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Date

July 20, 1976
A MODEL FOR THE DEVELOPMENT OF A COMPETENCY-BASED
EDUCATION PROGRAM IN THE BOZEMAN PUBLIC SCHOOLS

by

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A professional paper submitted in partial fulfillment
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This project dealt with the problem of developing a model to implement a competency-based education program in the Bozeman Public Schools. The major areas of concern were the development of the basic skills of reading, writing, and computation.

Competency-based education is designed to emphasize the learning and demonstration of basic skills, which are based on behavioral or performance objectives. The emphasis is placed on the goals and objectives and not on the means for their attainment. Individual achievement is emphasized while the learning is basically self-paced and student-centered. The students know in advance what is expected of them and in turn are held accountable for meeting the established criteria.

In addition, this type of program can give rise to curriculum articulation, improved staff relations, community-school relations, and an improved education for all students.

Some of the major conclusions reached as a result of this project were: (1) many competency-based programs have been implemented without a clear set of criteria for the goals of the program, (2) the most successful programs were developed through the use of cooperative committees and departments to plan the program and develop materials for use in CBE, (3) the best programs provided leadership, feedback, and evaluation techniques for program improvement, and (4) inservice training for all personnel in the program, staff and administration, is crucial to the development and continuation of the CBE program.

Criterion-referenced testing programs are to be used throughout the district in grades K-10 to evaluate the competencies and indicators established by the committees and to test the skill levels of the students.

Development and implementation models were drawn using the PERT chart technique to serve as program aids.
Chapter 1

INTRODUCTION

CBE - competency-based education - what is it? Where did it come from? Some individuals in the field of education see it as nothing more than "old wine in new bottles" while others state that "probably no educational movement of recent times has shown so much promise as this application of a common sense principle . . .", and still others say "it sounds good if you can figure it out" (Schmieder, 1973).

Presently, about all the educators can agree on with regard to CBE, as stated by Hall and Jones (1976:1-2), is that:

1. It has something to do with competence as an objective of education - a goal few seem to find fault in.

2. It appears to be a relatively new movement, and, as a movement, it seems to be growing rapidly.

3. It has a catchy name.

4. The name is value laden, for when it is mentioned discussion follows quickly and loudly.

5. It has divided the educational community into armed camps of pro and con.

6. It is best known as something in teacher education, and heaven knows, some say, whatever it is they need it.

"Something to do with competence", "new movement", "catchy
name", "value laden", in the statements above, are good modifiers of the concept of competency-based education. "Best known as something in teacher education" in statement six refers to the colleges that have a competency-based teacher training and certification program. The fifth statement concerning the division of the educational community is probably based on not understanding the idea, as is inferred by Ellis' statement:

The question of implementing a competency-based curriculum is one which must be faced. Since the success of any design rests with the teachers who implement it, and as there are many teachers who admittedly do not understand the underlying plan of that which they teach, one would assume that we must develop viable competency-based teacher-education programs, both pre-service and inservice.

Change in the present curriculum will come only when teachers become dissatisfied with the curriculum they now have and the ways they are now teaching. Undoubtedly there is much dissatisfaction among teachers as well as administrators and parents with the present curricula in most places (1972:37).

The previous statements, possibly, refer more to competency-based education for teachers than students. Perhaps a brief explanation of the CBE concept and a few definitions would be helpful in understanding the concept as it is to be used with students in the public schools. Richard W. Burns states:

The most striking feature of competency-based education obviously is competency, which is synonymous with the concept of ability. At the end of instruction, in competency education, the learner is to have acquired, the ability or skill to do - do something - since doing is the essence of learning (1972:22).

Competency, using Webster's (1966) definition, would be a
minimum level of learning or obtaining a specified skill as opposed to a quality level reaching proficiency.

The terms "competence" and "competent" are contrasted with "proficiency" and "proficient" in the definitions below to stress the point that CBE is concerned with a minimum level of learning.

