6	9	3 -32	59	2 -99	25.5	59	1 -99	30.5	
1965	28	0 -95	26.3	10	0 -19	59	12-97	20.5	50	6 -97	24.2	

^a The notation S.D. will stand for standard deviation in this and subsequent tables.

^b The notation SS will stand for points gained on scaled scores between pre-test and post-test in this and subsequent tables.

Table 3. Mean scores and variability on certain standardized tests at the completion of a course in TEMAC intermediate algebra and/or at the end of 36 weeks spent in the course

COOP					STEP				SCAT			
Year	%tile	Range	S.D.	SS	Range	%tile	Range	S.D.	%tile	Range	S.D.	
1963	25	3 -40	16.7	6	0 -11	70	31-97	16.5	66	46-87	16.7	
1964	36	12-70	24.0	11	3 -19	71	35-97	20.5	73	58-98	15.7	
1965	31	0 -70	18.6	10	3 -23	70	53-82	8.9	76	31-94	18.8	

Table 4. Mean scores and variability on certain standardized tests at the completion of a course in TEMAC plane geometry and/or at the end of 36 weeks spent in the course

Year	COOP					STEP				SCAT		
	%tile	Range	S.D.	SS	Range	%tile	Range	S.D.	%tile	Range	S.D.	
1963	32	1 -54	17.1	16	0 -29	63	1 -97	29.1	55	6 -92	30.7	
1964	21	0 -62	22.5	10	16-48	71	35-99	16.8	72	31-99	20.6	
1965	40	0 -91	31.4	19	6 -39	71	2 -98	23.7	71	6 -99	25.2	

Table 5. Mean scores and variability on certain standardized tests at the completion of a course in TEMAC trigonometry

Year	COOP					STEP			SCAT		
	%tile	Range	S.D.	SS	Range	%tile	Range	S.D.	%tile	Range	S.D.
1963	64	59-79	17.6	17	15-19	92	79-99	8.2	94	91-99	3.6

Table 6. Mean scores and variability on SCAT and STEP tests at the conclusion of TEMAC basic mathematics course

Year	SCAT			STEP		
	%tile	Range	Standard deviation	%tile	Range	Standard deviation
1964	19	2 -50	15.8	25	2 -50	14.9
1965	28	1 -79	20.5	31	4 -87	24.9

An examination of these tables shows that in general the students in geometry and algebra classes achieved in the low average range in their specific subject areas as measured by COOP tests, but were generally average to high average in general mathematical knowledge as measured by the mathematics section

of STEP tests. There was considerable variability in achievement, but it was quite consistent with variability in aptitude as measured by the quantitative section of SCAT. Some students achieved in the high average to high range each year. Abilities of students generally increased from elementary algebra, to geometry, to intermediate algebra.

1963 was the only year in which a group of trigonometry students began studying together. Students taking trigonometry in subsequent years have begun the study at odd times during the year or have been enrolled on a part time basis. As measured by SCAT the 1963 students constituted a high ability, relatively homogeneous group. Variation in achievement was considerably greater than might have been expected considering the rather homogeneous measure of their ability.

The students studying basic mathematics generally were low to low average ability students, students who did not have the capacity to study algebra. They probably did as well as they could be expected to do.

An analysis of the gains shown in the SS column for 1965 indicated that the chances are about 95 out of 100 that these gains are significant for elementary and intermediate algebra, and about 99 out of 100 that the gains in geometry are significant.

Results as measured by control group:- Comparisons of gains made by ninth grade students enrolled in TEMAC elementary algebra during 1964 with gains made by two control groups, one studying algebra in a conventional class and one not enrolled in mathematics can be made from Table 7.

Table 7. Mean gains in %tile points for certain groups of ninth grade students as measured by STEP tests administered in March 1963 and March 1964. 1963 scores were derived from beginning of year norms and 1964 scores from end of year norms

	SCAT		STEP	
	%tile B8 norms	S.D.	Gain in %tile points E9 - B8	S.D.
Experimental group ^a	90.4	9.9	-12.6	12.9
Control group one ^b	89.2	11.7	- 5.7	7.8
Control group two ^c	89.7	12.3	-15.0	13.4

^aNine students who constituted all ninth grade students enrolled in TEMAC elementary algebra.

^bNine students who were studying modern algebra in a conventional classroom, equated in ability as nearly as possible to the experimental group using SCAT B8 norms.

^cSix students not enrolled in mathematics, equated in ability as nearly as possible to the experimental group using SCAT B8 norms.

Assuming no difference in ability, an analysis of these results indicate that the chances are about 90 in 100 that the students in the conventional class made greater gains than the students in the TEMAC class, and the chances are about 70 in 100 that the students in the TEMAC class made greater gains than the students who were not enrolled in mathematics. Students in the conventional class had greater variability in ability, but students in the TEMAC class had greater variability in achievement.

Effects of goal setting as measured by rate of student progress:- Students who completed their courses in 1964 and in 1965 were working toward student set goals. The students who completed their courses in 1963 were working toward

teacher set goals. To get some measure of the effectiveness of the student set goals in increasing rate of progress, the percent of students progressing at a rate which would enable them to complete 90% or more of their course in the expected time was tabulated. Some of these students were progressing at a rate which would enable them to finish 150% or more of their course. The tabulation is shown in Table 8.

Table 8. Percent of students who progressed at a rate which would enable them to complete 90% or more of a course in the expected completion time

Year	First year algebra	Second year algebra	Geometry	Trigonometry	Basic mathematics
1963	36	50	38	60	--
1964	82	50	39	80	82
1965	29	82	60	67	80

Results of this policy of goal setting are inconclusive, several variables affect this rate of progress. Nine students in the 1965 elementary algebra had already received nearly a unit of credit in general mathematics and were not particularly interested in earning more credit. Only five percent of students in the 1965 class indicated that they were interested in taking more mathematics than they could have taken under our previous program, compared to fifty or more percent in the 1963 and 1964 groups. Other variables such as abilities, interests, future plans, etc. doubtless affected the rate of progress. It is the feeling of the instructor that progress has been accelerated by student set goals.

Student opinion:- The following two pages constitute an opinion survey administered each May while the project was in progress.

STUDENT OPINION SURVEY

Name _____

Check only those statements with which you tend to agree.

1. I feel that this course has been effective in increasing my knowledge of mathematics. ()
2. I have learned some mathematics, but feel that another method of teaching would have been more effective. ()
3. I like this method of instruction because I can progress at my own rate. ()
4. Use of this method makes it easier to make up work missed because of absence. ()
5. Students who fall behind the class average tend to become discouraged and give up. ()
6. Students who might tend to fall behind in a conventional class will tend not to become discouraged using TEMAC, because they are not forced to compete with faster students. ()
7. In general this is a good way to teach mathematics, but it would be more effective if periodic class discussions could be arranged. ()
8. I find this method of studying boring. ()
9. This might be an effective way of teaching, but I find it difficult to discipline myself to study without a definite assignment ()
10. I feel that I can get more teacher help with my individual problems using this method than if we were using another method of teaching. ()
11. I feel that I can get less help with my individual problems using this method, ()
12. I feel that we could get more out of the class if we were all studying the same subjects. ()
13. The presence of students in the class who are studying other subjects does not greatly affect my progress. ()
14. Too much of our time is spent reviewing for and taking tests. ()
15. I would rather the tests were given at longer intervals. ()

16. I believe that the spacing of the tests has been about right ()
17. Discussing test results with the teacher helps me to understand mathematical concepts which were not clear to me. ()
18. Discussion of test results is too brief to be of much value in helping me to solve my problems ()
19. This method is helpful to me because otherwise I could not take as many mathematics classes as I need or would like. ()
20. I feel that it would be better to use another method of instruction even though I could not take as many mathematics classes as I would like. ()
21. Scheduling several classes the same hour for more than one period, helps me to take more other classes that I want. ()
22. I like this method, because in a bind, I can use the period for studying another class and make up my math work at another time. ()
23. There is too much opportunity to visit in our class. ()
24. Individual study areas would help me to progress faster. ()
25. Laboratory periods featuring applications of mathematics would be helpful. ()
26. This is the poorest method I have ever used in studying a subject. ()
27. The steps between frames are too small; they contain too much detail and too much repetition. ()
28. This is one of the most effective methods I have ever used in studying. ()
29. I believe the credit I earn has more meaning because it is given on the basis of what I accomplish and not on how much time I spend in class. ()
30. I believe that a student who is here every day should be given a full unit of credit whether or not he completes the course. ()

Give below any comments you have on improving this course, particularly on improving the use of these kinds of materials.

It is the writer's opinion that a tendency to agree with statement 1, 3, 4, 6, 10, 19, 21, 28, and 29 on the student opinion survey correlates positively with a favorable attitude toward the program, while a tendency to agree with statements 2, 5, 8, 9, 11, 12, 20, 26, and 30 correlates negatively with a favorable attitude toward the program. The remainder of the statements and No. 9 have to do with suggestions for modifying the program. A tendency to agree with statements 7, 14, 15, 18, 23, 24, 25, 27, and 9 would favor a change in the program, while a tendency to agree with statements 16, 17, and 19 is favorable to leaving the program as it is.

Although all statements are not equally polarized toward a favorable or an unfavorable attitude, some attempt to measure student acceptance or rejection of the program was made by averaging the percent of students who agreed with favorable statements and comparing this figure with the average percent who agreed with unfavorable statements. The result is tabulated in Table 9.

Table 9. Mean percent of students tending to agree with statements favorable or unfavorable to TEMAC mathematics programs

	1963	1964	1965
Favorable	69	73	68
Unfavorable	36	25	15
Ratio of favorable to unfavorable	1.9	2.9	4.5

As can be noted from the table, the ratio of favorable to unfavorable responses were nearly two to one in 1963 and had increased to more than four to one by 1965.

In no instance did a majority of the students favor changing any aspect of the program; however, substantial minorities would favor better class control, independent study areas, and greater emphasis on goal setting.

Following are some typical comments which students added to the opinion survey.

I feel this type of teaching has helped me greatly in my studying mathematics. About improving the course, I would say it satisfied the needs as it is.

I think group discussions periodically would really be helpful. A teacher has a way of explaining some principles that cannot be completely understood by reading them out of a book.

I feel that this is a good course, but I cannot discipline myself. I think if we had assignments by the teacher we would do more.

Junk these machines and go back to the teacher. To show what I mean, I got straight A's with a teacher and learned things; now I'm in the C bracket and learning very little.

I don't agree with this type of teaching. True, it helps some, but more are discouraged. I know myself, I would like to take more math classes, but if TEMAC systems were to continue I would not even remotely consider it. There are others who share my point of view. Interest in this class is a thing of the past. There is too much repetition, and the examples are too hard. A dual teaching program one using TEMAC and another using the conventional system would benefit everyone.

In general I feel that the geometry course was very well done and interesting.

I feel it should be more related to the teacher.

Setting periodic deadlines as a booster to study would help students finish the course.

I like the way the material of the course is made up, but I am sure that if individual study areas were provided, much more math would be accomplished.

I would like more time. What I have covered I have learned. Usually in math I go a whole year and don't learn anything, but now I know at least what I have covered, even if I have not finished the book.

Have intervals in which you have class discussions in which to see how much a person has learned.

I feel that if we could have an instructional period every week or two to define terms, pronounce words, etc. it would help the student understand the course a lot better.

I have enjoyed this system of teaching very much and I feel I have gained much in my study of math. More emphasis could be placed on applications of what is learned.

I like the course the way it is. Even if it gets hard to understand at times I can always get the teacher's help.

This course, I believe, could be improved by having very strict class discipline. I would like to see this method of study extended to other areas, not just math. I think some books, such as geometry, are written so as to be easily understood. Others are a lot harder to understand. If they were all written on the same level of understanding it would be easier.

This is one of the most efficient ways of studying any kind of subject that I have ever taken in high school.

Everything that I feel about the course is included in the statement, you gain much more from the subject by using the TEMAC system. I hope this program is carried on into future years. It has helped me greater than any other way of studying.

I think that individual classes would be helpful as far as progression and learning are concerned; such as algebra one in one classroom, algebra two in another, etc.

I feel that the class was very interesting and satisfactory. I feel a great sense of accomplishment since I completed my course in plenty of time. The method of letting a student study at his own rate is far better than other methods because slower students need more time for reviewing. It also helps for building character since the student depends upon himself.

I feel that this is an improved way of teaching; because if it weren't it wouldn't be useful to me. It might be improved a little, but I don't know how.

Evaluation-

Instructor's interpretation of results:- The instructor feels that although this project has helped in some aspects of the mathematics program, more work needs to be done toward solving problems of instruction. In summary:

1. This program seems to hold promise for increasing the flexibility of, and enlarging the curriculum offerings in Wayne High School.
2. The program seems to have made it possible for a larger percent of students to enroll in mathematics classes.

3. The program is in harmony with the philosophy of individualized instruction. Variability in achievement is quite consistent with variability in ability. The ninth grade experimental group in elementary algebra in 1964 and the trigonometry group in 1963 showed considerably greater variation in achievement than in ability.

4. An accurate evaluation of the program from standardized tests is impossible because there was not sufficient control groups. Achievement on subject matter tests was not as high as abilities seemed to warrant, and in several instances varied considerably from the instructor's subjective judgment of the student. Over-all mathematics growth as measured by STEP correlates well with ability as measured by SCAT.

5. One of the purposes of the project was to provide opportunity for highly motivated students to achieve in mathematics. A considerable number of such students achieved well as indicated by the wide variability on test scores. Time will tell how well the program will help them to obtain desired goals. One student who completed the TEMAC second year algebra course, the trigonometry course and the language of algebra course was selected for the United States Military Academy at West Point. He credited much of his success in competition for this post to the training he received through this program.

6. It was the instructor's feeling that students in his conventional classes were making somewhat greater progress than the students in the programmed classes. The one measurement using control groups seemed to confirm this.

7. The project has proved helpful in placing students in areas where they might enjoy some success. A considerable number of students in basic mathematics were transferred there from a failing situation in algebra, and most of them enjoyed some success. Some students who were having difficulty

in second year algebra were more successful when transferred to a geometry course.

8. The project made it easier to place students received by transfer and students returning after extended absence.

9. There is need for further investigation into more effective ways to use programmed materials in this situation. The instructor feels that the policy of student set goals has been moderately successful.

10. Discipline problems have increased under this project. Considerable work needs to be done in this area.

11. One criticism of the use of programmed materials has been that students tend to become bored. This did not seem to be an important factor in this project.

12. Generalizations from this study to similar situations should be minimized. Any conclusion which may be drawn concern only conventional classes as they were taught in Wayne High School and TEMAC materials as they were used there. The instructor's training and most of his experience has been in conventional class situations. An area worthy of investigation would be the effect on student progress of special teacher training in the use of programmed materials. In fact it is the instructor's opinion that the special problems of rural schools require teachers with special qualifications and training. Adequate cognizance of this has never been taken in American education, and until the time that rural teaching is made a profession attractive enough to draw and hold the personnel who in the majority of cases possess these qualifications, rural schools will not be able to fully capitalize on their special strengths and achieve the quality of education of which they are potentially capable.

13. There has been no attempt to compare the effectiveness of TEMAC programmed courses versus other programmed courses in mathematics. Some TEMAC

courses seemed more effective than others. Students in second year algebra seemed to have more difficulty than students in geometry or in first year algebra.

It would seem logical that with the passage of time programs will be improved so as to do a more effective job. To quote M. Daniel Smith^a:

"Some day it may be possible to teach careful observation, perseverance, retention of complex axiomatic systems, and other behaviors which the 'good student' now seems to possess by chance or heredity. This is the greater challenge offered by the field of programmed instruction, and will be its greater contribution to education."

Recommendations and Projections for Further Study -

The following are the instructor's personal feelings and recommendations after three years in the project.

1. Whenever class enrollment is large enough, students should be taught in conventional single classes. Multiple classes should be continued for purposes of schedule flexibility and curriculum enlargement.

2. Careful attention should be given to providing an environment conducive to good study habits. This includes a comfortable room, provision for individual study areas, and work on class control.

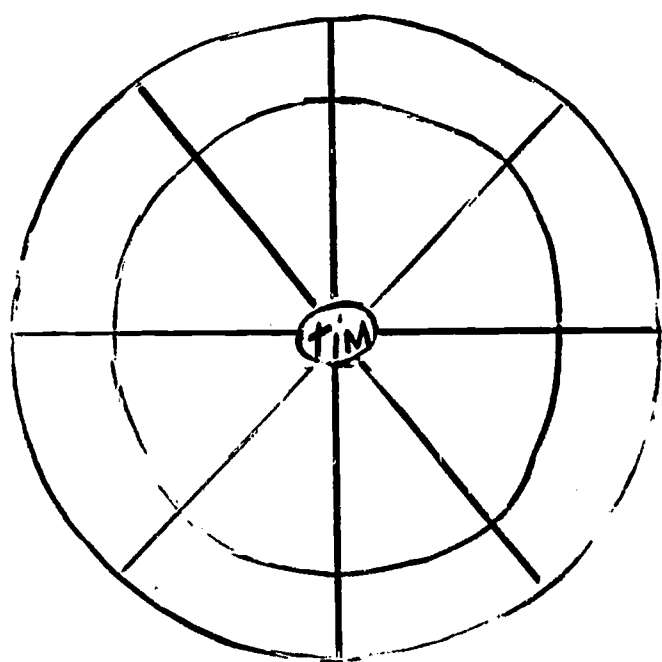
3. There should be constant appraisal of, and further experiment with, new courses and innovations which promise to be more effective in achievement of the goals of this project.

4. There should be continued work toward the improvement of the existing program. An area worthy of study would be the effectiveness of taped discussions and reviews to be used with some type of visual aids on an individualized basis.

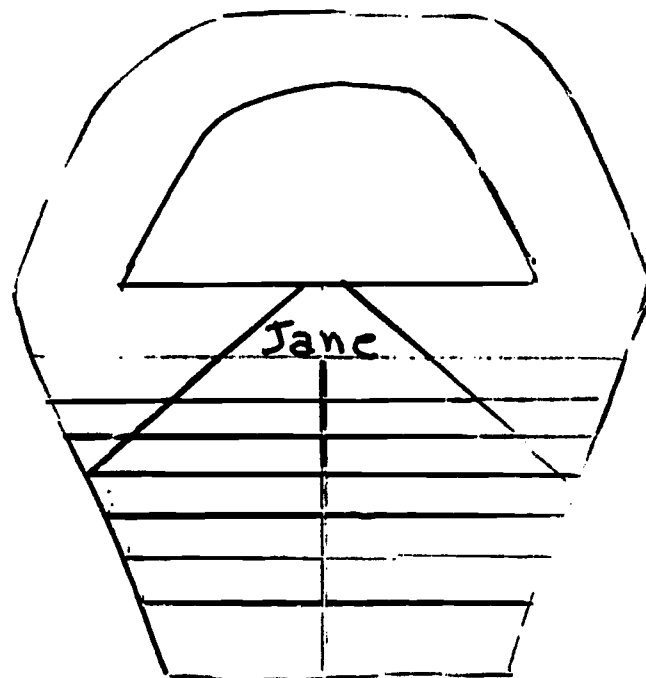
^aSmith, M. Daniel, "Some Considerations in Teaching Mathematics by Programmed Instruction." The Mathematics Teacher, 55:343-350, May 1962

system. Later and usually following the holiday vacation, the children started to use the story cabinet. The stories were very interesting to the children. The stories are full of interesting information and the children liked the word games and record keeping that followed each story.

The fourth and last phase of the program was called Library reading. This part was planned to save time for the teacher; give the children free reigns in independent reading, self-selection, keeping their own library card, and to promote reading experiences in the home with the parents. Each child was provided as often as he needed one, with a library card made from tagboard and marked into sections.



Betty		



This was his library card and on it he wrote the name of the book he took home. Books were selected without the teachers help, from trade books, library, and bookmobile books.

When the books were returned with a note from the parent saying the child had read the book, a star was placed by the name of the book on the card. These

cards were placed in a special place in the room, and when a card was finished the child took it home to his family.

The responsibility of reading these books rested entirely with the parent and the child; it was also a means of letting the parent see the progress in reading. My only responsibility here was to let the child tell me now and then about the interesting parts of stories, and keep track of the books read.

One needs to understand children to know how important an improvised detail on a card can be to the child. It was amazing to see the high rate of enthusiasm this reading created in the children toward home reading. The best books became good conversational pieces and all the children participated, from the little slow reader who was proud to have a card with a dozen books listed, to the child who read 200 books during the school year.