**Competence**: property or means sufficient for the necessities and conveniences of life; the quality or state of being functionally adequate or of having sufficient knowledge, judgment, skill, or strength (as for a particular duty or in a particular respect).

**Competent**: possessed of or characterized by marked or sufficient aptitude, skill, strength or knowledge; possessed of knowledge, judgment, strength, or skill needed to perform an indicated action.

**Proficiency**: advancement toward the attainment of a high degree of knowledge or skill; the quality or state of being proficient.

**Proficient**: well advanced in art, occupation, skill, or a branch of knowledge; usually efficient (Webster, 1966).

The dictionary (1966) further states: "Proficient stresses a competency derived from training and practice" and lists synonyms as "adept", "skilled", "skillful", "expert", and "masterly."

The skills which the model for implementation of the CBE program will concentrate on are those termed the basic "3-R's" - reading, writing and computation.

Competency-based education can be a tremendous asset to the educational environment and educational output of the school district. It can be responsible for articulation of the curriculum, from
kindergarten through grade twelve. Place (1973:4) states that a competency-based curriculum "is the best means currently available to insure curriculum articulation, scope, and sequence."

According to Alschuler and Ivey (1972:53) "the first task in establishing competency-based education is to determine what is relevant both to students and to society." And, as was stated previously, the primary concerns are elements of a basic education.

For a definition of the term "basic education" the investigator referred to a Montana State Board of Education report (1975:21-22). Bozeman was among the school districts and communities involved in developing this philosophy. The report states:

A basic quality education is a process which can enable students to transform their potential into actuality. Further, the Board has identified eight dimensions inherent to the definition. Each is of equal importance; all are interrelated. To help students transform their potential into actuality, schooling should enable them:

a) to find joy in learning.
b) to communicate ideas, knowledge, thoughts, and feelings.
c) to reason critically and creatively.
d) to assume social responsibility.
e) to further their creative ability.
f) to be effective in a changing world.
g) to develop personal responsibility.
h) to learn who they are becoming.

The definition and attendant dimensions constitute a student-oriented philosophy of education. They define schooling as a process which enhances the development of the total person - body, mind, and feelings.

In July, 1975, adjacent to the Montana State Board of Education report, the results of a survey of local attitudes towards education
in Bozeman were published. The survey was completed under the direction of the Superintendent of the Bozeman Public Schools and was "designed to measure and record the attitude of Bozeman citizens and educators toward the local public schools."

Questionnaires were sent out to a stratified random sample of the community during the months of March and April, 1975. In addition, members of the following groups received the same questionnaire: staff members, teachers, students, administrators, board members and a group of adults defined as "community leaders."

When asked to prioritize the goals of education in Bozeman, as they saw them, a very strong desire for a "basic education" and/or "3-R's" type of goal surfaced. The public (Survey of Local Attitudes, 1975) listed the following as their three top priorities:

1. Teaching students the skills of reading, writing, and arithmetic.
2. Teaching students how to solve problems and think for themselves.
3. Teaching students the skills of speaking and listening.

The public was then asked to indicate the amount of emphasis they felt should be placed on each area, and "basic education - 3-R's" was in the top four of all three programs - elementary, junior high and senior high (1975:3-7) - which again shows a desire for emphasis on competence in the basic skill areas.

This idea is further supported by another statement in the Montana State Board of Education report (1975) which reads as follows:
Acquiring the basic skills of reading, writing and arithmetic is inherent in the definition and dimensions. Basic skills are essential; they are vital tools which facilitate student growth and lifelong learning. The Board believes that the teaching of basic skills is one of the prime functions of schooling. The Board did not see the definition and dimensions of basic quality education as detracting in any way from the basic skills as permeating each dimension so that intellectual and attitudinal growth occur simultaneously, mutually reinforcing one another.