The arithmetic instruction came immediately following recess. The first year we tried to streamline the texts to meet the needs of our changed program, but with the introduction of the new modern math (greater Cleveland), into our school, and after a careful study of the material, we found it necessary to introduce and teach each new principle and concept, because the mathematical terms were different and there were new approaches to concepts. We decided to teach all the children, regardless of grade, step by step from the very first of the series. In order to save time and give the older children the background they needed in this new material, we taught the lessons to the whole group at once. After each formal instruction the children were given work sheets from their own grade level on the subject taught. This presented a problem for concepts were not placed in the same area of each grade cabinet. It resulted in some confusion. The new material had not been organized for

individualized teaching. With the help of our consultant, Mrs. Searle, we grouped and filed the sheets in the cabinets, and labeled the different concepts so they were easy to find; then we set up a system of finding, checking, and recording sheets that could be done by the children under the teachers supervision; this saved a lot of time and confusion. A folder or pocket was provided for each child in which he could keep his sheets and a record keeping chart for his own use. We found this helped us very much and promoted the type of progressive system we wanted.

Teachers kept a progress record of each child for the purpose of a quick check to see where the child was in his work and where he needed extra help. The cluster plan was used for the extra teaching of concepts, and repeat work. Children corrected their own sheets and every sheet was reworked and corrected while it was fresh on the child's mind, (an extra reinforcement in learning); then the child was permitted to go on.

I feel that this material and the process of using it has given the children a greater understanding of sets, groups, symbols, comparisons, equations, types of measuring, telling time, etc., and newer, more meaningful ways of approaching addition, subtraction, multiplication, and division.

We learned that the old texts and the new material could not be combined because of the terminology and approach with young children. I wonder if the children have some of this same problem, when they take the yearly test for achievement. It would help to have the tests prepared by the same people who prepare the sheets they work. They might have rated higher, however, generally speaking, the children went above their grade placement in most cases and some as much as 1.5 higher. This same spread might be found under the old plan, but in this program the child with the potential to travel ahead may do so, while all the group have a feeling of composure and security

traveling at the speed they are capable of.

The new spelling, and the physical activity period were the two subjects that were stable for the afternoon schedule. All other subjects and projects of the day were sometimes changed and arranged to fit the needs of the children. As nearly as possible we held these subjects to a definite habit forming time because of their importance to the child,--health for health's sake; spelling, arithmetic, and reading because they were the part of the daily program where the most adjustments were made. This was true of the first two years because children had already been started with the old plan and materials, after that it seemed the best way, so we continued the same way.

The new spelling program was introduced into our school the very first of all the new materials, and was developed by the B.Y.U. Laboratory School.

This program consisted of a set of books of graded levels, each containing lists of words for spelling, and a paragraph on phonics related to the words in the list. Each list and instruction in phonics was called a group, as, group 1, group 2, and so on. The books were called levels, as, level IA, level IIA, level IB, etc.

The first step in this procedure was to give a placement test (provided in the instructions), to the second and third grade children, to indicate the book level for the child to start in. The children were given a copy of these instructions to follow.

1. Read the instructions at the beginning of each list.
2. Print the instruction.
3. Read the words.
4. Make a sentence with the words indicated by a star.
5. Print the words.
6. Study the words (spell them to yourself).
7. Print the words again.
8. Test with your partner.

Children pasted this copy in the front of the notebook and then before they began, a few sample lessons were given to the whole group to make sure they understood what to do and how to go ahead on their own.

The capable children worked with a partner, following the instructions; the teacher worked with slow children and gave group tests during class time. The beginning children came into the program later when they were ready for it.

A unit test was given at the end of each level completed before the child could go on. The test was given by the teacher, and some children learned the words and passed the tests on as many as six levels during the year. There was no stigma attached to spread in the childrens achievement in spelling. Children liked the program, they liked working with a partner and the self checking part in the work.

At the beginning of school each year children were given the placement test over again so they could start where they needed to. This way there was opportunity for review each year.

The functional words chosen each day were added to the groups of words to be studied.

All other work was taught mostly to the whole group at the same time. Children contributed according to their interest and ability. Social living and science were taught as units; much of the English was taught individually through the written work of the child. Spelling and writing were also helped in this way.

Some team teaching was done. Not only did we organize and plan together, but we put all the children together at times for instruction and activity.

We planned together for the use of such materials as phonographs, projectors, film strips, and tape recorders. We worked on materials for programs and social activities. I think we tried very hard to synchronize the program and were successful in having both teachers and children work well together.

Evaluation - We found both advantages and disadvantages in this program, but I feel that with experience and growth many of the problem areas will be taken care of. For three years we felt that the extreme difference in ages of first and third grade children was in some ways a problem, but this past year, with two grades, we realized that the span and spread of childrens ability and growth is always there and we did miss the mature influence and capable help of the older children. So what seemed a problem, only needed more understanding and time to work out the minor details; this is probably the answer to other disadvantages.

Record keeping and filing of material demands a great deal of time and makes extra work for the teacher.

The child keeps many records for himself, but that is part of the learning process for him; the teacher must still keep her own files and record charts for the purpose of knowing the child's progress, where he needs special help and as a check against his record.

I am converted to record keeping and to progress charts of the childrens' work, but I also feel that with the extra work for the teacher, it is easy to let this phase of the program get out of balance. Teachers need to be careful in budgeting time so that record keeping will not crowd out time needed for lesson preparation. Secretarial help is useful to the teacher, so that she may not shorten preparation time but if anything enlarge on it. Individualized teaching needs a great deal more time than the old plan, where all children are taught from the same page at one time.

All the children were accepted by the group. Age and achievement did not seem to make any difference in a social way. The independent and responsible way in which most children responded to their work was a joy to the teacher. The discipline problems that are caused by children having to wait for each other were not there. Children are anxious to continually move on, but they rebel sometimes against busy work, just work to keep them busy. Children were interested and happy in being able to go ahead with their work, and usually did so without urging from the teacher.

Cheating was practically unknown. Now and then a child would be too anxious to get the right answer the quickest way, but by constantly teaching them to understand the why of these new methods of learning, very few instances came up that could be called cheating.

I feel that we have met the individual needs of children better in this individualized program, and that they are better adjusted. The slow children of the room were not affected by the faster ones, in that way they felt insecure. To me the area of the most growth in all the children was not in the subjects taught, although the growth there was very good, but in the personality of the child. His ability to think better, adjusting socially, and going ahead independently, these areas that cannot be measured exactly, were changed the most, and growth in mental maturity toward self-independence. There was growth in the feeling of security and belonging in the child. The close individual work between student and teacher was very helpful to the child in helping him to feel at home.

Mrs. Jackson has in her report all the detailed statistical data of the test results and in a general way it is the pattern of both units. I will not attempt to give the same report here.

I want to say that to me this pattern of procedure in the classroom is a far better way to teach children and develop all their potentialities. I hope the program stays in the school.

The grouping of children and grades may change, but to me, the individualized plan for teaching children is, by far, the best approach to teaching.

I have been happy working in the small schools project, and am grateful to all those who have helped me and that I have worked with.

Materials and Resources - The Bicknell Elementary School building is new and is modern in most every respect. The teachers in the school really appreciate the fine equipment and all the new wonderful materials that are available for use in our school. Some of these items are:

Overhead projector
Movie projector
Slide and film strip machine
Tape recorders
Opaque projector
Ditto machine
Copying machine
Microscope
Record players
Primer typewriter
Movable blackboards
Flannel boards

Counting frames
Counting man
Number lines
Games and flash cards
Lincoln logs and blocks
Easels
Chart holders
Paper of all kinds
S.R.A. Reading labs.
S.R.A. Mathematics program
Spelling folders
Books (including many new
basic readers, supplementary
readers, and trade books.)

We also have television which will be ready for this coming year.

**PROMISING PRACTICES FOR IMPROVING
INSTRUCTION IN SMALL SCHOOLS**

**Practice No. 4
Individualizing English in a Small High School**

**Bryce Valley High School
Tropic, Utah**

**A project of
The Western States Small School Project**

**Utah State Department of Public Instruction
Dr. T. H. Bell, Superintendent
Room 223, State Capitol Building
Salt Lake City, Utah**

INDIVIDUALIZING ENGLISH IN A SMALL HIGH SCHOOL

Garfield County District

Russell Merrell,
Superintendent

Bryce Valley High School

Kerry D. Nelson,
Principal

Contributing Teacher(s):

Marian Shakespear
Dar Smith
Kerry D. Nelson

* * * * *

General Description -

(a) Problems to be Solved:

Many of our students were not getting adequate education in English. The slower students were getting farther behind as the years went by; the faster students were wasting much time and were getting lazy habits. The English teacher was so swamped with correcting she had little time for preparation and real teaching.

(b) Desired Outcomes:

Our aim, then, was to individualize our instruction, to give each student a program which would fit his individual needs and encourage personal responsibility. By using a lay person to assist in testing and correcting we hoped to relieve the teacher for her most important function, planning and teaching.

(c) Grades, Pupils and Teachers Involved:

This program involved all pupils in grades seven through twelve. Their approximate mental ages ranged from seven to twenty years. Our team was composed of two teachers, a study supervisor, and a lay person who tested and checked papers.

(d) Our School:

Most of our students come from low to medium income families. There are very few children whose parents are professional people. About a half of our students are brought in from surrounding communities by bus. It is a small school of about 155 students. The school population is fairly constant.

Preparation - The organization of the Western States Small Schools Project gave us the backing we needed to initiate our new program. A workshop at Utah State University oriented us, giving us ideas and information gained from similar experiments in other schools. We used many of these suggestions relative to format and materials.

Practice - We started our program using two study rooms, a small testing room and the library. We later tore out two partitions, making one large study room. In the corner of this room we made a testing center, supervised by a lay person who administered the tests and checked papers. The library was used for group discussions and as a research center. The principal, Mr. Nelson, supervised independent study. Two teachers, Mrs. Shakespear and Mr. Smith, were available to the students for consultation, oral reporting and group discussions. The junior high section met the first hour and were followed by the senior high group.

During the first week, each student was given his course outline, his own graph for his personal record (his expectancy level was indicated on his graph), and a list of the materials he would need. Each program was explained in an individual conference between student and teacher.

As a student completed a unit of work, he requested a test, or, in some cases, an oral discussion. If he passed the test, he would record the test results on his graph. If his score did not come up to his expectancy, he would come to the teacher for discussion of the test material. When he felt prepared, he would then take another test covering the same material.

The teacher scheduled individual or group conferences when tests indicated a need.

At the end of each six weeks, a throw-away report card indicating student progress was issued to the student. No grade was given.

The student's work was evaluated at the end of the year. If the student had completed his course, he was given a full credit. If he had not completed his outlined course, he was given that fraction of credit that he had earned. In some cases additional credit was given, for additional work.

Evaluation -

(a) Student Reaction:

Student attitude toward the program was generally favorable. Greater student responsibility was noted. Slow students showed renewed interest. Student achievement was as good as, or better than that noted in the conventional program.

(b) Teacher and Administrator Reaction:

Teachers and administrators were enthusiastic about the program. Some relief from paper correcting and supervision left the teacher more time for actual planning and teaching. Having two teachers, working as a team, gave the advantage of utilizing the strengths of each. The challenge of the experiment was stimulating and revived enthusiasm and interest. The fact that students initiated most of the requests for help when they felt the need for help made them much more receptive and teachable.

(c) Parent Response:

We have had general approval from parents who were acquainted with our program.

(d) Other Observations:

We have not yet achieved the degree of success in speech we would

like, We could do this with more planning time for speech units. We felt that our writing reached a higher level of organization this past year. Literature units need to be expanded. We hope to initiate two regular study and discussion groups aside from the regular program, one for college-bound seniors, another for students who lack initiative, whose progress is sub-standard.

Materials and Resources -

Literature:

Library Books (Classics, travel, biography, etc.)
Literature Units (Teacher-made, student-made)
Scholastic Literature Units (Scholastic Book Services)
Literature Sampler (Learning Materials, Inc., Encyclopedia Britannica, Inc.)
Anthologies (On hand from previous years)
Films (Borrowed)
Tapes (Teacher-made, student-made)
Records (Scott, Foresman and Company) (L. W. Singer)
Paperbacks

Language:

2200 (Harcourt, Brace and World)
2600 (Harcourt, Brace and World)
3200 (Harcourt, Brace and World)
MacMillan Programmed English (MacMillan)
E-F Series (California Test Bureau)
Warriner's Complete Course (Harcourt, Brace and World)
Text Books (Accumulated throughout the years, used for reference and review)
Auditory Unit (Teacher-made)

Spelling:

SRA Laboratory, Spelling (Science Research Associates)

Writing:

A Programmed Approach to Writing (Ginn and Company)
Writing: Unit Lessons in Composition (Ginn and Company)
Beginning Writing Unit (Teacher-made)

Study Skills:

How To Study (American Guidance Service, Inc.)

Reading:

Basic Reading Skills (Scott, Foresman Company)

SRA Reading Lab (Science Research Associates)

Reading the Sure Way, Record and Book (The Institute of Audiographic Arts, Studio City, California)

**PROMISING PRACTICES FOR IMPROVING
INSTRUCTION IN SMALL SCHOOLS**

**Practice No. 5
Individualizing and Non-Grading Math
in a Small High School**

**Bryce Valley High School
Tropic, Utah**

**A project of
The Western States Small School Project**

**Utah State Department of Public Instruction
Dr. T. H. Bell, Superintendent
Room 223, State Capitol Building
Salt Lake City, Utah**

INDIVIDUALIZING AND NON-GRADING MATH IN A SMALL HIGH SCHOOL

Garfield County District

Russell Merrell,
Superintendent

Bryce Valley High School

Kerry D. Nelson,
Principal

Contributing Teacher(s)

Mayo Rich
Afton Pollock
Kerry D. Nelson

* * * * *

General Description -

(a) Problems to be Solved:

In the past some students entering schools of higher learning did not have all the math they needed to compete with students from larger schools. We realized that in our situation we did not have teachers available for extra math classes. Individualization was difficult, and many slow students felt little success or interest in mathematics.

(b) Desired Outcomes:

We hoped that by instituting a consecutive non-graded program to make it possible for students to learn as much math as their time and capabilities would allow. We hoped to encourage all students to take personal responsibility and to gain a feeling of success in their work. By using a lay person for testing and checking, we desired more teacher time for actual teaching.

(c) Grades, Pupils and Teachers Involved:

All junior high students and about 70% of the senior high students were involved in the new program. The junior high met as a group the 3rd period of the day and were followed by the senior high students. A few students who did not find this time convenient or who wanted additional math arranged for another period during the day. Kerry D.

Nelson, our principal, was assigned the responsibility of the remedial group. Afton Pollock took the responsibility of the junior high course offerings and May Rich the senior high courses. A lay person was in charge of testing and paper checking. We had about 155 students in our school.

(d) Facilities for Teaching:

At the beginning of the year we used one large room containing two teacher stations and a testing area and another smaller room for the remedial students. We later moved all students into the large room, leaving the smaller room available for group discussions.

Preparation - Lacking precedent for a non-graded, individualized math that would fit our particular needs, we found it necessary to do a great deal of individual thinking and planning. The advent of the W.S.S.S.P. gave us the backing we needed. Several sessions with the directors of the project and other outstanding educators supplemented our own ideas and helped us to get the project underway.

Practice - At the beginning of the year, from test results and previous work of students, we determined each student's expectancy level and placed him in the material best fitting his needs.

The student used programmed materials and was instructed to proceed as fast as he could consistent with understanding. The student requested a test at the completion of each unit of work. If he did not pass this test he was required to do more work in that unit and consult with his teacher.

Upon satisfactory completion of a course, the student could move to another. He could earn as many credits as he was capable of earning in each year.

The course offerings were:

Remedial Fundamentals
E-F Series (Addition, Subtraction,
Multiplication, Division)
7th Grade Math
Modern Junior High Math

Basic Math
Basic Math (Problem Solving)
Modern Algebra I and II
Consumer's Math
Modern Trigonometry
Plane Geometry
Solid Geometry
Analytical Trigonometry
Sets, Functions and Inequalities
Verbal Problems
Language of Algebra
Introductory Calculus

A throw-away report card, showing progress of the pupil was issued each six weeks. The teacher kept the record of student progress.

Evaluation - Students taking the ACT Test for college entrance averaged between the 78th to 80th percentile. Students completed more units of work than under the traditional method. One student completed all course offerings; six others completed all but one or two. Greater interest was apparent throughout the school. We received favorable reports from our college students who had participated in the program in prior years. As teachers and administrators, we feel we are doing more for the individual student than we have done before. We believe in the program and are continuing our efforts to improve it. Parents are generally favorable to the program.

Materials and Resources -

Remedial Mathematics (Teacher-Made)
E-F Series (California Test Bureau)
SRA Modern Algebra (Science Research Associates)
SRA Modern Algebra (Temac, Encyclopedia Britannica Press)
Basic Mathematics Problem Solving (Addison-Wesley)
Temac (Encyclopedia Britannica Press) All other titles listed on previous page were Temac materials.

PROMISING PRACTICES FOR IMPROVING
INSTRUCTION IN SMALL SCHOOLS

Practice No. 6
Modern Mathematics in an Individualized
Program

Escalante Elementary School
Beryl, Utah

A project of
The Western States Small School Project

Utah State Department of Public Instruction
Dr. T. H. Bell, Superintendent
Room 223, State Capitol Building
Salt Lake City, Utah

MODERN MATHEMATICS IN AN INDIVIDUALIZED PROGRAM

Iron County District

Ianthus Wright,
Superintendent

Escalante Elementary School

M. K. Campbell,
Principal

Contributing Teacher(s)

Leda A. Jolley
George M. Jolley
Frank J. Petty (1 yr.)
M. Kay Campbell

* * * * *

General Description -

(a) Problems to be Solved:

The problem to be solved was that of individualizing our mathematics program, and at the same time introduce modern mathematics on a full-scale basis to grades one through six.

(b) Desired Outcome.

(c) Grades, Pupils and Teachers Involved:

This project took place in a three-teacher school with two grades under each teacher. The enrollment is approximately sixty students housed in a building with four classrooms, one being used as a special activities room.

As we visualize modern mathematics and individualization of mathematics, they might be incorporated into almost any school situation, with the possible exceptions being those conditions where the teacher is responsible to too many students, and also where the teachers are either unable or unwilling to participate in a program designed to prepare them for the changes. A desirable ratio might be approximately one teacher to twenty students.

Preparation - Though this report is being written in the absence of our faculty, I sincerely believe a concensus would be that no step in introducing any new program is more important than adequate teacher preparation.

An article which appeared in "The Arithmetic Teacher," April 1964, written by Glyde G. Corle, stated that ". . . changes which require a reorientation of our intellectual processes come slowly and painfully." Corle suggests at least twelve hours of college credit for adequate teacher preparation in new math before a school is ready to adopt a full-scale new math program. We feel this might be cut down some but not a great deal. We consider our attitude and participation in this new program as being healthy and effective. This might properly be attributed to the following preparatory phases: 1-Three different WSSSP workshops. 2-Personalized consultant help from a qualified instructor of the Brigham Young University (Dr. Richard Brown visited our school periodically during one school year). 3-An extension course in current mathematical ideas offered by the Brigham Young University. 4-Mathematics conferences sponsored by the Utah Education Association.

A variety of new materials were obtained which helped to clarify new ideas as well as develop more depth of understanding.

Practices - The new practices now used in our school are basically modern mathematics in an individualized program (I am assuming these terms are appropriate and do communicate). This instruction revolves around three types of communication. First, a one-to-one correspondence which is the most commonly used. Second, a small group situation in which students with common mathematical needs are brought together for a given amount of time. This requires a systematic record keeping arrangement which helps identify problems. Third, an entire class, of blanket type instruction and testing which is least frequently used. This serves the purpose of needed convenience as well as uncovering weaknesses which might be overlooked in the two foregoing types of instruction.

Evaluation - The comments and feelings of students, faculty and parents along with the testing results of the past project clearly bear out that this project under the WSSSP has made a positive improvement in the quality of teaching, the academic improvement of the students, increase in needed facilities and equipment, and general attitude of most people associated with our school. As near as we can ascertain, the most marked improvement in mathematics in the Escalante Valley School has been made under this project. We hope this may serve as a helpful contribution in raising the quality of instruction and student progress in rural schools.

I am unable, at this time, to provide any statistical information on our project. This is due to the fact that I received the request for this report after I had left for and was actively engaged in summer school at Provo, however, since the testing scores will be the subject matter for a masters project, more information and statistical data will be available in the fall of 1965.

In the first year of our project, we individualized our reading program. This was done under approximately the same in-service and advisory system as described in our mathematics project. During this phase an unused classroom was converted into a badly needed and relatively well stocked library.

It is our desire to have another opportunity of participating in a similar program to further improve our facilities, equipment and instructional abilities in the language arts area.

Active support and assistance from the advisory and administrative personnel of the Iron County School District has been appreciated.

**PROMISING PRACTICES FOR IMPROVING
INSTRUCTION IN SMALL SCHOOLS**

**Practice No. 7
Individualizing Instruction in High School
Language Arts**

**Milford High School
Milford, Utah**

**A project of
The Western States Small School Project**

**Utah State Department of Public Instruction
Dr. T. H. Bell, Superintendent
Room 223, State Capitol Building
Salt Lake City, Utah**

INDIVIDUALIZING INSTRUCTION IN HIGH SCHOOL
LANGUAGE ARTS

Beaver County District

Paul Lefevor,
Superintendent

Milford High School

Jesse E. Long,
Principal

Contributing Teacher(s):

Alice Elmer
Lora Johnson
Dee R. Goble
Nelda Memmott (Remedial Teacher)
Jesse E. Long
Joyce Joseph (Student Teacher)
Frances Goble (Lay Reader)
Pauline Rummler (Secretary and Clerk)

* * * * *

General Description -

(a) Problems to be Solved:

Improvement in our language arts curriculum to enable us, in a small school, to reach the slow learner as well as accelerate and provide more challenges of the fast learner. The conventional classroom has not enabled us to accomplish the above objective.

(b) Desired Outcome:

We, the Milford High School Language Arts Teachers and Supervisory Staff, endorse a program that will give the students a chance to achieve and progress in an atmosphere conducive to the development of their abilities and satisfaction of their needs. It should, in some way, give a feeling of security and a feeling of accomplishment. It should be geared to the individual student so that his means of communication may be broadened and his interests aroused to do a better job of learning for himself, rather than for the teacher and the grade.

Character is the aim of true education; language arts is but one means used to accomplish this desired end.

1. To develop basic skills, understandings, and attitudes of communication through experiences in speaking, reading, writing, listening and literature.
 - (a) Provide a developmental reading program for all secondary students.
 - (b) Encourage use of spelling and vocabulary skills at each level of learning.
 - (c) Provide experiences in self-expression for each student.
 - (d) Instill in each student the desire to attain self-discipline.
 - (e) Provide the opportunity for each student to develop the ability to think critically and analytically.
 - (f) Provide experiences in literature that will enhance each student's appreciation for aesthetic values and human relations.
 - (g) Encourage students to organize and complete the major part of their school work during the regular class periods.
 - (h) Stimulate students to read independently outside of the regular literature program for self-improvement.
 - (i) Realize that the reading of literature is a creative process in which the reader lives in imagination in a wider world and comes back to his own world with enriched experiences, deepened sympathies, and new insight and understanding.
- (c) Grades, pupils and teachers involved. Describe school and situation into which practice must fit:

We decided that since the art of communication is of extreme importance in our modern society that we would individualize our language arts department first. In our school this involved having a section for grades seven to nine individualized, involving 101 number of students in one class period, and grades ten to twelve involving 131 students in one

class period. We used the staff of three full time teachers, two part-time teachers, principal, and a lay reader as a teaching team.

Our high school physical plant is fifty years old, consisting of three and a half floors. We had a remodeling program on our bottom floor enabling us to have one large instruction room capable of holding 120 students, three other smaller classrooms and the library all on the bottom floor of our building and closely accessible to each other. We feel that the facilities considering the age of our building lend themselves to an ideal atmosphere of learning in an individualized program.

Preparation -

(a) Description of Teaching Orientation:

In February of 1964 several staff meetings were held involving the district curriculum supervisor, the English teaching staff and the administration. It was decided at this time we would begin analyzing other small schools in our area already involved in individualized instruction. We arranged for our staff members and administrators to visit Parowan High School, Cedar City High School, Panguitch High School, Bryce Valley High School, and Virgin Valley Nevada High School. After the visits we held additional staff meetings to analyze the existing programs of each and how we could establish a program to fit our own needs. The spring of 1964 we conducted an extensive testing program of all students. We checked their records thoroughly and recorded pertinent information for each student. We decided to have our language arts teachers report back to school the last week of July during the summer of 1964, this would give them four weeks to work together as a team and complete the curriculum planning we had worked on during the spring of the year. The staff also attended the Western State Project Workshop,

held at Brigham Young University. A series of meetings with parents to discuss the new program with them, and to orient them on the anticipated changes took place during the spring of 1964. By the time our students reported for school August 31, 1964, we had the curriculum pretty well completed, purchased many varied types of language arts materials and were ready to begin an extensive orientation period orientating each of our students into a new program of individualized language arts instruction with team teaching. We had excellent support and encouragement from our Board of Education, District Superintendent of Schools, and our District Curriculum Supervisor. It took almost one year of thorough preparation before we launched ourselves into this new program.

Procedures - Our junior high school Language Arts group meet first period in our large classroom facility and an immediate adjacent classroom. For convenience of roll check, each student has an assigned seat - it takes one minute for complete roll call. Instructions for the day are listed on the chalk boards in the classroom area. From these instructions the students determine individually whether they will be in a discussion group, working individually on regular work or in a testing situation. Each student has been counseled independently, with a counselor, and has arranged a program to meet his individual needs. This program is a part of a schedule kept in a folder with all other materials used by the student. They have to complete grammar, literature, composition, spelling and reading units during the year designed on their individual level. When the students have completed prescribed work and ready for testing or discussion or counseling, they indicate this in writing and place in the teacher preparation box. Students have freedom of movement to pursue the work that may be involved in their daily program. Rather than have students

assigned to group levels, we have attempted looking at the student individually and set up a complete program for the student as an individual. Because of our enrollment and the program we have been able to succeed fairly well in the project. All of our spelling tests and many of our discussions have been previously taped by the teachers and the tape recorder replaces the teacher in this activity. Our senior high school meets the second period of the day and follows somewhat the same activity.

We have duplicated unit outlines for all levels of work for the student to follow - each student does his own recording, but the teachers also keep a record for grading and counseling purposes. The teachers and lay reader do all checking. Our team planning period for the teacher is of utmost importance in keeping things organized and taking care of all checking of materials and program organization.

Evaluation - After being in the language arts program for one year, I feel that the following comments to be pertinent in evaluating our last years' program:

- (1) We feel that we were able to reach more students with the new program of individualized instruction than we did in the conventional classrooms.
- (2) The National Merit Scholarship Examination and the American College Testing Program of last year has indicated to us that we did make some gain with our junior and senior students in efficiency. We will conduct achievement tests this fall on all grade levels which will enable us to determine other class areas.
- (3) I am completing counseling with our next year seniors and all of them agree that the program has helped them. Some stated they prefer the conventional classroom because they feel more comfortable in always being directed. By far the majority do not wish to change back to the other program.

- (4) We now have Language Arts in two periods rather than nine and this has enabled us to free teachers for other teaching assignments which have broadened our curriculum offering.
- (5) We have some school patrons who have reservations concerning the success of the program. The majority are with us and feel that once we have it successfully in operation it will be an asset.
- (6) The success of our program is contributed to the fact that we had a team of hard working teachers willing to put in the extra mile and work towards improving the program.
- (7) We have found that we need to do a better job of orientation, and a preparation has been made to improve this problem.
- (8) We need to do a better job of student orientation on how to study and accept the responsibility for self-discipline.
- (9) We had a shortage of some materials but have been able to correct this for the coming year.
- (10) We have eliminated most of our dropout problems, because the slow learner has a program designed to help him.

Materials and Resources -

(1) Harcourt Brace and World Publishing Company

- a. English Grammar Composition 7 - 12 Warriner et al.
- b. English 2200, 2600, 3200 series, author Bulmenthel.
- c. Literature Companion Series - six levels.
- d. Laureate Literature Series 7 - 8th grade levels.

(2) Science Resource Associates

- a. Reading labs (all levels)
- b. Spelling labs (all levels)
- c. Contemporary Transparency lab.
- d. Vocabulary lab
- e. Literature lab

(3) California Testing Bureau

- a. C - D and E - F Language Arts Materials.

(4) Scott Foresman

- a. Complete Literature Series 7 - 12.**

(5) Ginn and Company, Author Gordon

- a. Introduction to Literature**
- b. Study of Literature**
- c. A Program Approved to Writing**

(6) MacMillan Company

- a. Sullivan - Program English**

We use several series of records, tape recordings and television.

**PROMISING PRACTICES FOR IMPROVING
INSTRUCTION IN SMALL SCHOOLS**

**Practice No. 8
Individualizing Instruction in High School English**

**Wayne High School
Bicknell, Utah**

**A project of
The Western States Small School Project**

**Utah State Department of Public Instruction
Dr. T. H. Bell, Superintendent
Room 223 - State Capitol Building
Salt Lake City, Utah**

INDIVIDUALIZING INSTRUCTION IN HIGH SCHOOL ENGLISH

Wayne County District

Arthur H. Lee,
Superintendent

Wayne High School

Sammy N. Newton,
Principal

Contributing Teacher(s):

Mark E. Larsen
Myrra W. Newton
David Kjar

* * * * *

General Description -

(a) Problem to be Solved:

What kind of English program will highly motivate students to develop their communication skills, to learn to understand the way language functions, and to appreciate and enjoy literature.

(b) Desired Outcomes:

1. A program which will encourage each individual student to work at a rate of speed which is most productive for him.
2. A program which will encourage the student to participate in the evaluation of his needs and the selection of his objectives in the course, and which will assist him in attaining these objectives.
3. A program which will require every student to interact as both speaker and listener in discussions of the literature read.

(c) Grades, Pupils and Teachers Involved:

Eleventh and twelfth grade students enrolled in English on a non-graded basis were included. This involved four classes and three teachers. The ungraded basis provided for a more flexible schedule offering five periods where English could be taken.

Preparation - Various English materials (listed below) which were designed to permit students to progress through them at individual rates of speed, were purchased. The teachers prepared study guides; these were in the areas of history of the English language, critical reading and listening, how to write a research paper, literature and others. The literature units consisted of some units on a theme with reading to be done and questions to be answered, other units on unrelated reading materials at various ability levels, also with questions. Books containing the material to be read were "rounded up" from various sources, library, private collections, paperbacks, etc., and centrally located. An individual progress record for each student was prepared.

Practice - At the beginning of the year the students in each class were divided into reading groups of four or five per group and assigned a literature unit with its accompanying study guide. These groups were assigned reading on the basis of the S T E P Reading scores. The students with the highest reading scores were given the units on themes. The next group was given a unit with a novel and short stories which were fairly easy reading, had high adolescent appeal, high literary merit, and with an adventurous, outdoor setting. Most of this group were boys and the purpose of the unit was that they might end the year with a rewarding experience with literature and thereby receive increased motivation toward future undertakings in the class and elsewhere. A third group was selected because their behavior at school had distinguished them as being among those students most alienated from school and society. They were required to read a novel in which the central theme dealt with the struggle of one adolescent who is on the outskirts of society to determine the relationship of his own values to those of society and its institutions when the two are often in conflict. The purpose for this novel was to focus the attention of these individuals on a problem which might lead them to examine their own social

relationships. A further purpose was to attempt to reinforce their own self-esteem through identification with the highly admirable central character of the novel.

In addition to being assigned to a literature study group, each class was oriented to the entire range of study materials and readings available to them and each student with the teacher determined what he should be able to accomplish during the year (many students accomplished more than they had anticipated they could). The students had needs for certain areas of study and spent time on those areas.

Each student was required to periodically complete a lesson in the Ginn Unit Lessons in Composition book. These books were purchased and assigned on ability levels.

Many students completed Sullivan's Programmed English as a review of grammar.

Units on History of the English Language, Critical Reading and Listening, How to Write a Research Paper, were based on material in Your Language, Book 6. Punctuation units, spelling units were also available to those who needed them.

Evaluation - No objective evaluation of this program has been attempted. However, both student reaction, as it has been voiced and observed through classroom behavior, and teacher reaction support the conclusion that this program has been sufficiently satisfactory to the participants so that they wish to continue some form of it next year.

Student opinions expressed midway through the year were that they did not prefer to return to a program wherein all students would work on a single assignment. One student said, "I have really enjoyed this class in every way. I especially like the way we worked individually so that each student could work

on what he needed most rather than on an assigned subject which he felt he did not need." Many students commented that they had learned more this year than any year since they were in the 7th grade.

Teacher Opinion: This program seemed encouragingly successful, both in allowing each student to work at his own rate of speed and in motivating him to work at his best rate of speed. (We were amazed at the range of variability.) The use of the Individual Progress Record and the allowance of freedom for the student to select his own objectives and study materials were essential contributors to this success.

The program seemed somewhat successful in encouraging the student to participate in the evaluation of his needs and in the selection of his objectives and in assisting him to attain those objectives. However, much improvement remains to be made. Study guides and materials in sufficient variety and level of skill were not available to the student. And equally as serious, students lacked valid means by which to determine their extent of progress through the year.

The discussion sessions held in connection with the literature units were very successful. Since there were usually fewer than seven in a group, everyone participated as both speaker and listener. However, certain factors did operate to reduce the extent of success below what it might have been. For one thing, these sessions were not held often enough. Also, too little provision was made to permit students to have a discussion session as they felt the need for it.

Materials and Resources -

Classroom
Office
School Library

State Bookmobile Library
Public Library

Programmed English - MacMillan
Unit Lessons in Composition - Ginn
A Programmed Approach to Writing - Ginn
TMI - Grollier Self-Tutoring - Spelling
TMI - Grollier Self-Tutoring - Punctuation
Programmed Vocabulary - Lyons & Carnahan

Teacher-made study guides:

Literature anthologies
Short story collections
Paperback novels

Your Language Book 6
Other language references

**PROMISING PRACTICES FOR IMPROVING
INSTRUCTION IN SMALL SCHOOLS**

**Practice No. 9
Expanding Mathematics Study Opportunities
in Small High Schools**

**Wayne High School
Bicknell, Utah**

**A project of
The Western States Small School Project**

**Utah State Department of Public Instruction
Dr. T. H. Bell, Superintendent
Room 223, State Capitol Building
Salt Lake City, Utah**

EXPANDING MATHEMATICS STUDY OPPORTUNITIES IN SMALL HIGH SCHOOLS

Wayne County District

Arthur H. Lee,
Superintendent

Wayne High School

Sammy Newton,
Principal

Contributing Teacher(s):

Ernest H. Jackson
Mark Larsen

* * * * *

General Description -

(a) Problems to be Solved:

Wayne High School has the problem, with its limited staff, of offering a broad curricular program which will meet the needs of all its students. This project was initiated to improve these offerings in the area of mathematics.

By national averages, mathematics enrollment in grades nine through twelve in Wayne High School has been low. The only offerings in these grades were elementary algebra, plane geometry, and consumer's mathematics. There was one teacher with training to teach algebra, geometry, and higher courses in mathematics. Approximately one-half his time was used in teaching science and eighth grade mathematics.

It was proposed that program flexibility be increased to avoid schedule conflict, and that the curriculum be extended. This was to be done by organizing multiple classes in mathematics for several periods per day. It seemed to the personnel involved in the project that programmed materials would lend themselves well to a multiple class situation.

(b) Desired Outcomes:

The objectives of the program were, (1) to increase mathematics

offerings and to make it possible for more students to enroll in mathematics courses in Wayne High School, (2) to compare the effectiveness of TEMAC programmed texts in a multiple class situation in promoting student progress in mathematical knowledge with the effectiveness of more conventional methods of presenting mathematics, and (3) to discover effective methods for using programmed materials.

(c) School Situation-

Wayne High School is a combined junior - senior high school with grades seven through twelve. It has an average enrollment of about two hundred sixty students and serves a population of about sixteen hundred persons, the entire population of Wayne County, Utah. Most of the students are brought in by bus, some from as far as seventy five miles.

Limitations in size make it difficult to schedule conventional classes so as to avoid conflict; and it is not economically feasible to hold conventional classes for the small groups of students who want to study such courses as intermediate algebra and trigonometry; however the administration and the mathematics instructor consider the needs of these students important.

Preparation - The instructor was oriented in the use of programmed materials at a one day workshop sponsored by Encyclopedia Britannica Films in Salt Lake City in the summer of 1961, and received additional help with programmed materials and the problems of small schools at the following workshops sponsored by the Western States Small Schools Project: Brigham Young University, Provo, spring of 1962 and summer of 1964; Utah State University, Logan, summer of 1963; and at Albuquerque, fall of 1963.

Materials used have been TEMAC programs in the subject matter areas mentioned in the text of this report, and SCAT, STEP and COOP tests.

Administration has made the project possible by arranging time in the schedule to carry out the project, arranging time for testing and counseling of students, arranging for the acceptance of the project by the WSSSP, arranging for consultant help, maintaining liaison with WSSSP, permitting the instructor to attend workshops on school time, sending administrators and faculty members to workshops, and handling the business part of the project.

Practice -

Organization:- The project was organized to take care of the functions of testing, guidance, and instruction.

Under the administration of the school guidance counselor pre and post tests were administered to students in the experimental program, using Cooperative Achievement Tests in the appropriate subject areas; also in March 1963 and each March thereafter SCAT and SIEP tests were administered to all students in the high school, excluding the 1964 twelfth grade. Where available scores on other tests were used in the guidance of students.

During the 1961-62 school year thirty-two students met in the chemistry laboratory and studied geometry and second year algebra using TEMAC texts.

In 1962-63 programmed mathematics was offered two periods during the day. One section consisted of twenty students and another of sixteen; both met in a small classroom. In addition two students were permitted to study on their own. The offering during the year was increased so that it included first year algebra, second year algebra, geometry, trigonometry, and modern algebra.

During the 1963-64 school year programmed mathematics was again offered two periods during the day. The sections contained thirty-one students each and met in a large classroom. In addition, seven students met in a group in another room during another period and studied the materials without the supervision of a teacher except when taking tests. Also, one other student studied the materials during a fourth period with a teacher's help available to him.

The course offering was enlarged to include a general mathematics course for those students who could not profit from algebra.

The same subject matter was offered in 1964-65 to one hundred six students. These were divided into four sections meeting in different periods of the day. The size of the sections varied from nineteen to thirty-nine.

Each student was issued a TEMAC programmed mathematics textbook and supplement and allowed to progress at his own rate. When available, teacher help was given at the request of the student. Each student made a weekly report of his progress, and took tests at the places indicated in the teacher's manual. Tests were checked by the instructor and, if deemed advisable, discussed with the student. If the test showed that the student had failed to master the unit of subject matter he was given suggestions for review and later tested on the same material using a different form of the test. When the area was reasonably well mastered, the student was permitted to progress on to the next unit.

There was some attempt to hold small group discussions under teacher supervision. This became more difficult as more subjects were added, and the difficulty was further increased as the year progressed and there was greater spread in student accomplishment. Usually by the end of the year all discussion was on an individualized basis.

In 1962-63 students were given a ten day how-to-study course before being issued their TEMAC materials. There has been no evaluation of this innovation since no careful records were kept the previous year.

Time goals:- The percentage of students who completed their courses in 1963 was disappointing. Some students did well and worked to capacity. Too many took advantage of what they considered their privilege to work as slowly as they wanted.

There was introduced during the 1963-64 school year a policy of student set goals as to the amount of material to be covered and the quality of work necessary to receive a passing grade. This was accomplished as follows: First, a form was devised, part of which constitutes the following page of this report. With this form the student is able to plot each day of the school year against the number of hundreds of frames he has completed in his course. At some time during the first three weeks of school each student met privately with the school counselor. They discussed scores on standardized tests, past achievement of the student, and such other predictive material as the counselor may have had in his office. After the discussion the student in consultation with his counselor set a reasonable goal as to the amount of credit he might be expected to earn. The rate that he must work to attain the goal was indicated as a graph on the form and was filled out in duplicate. One copy remained with the student and the other was given to the instructor. The counselor also indicated to the instructor the quality of work which might be expected from the student. This was determined with the help of a scale developed by the Brigham Young University. As the student progressed he plotted his achievement against the date. The instructor's copy was kept up-to-date from the student's weekly report of progress. A glance at the form was all that was necessary to see whether the student was progressing at a rate which would enable him to reach his goal.

Control groups:- Forty-five ninth grade students were given SCAT and STEP tests in March of 1963 and again in March of 1964. Unfortunately in 1963 they were scored against beginning of the year norms and in 1964 against end of year norms. Under these circumstances the students would be expected to lose a few percentile points.

Of these students, nine were enrolled in TEMAC first year algebra; seventeen were enrolled in a conventional first year algebra class using Nichols and Collins,

Course _____
Date ended _____

Test scores

Cumulative test scores

21 _____

 22 _____

 23 _____

 24 _____

 25 _____

 26 _____

 27 _____

 28 _____

 29 _____

 30 _____

6 _____

 7 _____

 8 _____

 9 _____

 10 _____

Expectancy score

Work completed
Frames Tests

First quarter _____
Second quarter _____
Third quarter _____
Fourth quarter _____

7000

6000

5000

— 400 —

300

209

100

Frames

1

2

5

4

5

6

7

8

9

1

1

1

Week ~~1~~
-93-

Modern Elementary Algebra as a text. The remainder were not enrolled in any mathematics course during the year. The programmed class and the conventional class were both taught by the same instructor.

For purposes of getting some comparison between the effectiveness of the experimental program and that of a conventional class, three groups from the ninth grade were equated as nearly as possible on mathematical ability using the quantitative section of SCAT as a measuring device.

The experimental group consisted of all members of the ninth grade who were enrolled in the TEMAC first year algebra course.

The first control group consisted of nine students picked from the conventional modern algebra class.

The second control group consisted of six students who were not enrolled in a mathematics class.

Growth was measured by the difference between the 1964 and the 1963 STEP scores.

Evaluation - Attempts to determine the results of the project have been made from, (1) enrollment trends, (2) rate of student progress, (3) results on standardized tests as compared to national norms, (4) results of standardized tests given to experimental and control groups, (5) comparison of student progress from one year to the next when a variable is introduced, (6) student opinion, and (7) the instructor's subjective judgment, based upon his observation of the program.

Results of the project, in terms of its objectives, are summarized numerically in the tables which appear in this section.

Enrollment trends:- Mathematics enrollment trends obviously are affected by many variables including, subject matter requirements, interests, home and community backgrounds, vocational and educational plans, abilities, curriculum

offerings, etc. Any tentative conclusions which may be drawn from the relationship between new curriculum offerings made possible by this project and mathematics enrollment is based on the assumption that other factors have remained relatively constant during the time of this project and the period immediately preceding it. Trends in mathematics enrollment in Wayne High School during the years of this project and for some time before are summarized in Table 1.

Table 1. Trends in mathematics enrollment, grades nine through twelve, Wayne High School 1958 to 1965

Year	Total enrollment grades 9 - 12	Mathematics enrollment	Percent enrolled in mathematics
1958-59	174	72	41
1959-60	161	86	53
1960-61	170	71	42
1961-62 ^a	170	77	45
1962-63	168	88	52
1963-64	175	129	74
1964-65	178	120	67

^aIntroduction of TEMAC programs

Mathematics enrollment in the school has tended to increase since the beginning of the project. Although enrollment in programmed classes increased during the 1964-65 school year, enrollment in conventional classes decreased enough to result in the lower percent of students taking mathematics.

Any enrollment in such courses as second year algebra and trigonometry has been made possible by the project, since such courses were not previously offered.

The writer feels that the general increase in percentage of students studying mathematics is desirable, but decrease in enrollment in conventional classes is undesirable until such time as programmed classes are shown to be more effective.

Results measured by standardized tests:- Mean scores and variability on standardized tests are given in Tables 2, 3, 4, 5 and 6. The scores given are for appropriate subject areas on the Cooperative Achievement Tests, for the mathematics section of the Sequential Tests of Educational Progress, and the quantitative section of the School and College Ability Tests.

Table 2. Mean scores and variability on certain standardized tests at the completion of a course in TEMAC elementary algebra and/or at the end of 36 weeks spent in the course

end of 50 weeks spent in the course												
COOP						STEP				SCAT		
Year	%tile	Range	S.D. ^a	SS ^b	Range	%tile	Range	S.D.	%tile	Range	S.D.	
1963	37	2 -88	31.8	11	3 -20	45	4 -96	34.9	40	5 -84	31.8	
1964	57	1 -98	24.6	9	3 -32	59	2 -99	25.5	59	1 -99	30.5	
1965	28	0 -95	26.3	10	0 -19	59	12-97	20.5	50	6 -97	24.2	

^a The notation S.D. will stand for standard deviation in this and subsequent tables.

^b The notation SS will stand for points gained on scaled scores between pre-test and post-test in this and subsequent tables.

Table 3. Mean scores and variability on certain standardized tests at the completion of a course in TEMAC intermediate algebra and/or at the end of 36 weeks spent in the course

ONE END OF 50 WEEKS SPAN FOR EACH YEAR											
COOP					STEP				SCAT		
Year	%tile	Range	S.D.	SS	Range	%tile	Range	S.D.	%tile	Range	S.D.
1963	25	3 -40	16.7	6	0 -11	70	31-97	16.5	66	46-87	16.7
1964	36	12-70	24.0	11	3 -19	71	35-97	20.5	73	58-98	15.7
1965	31	0 -70	18.6	10	3 -23	70	53-82	8.9	76	31-94	18.8

Table 4. Mean scores and variability on certain standardized tests at the completion of a course in TEMAC plane geometry and/or at the end of 36 weeks spent in the course

Year	COOP					STEP			SCAT		
	%tile	Range	S.D.	SS	Range	%tile	Range	S.D.	%tile	Range	S.D.
1963	32	1 -54	17.1	16	0 -29	63	1 -97	29.1	55	6 -92	30.7
1964	21	0 -62	22.5	10	16-48	71	35-99	16.8	72	31-99	20.6
1965	40	0 -91	31.4	19	6 -39	71	2 -98	23.7	71	6 -99	25.2

Table 5. Mean scores and variability on certain standardized tests at the completion of a course in TEMAC trigonometry

Year	COOP					STEP			SCAT		
	%tile	Range	S.D.	SS	Range	%tile	Range	S.D.	%tile	Range	S.D.
1963	64	59-79	17.6	17	15-19	92	79-99	8.2	94	91-99	3.6

Table 6. Mean scores and variability on SCAT and STEP tests at the conclusion of TEMAC basic mathematics course

Year	SCAT			STEP		
	%tile	Range	Standard deviation	%tile	Range	Standard deviation
1964	19	2 -50	15.8	25	2 -50	14.9
1965	28	1 -79	20.5	31	4 -87	24.9

An examination of these tables shows that in general the students in geometry and algebra classes achieved in the low average range in their specific subject areas as measured by COOP tests, but were generally average to high average in general mathematical knowledge as measured by the mathematics section

of STEP tests. There was considerable variability in achievement, but it was quite consistent with variability in aptitude as measured by the quantitative section of SCAT. Some students achieved in the high average to high range each year. Abilities of students generally increased from elementary algebra, to geometry, to intermediate algebra.

1963 was the only year in which a group of trigonometry students began studying together. Students taking trigonometry in subsequent years have begun the study at odd times during the year or have been enrolled on a part time basis. As measured by SCAT the 1963 students constituted a high ability, relatively homogeneous group. Variation in achievement was considerably greater than might have been expected considering the rather homogeneous measure of their ability.

The students studying basic mathematics generally were low to low average ability students, students who did not have the capacity to study algebra. They probably did as well as they could be expected to do.

An analysis of the gains shown in the SS column for 1965 indicated that the chances are about 95 out of 100 that these gains are significant for elementary and intermediate algebra, and about 99 out of 100 that the gains in geometry are significant.

Results as measured by control group:- Comparisons of gains made by ninth grade students enrolled in TEMAC elementary algebra during 1964 with gains made by two control groups, one studying algebra in a conventional class and one not enrolled in mathematics can be made from Table 7.

Table 7. Mean gains in %tile points for certain groups of ninth grade students as measured by STEP tests administered in March 1963 and March 1964. 1963 scores were derived from beginning of year norms and 1964 scores from end of year norms

	SCAT		STEP	
	%tile B8 norms	S.D.	Gain in %tile points E9 - B8	S.D.
Experimental group ^a	90.4	9.9	-12.6	12.9
Control group one ^b	89.2	11.7	- 5.7	7.8
Control group two ^c	89.7	12.3	-15.0	13.4

^aNine students who constituted all ninth grade students enrolled in TEMAC elementary algebra.

^bNine students who were studying modern algebra in a conventional classroom, equated in ability as nearly as possible to the experimental group using SCAT B8 norms.

^cSix students not enrolled in mathematics, equated in ability as nearly as possible to the experimental group using SCAT B8 norms.

Assuming no difference in ability, an analysis of these results indicate that the chances are about 90 in 100 that the students in the conventional class made greater gains than the students in the TEMAC class, and the chances are about 70 in 100 that the students in the TEMAC class made greater gains than the students who were not enrolled in mathematics. Students in the conventional class had greater variability in ability, but students in the TEMAC class had greater variability in achievement.

Effects of goal setting as measured by rate of student progress:- Students who completed their courses in 1964 and in 1965 were working toward student set goals. The students who completed their courses in 1963 were working toward

teacher set goals. To get some measure of the effectiveness of the student set goals in increasing rate of progress, the percent of students progressing at a rate which would enable them to complete 90% or more of their course in the expected time was tabulated. Some of these students were progressing at a rate which would enable them to finish 150% or more of their course. The tabulation is shown in Table 8.

Table 8. Percent of students who progressed at a rate which would enable them to complete 90% or more of a course in the expected completion time

Year	First year algebra	Second year algebra	Geometry	Trigonometry	Basic mathematics
1963	36	50	38	60	--
1964	82	50	39	80	82
1965	29	82	60	67	80

Results of this policy of goal setting are inconclusive, several variables affect this rate of progress. Nine students in the 1965 elementary algebra had already received nearly a unit of credit in general mathematics and were not particularly interested in earning more credit. Only five percent of students in the 1965 class indicated that they were interested in taking more mathematics than they could have taken under our previous program, compared to fifty or more percent in the 1963 and 1964 groups. Other variables such as abilities, interests, future plans, etc. doubtless affected the rate of progress. It is the feeling of the instructor that progress has been accelerated by student set goals.

Student opinion:- The following two pages constitute an opinion survey administered each May while the project was in progress.

STUDENT OPINION SURVEY

Name _____

Check only those statements with which you tend to agree.

1. I feel that this course has been effective in increasing my knowledge of mathematics. ()
2. I have learned some mathematics, but feel that another method of teaching would have been more effective. ()
3. I like this method of instruction because I can progress at my own rate. ()
4. Use of this method makes it easier to make up work missed because of absence. ()
5. Students who fall behind the class average tend to become discouraged and give up. ()
6. Students who might tend to fall behind in a conventional class will tend not to become discouraged using TEMAC, because they are not forced to compete with faster students. ()
7. In general this is a good way to teach mathematics, but it would be more effective if periodic class discussions could be arranged. ()
8. I find this method of studying boring. ()
9. This might be an effective way of teaching, but I find it difficult to discipline myself to study without a definite assignment ()
10. I feel that I can get more teacher help with my individual problems using this method than if we were using another method of teaching. ()
11. I feel that I can get less help with my individual problems using this method. ()
12. I feel that we could get more out of the class if we were all studying the same subjects. ()
13. The presence of students in the class who are studying other subjects does not greatly affect my progress. ()
14. Too much of our time is spent reviewing for and taking tests. ()
15. I would rather the tests were given at longer intervals. ()

16. I believe that the spacing of the tests has been about right ()
17. Discussing test results with the teacher helps me to understand mathematical concepts which were not clear to me. ()
18. Discussion of test results is too brief to be of much value in helping me to solve my problems ()
19. This method is helpful to me because otherwise I could not take as many mathematics classes as I need or would like. ()
20. I feel that it would be better to use another method of instruction even though I could not take as many mathematics classes as I would like. ()
21. Scheduling several classes the same hour for more than one period, helps me to take more other classes that I want. ()
22. I like this method, because in a bind, I can use the period for studying another class and make up my math work at another time. ()
23. There is too much opportunity to visit in our class. ()
24. Individual study areas would help me to progress faster. ()
25. Laboratory periods featuring applications of mathematics would be helpful. ()
26. This is the poorest method I have ever used in studying a subject. ()
27. The steps between frames are too small; they contain too much detail and too much repetition. ()
28. This is one of the most effective methods I have ever used in studying. ()
29. I believe the credit I earn has more meaning because it is given on the basis of what I accomplish and not on how much time I spend in class. ()
30. I believe that a student who is here every day should be given a full unit of credit whether or not he completes the course. ()

Give below any comments you have on improving this course, particularly on improving the use of these kinds of materials.

It is the writer's opinion that a tendency to agree with statement 1, 3, 4, 6, 10, 19, 21, 28, and 29 on the student opinion survey correlates positively with a favorable attitude toward the program, while a tendency to agree with statements 2, 5, 8, 9, 11, 12, 20, 26, and 30 correlates negatively with a favorable attitude toward the program. The remainder of the statements and No. 9 have to do with suggestions for modifying the program. A tendency to agree with statements 7, 14, 15, 18, 23, 24, 25, 27, and 9 would favor a change in the program, while a tendency to agree with statements 16, 17, and 19 is favorable to leaving the program as it is.

Although all statements are not equally polarized toward a favorable or an unfavorable attitude, some attempt to measure student acceptance or rejection of the program was made by averaging the percent of students who agreed with favorable statements and comparing this figure with the average percent who agreed with unfavorable statements. The result is tabulated in Table 9.

Table 9. Mean percent of students tending to agree with statements favorable or unfavorable to IEMAC mathematics programs

	1963	1964	1965
Favorable	69	73	68
Unfavorable	36	25	15
Ratio of favorable to unfavorable	1.9	2.9	4.5

As can be noted from the table, the ratio of favorable to unfavorable responses were nearly two to one in 1963 and had increased to more than four to one by 1965.

In no instance did a majority of the students favor changing any aspect of the program; however, substantial minorities would favor better class control, independent study areas, and greater emphasis on goal setting.

Following are some typical comments which students added to the opinion survey.

I feel this type of teaching has helped me greatly in my studying mathematics. About improving the course, I would say it satisfied the needs as it is.

I think group discussions periodically would really be helpful. A teacher has a way of explaining some principles that cannot be completely understood by reading them out of a book.

I feel that this is a good course, but I cannot discipline myself. I think if we had assignments by the teacher we would do more.

Junk these machines and go back to the teacher. To show what I mean, I got straight A's with a teacher and learned things; now I'm in the C bracket and learning very little.

I don't agree with this type of teaching. True, it helps some, but more are discouraged. I know myself, I would like to take more math classes, but if TEMAC systems were to continue I would not even remotely consider it. There are others who share my point of view. Interest in this class is a thing of the past. There is too much repetition, and the examples are too hard. A dual teaching program one using TEMAC and another using the conventional system would benefit everyone.

In general I feel that the geometry course was very well done and interesting.

I feel it should be more related to the teacher.

Setting periodic deadlines as a booster to study would help students finish the course.

I like the way the material of the course is made up, but I am sure that if individual study areas were provided, much more math would be accomplished.

I would like more time. What I have covered I have learned. Usually in math I go a whole year and don't learn anything, but now I know at least what I have covered, even if I have not finished the book.

Have intervals in which you have class discussions in which to see how much a person has learned.

I feel that if we could have an instructional period every week or two to define terms, pronounce words, etc. it would help the student understand the course a lot better.

I have enjoyed this system of teaching very much and I feel I have gained much in my study of math. More emphasis could be placed on applications of what is learned.

I like the course the way it is. Even if it gets hard to understand at times I can always get the teacher's help.

This course, I believe, could be improved by having very strict class discipline. I would like to see this method of study extended to other areas, not just math. I think some books, such as geometry, are written so as to be easily understood. Others are a lot harder to understand. If they were all written on the same level of understanding it would be easier.

This is one of the most efficient ways of studying any kind of subject that I have ever taken in high school.

Everything that I feel about the course is included in the statement, you gain much more from the subject by using the TEMAC system. I hope this program is carried on into future years. It has helped me greater than any other way of studying.

I think that individual classes would be helpful as far as progression and learning are concerned; such as algebra one in one classroom, algebra two in another, etc.

I feel that the class was very interesting and satisfactory. I feel a great sense of accomplishment since I completed my course in plenty of time. The method of letting a student study at his own rate is far better than other methods because slower students need more time for reviewing. It also helps for building character since the student depends upon himself.

I feel that this is an improved way of teaching; because if it weren't it wouldn't be useful to me. It might be improved a little, but I don't know how.

Evaluation-

Instructor's interpretation of results:- The instructor feels that although this project has helped in some aspects of the mathematics program, more work needs to be done toward solving problems of instruction. In summary:

1. This program seems to hold promise for increasing the flexibility of, and enlarging the curriculum offerings in Wayne High School.
2. The program seems to have made it possible for a larger percent of students to enroll in mathematics classes.

3. The program is in harmony with the philosophy of individualized instruction. Variability in achievement is quite consistent with variability in ability. The ninth grade experimental group in elementary algebra in 1964 and the trigonometry group in 1963 showed considerably greater variation in achievement than in ability.

4. An accurate evaluation of the program from standardized tests is impossible because there was not sufficient control groups. Achievement on subject matter tests was not as high as abilities seemed to warrant, and in several instances varied considerably from the instructor's subjective judgment of the student. Over-all mathematics growth as measured by STEP correlates well with ability as measured by SCAT.

5. One of the purposes of the project was to provide opportunity for highly motivated students to achieve in mathematics. A considerable number of such students achieved well as indicated by the wide variability on test scores. Time will tell how well the program will help them to obtain desired goals. One student who completed the TEMAC second year algebra course, the trigonometry course and the language of algebra course was selected for the United States Military Academy at West Point. He credited much of his success in competition for this post to the training he received through this program.

6. It was the instructor's feeling that students in his conventional classes were making somewhat greater progress than the students in the programmed classes. The one measurement using control groups seemed to confirm this.

7. The project has proved helpful in placing students in areas where they might enjoy some success. A considerable number of students in basic mathematics were transferred there from a failing situation in algebra, and most of them enjoyed some success. Some students who were having difficulty

in second year algebra were more successful when transferred to a geometry course.

8. The project made it easier to place students received by transfer and students returning after extended absence.

9. There is need for further investigation into more effective ways to use programmed materials in this situation. The instructor feels that the policy of student set goals has been moderately successful.

10. Discipline problems have increased under this project. Considerable work needs to be done in this area.

11. One criticism of the use of programmed materials has been that students tend to become bored. This did not seem to be an important factor in this project.

12. Generalizations from this study to similar situations should be minimized. Any conclusion which may be drawn concern only conventional classes as they were taught in Wayne High School and TEMAC materials as they were used there. The instructor's training and most of his experience has been in conventional class situations. An area worthy of investigation would be the effect on student progress of special teacher training in the use of programmed materials. In fact it is the instructor's opinion that the special problems of rural schools require teachers with special qualifications and training. Adequate cognizance of this has never been taken in American education, and until the time that rural teaching is made a profession attractive enough to draw and hold the personnel who in the majority of cases possess these qualifications, rural schools will not be able to fully capitalize on their special strengths and achieve the quality of education of which they are potentially capable.

13. There has been no attempt to compare the effectiveness of TEMAC programmed courses versus other programmed courses in mathematics. Some TEMAC

courses seemed more effective than others. Students in second year algebra seemed to have more difficulty than students in geometry or in first year algebra.

It would seem logical that with the passage of time programs will be improved so as to do a more effective job. To quote M. Daniel Smith^a:

"Some day it may be possible to teach careful observation, perseverance, retention of complex axiomatic systems, and other behaviors which the 'good student' now seems to possess by chance or heredity. This is the greater challenge offered by the field of programmed instruction, and will be its greater contribution to education."

Recommendations and Projections for Further Study -

The following are the instructor's personal feelings and recommendations after three years in the project.

1. Whenever class enrollment is large enough, students should be taught in conventional single classes. Multiple classes should be continued for purposes of schedule flexibility and curriculum enlargement.

2. Careful attention should be given to providing an environment conducive to good study habits. This includes a comfortable room, provision for individual study areas, and work on class control.

3. There should be constant appraisal of, and further experiment with, new courses and innovations which promise to be more effective in achievement of the goals of this project.

4. There should be continued work toward the improvement of the existing program. An area worthy of study would be the effectiveness of taped discussions and reviews to be used with some type of visual aids on an individualized basis.

^aSmith, M. Daniel, "Some Considerations in Teaching Mathematics by Programmed Instruction." The Mathematics Teacher, 55:343-350, May 1962