Some of the advantages in using the CBE concept in education, according to Place (1973:4), are (1) a CBE curriculum can close gaps and smooth out the overlapping areas of the curriculum while articulating and spiraling the predetermined levels of knowledge and competency; (2) the students know what is expected of them and there are no "secrets" in learning or testing; (3) the students proceed at their own rate and know when the objective is mastered; (4) students have the opportunity to participate in their own performance evaluation which gives most a sense of accomplishment and a strengthening of their own positive self-image; (5) if given the performance objectives, parents can help students at home which results in greater home support and stronger school-community relations.

Horace E. Aubertine (1972:38-39) adds to this by saying:

Teachers and pupils work toward student attainment of specified competencies; both, then, should participate in assessing the success of student endeavors. The pupils would be advised in advance of the competencies they must achieve before proceeding further in study, and they should be made aware that evaluation of performance is intended to be a diagnostic technique rather than a grading system. Probably, assessment profiles would be the most effective
as their broad base and flexibility are suitable to evaluation of competency level achievement. Furthermore, the use of profiles discourages teachers from assuming that performances necessarily leads to proficiency.

Mr. Aubertine further states:

Working within a competency-based program with specified objectives and performance assessment procedures, teachers are accountable for their part in the instructional process. They should be specialists in their fields and have extensive experience and education not only in teaching techniques, but also in curricular design and evaluation. Moreover, they should be adaptable in working with colleagues not only within their particular disciplines but across disciplines as well, for this kind of education calls for an interdisciplinary approach.

Along these same lines of thought, Aubertine says "students, too, are accountable for their part in the education process." He feels that through the requirement for participation and performance, "the competency-based program challenges students and, ideally, will serve to dispel that apathy which leads to education being indifferently received and quickly forgotten." And he feels this concept will negate cultural biases by overcoming differences due to diverse ethnic backgrounds or environments (1972:38-39).

Burns (1972:23) feels "accountability in education is to be responsible for, able to explain or prove that learning has taken place. Ultimately, this means being responsible for learners in the classroom achieving what they are supposed to achieve. . . ."

The use of the CBE philosophy in acquiring the basic skills, 3-R's if you will, as stated by Smith, in Schmieder (1973:vi), "... is
viewed as a signal process in the constant evolution of educational betterment." And "its goal is the improvement of instructional quality for the children of this country."

The main purpose for considering the CBE concept is to provide competence in the basic skill areas of reading, writing and computation. The goal of the Bozeman system is to guarantee a fair and equal education and a basic level of competency for a majority of the students. It is realized, however, there will be students who will not be able to meet the minimum competencies as a result of mental or physical impairment. These individuals will be part of the Special Education program and will have other alternatives designed to meet their particular needs.

Statement of the Problem

The purpose of this study will be to develop a model for the implementation of a competency-based curriculum in the Bozeman Public Schools in the basic areas of reading, writing and computational skills.

Contribution to Educational Theory or Product

In a recent report entitled "Graduation Requirements" prepared by a special task force of the National Association of Secondary School Principals (NASSP) (1975) the NASSP Executive Secretary, Owen B. Kiernan stated:
During recent decades every attempt has been made to move the high school diploma within the reach of all youth. In the process, a consequence, questions now are being raised about the meaning and worth of the diploma.

States like Oregon, California, Rhode Island, Florida, Michigan and Georgia, among others, have mandated some form of competency certification at the school district or state levels. An Oregon Graduation Requirements "mini-report" under the supervision of Jesse Fasold (1974:2), who was Superintendent of Public Instruction with the State Department of Education in Salem, Oregon stated:

The traditional high school diploma has been based on two legs - attendance and course requirements. These two features will still exist to some degree under the new requirements, but a third leg of demonstrated performance has been added.

This idea of attendance, credits earned through course requirements and competencies certified is being considered for the Bozeman school system requirements.

Joe Lars Klingstedt (1972:14) adds:

... it should be obvious that CBE is a trend that is definitely catching on in educational circles. Laymen as well as teachers are 'tuning in' to this kind of thinking. Several states are changing teacher certification requirements in the direction of clearly specified competencies which must be mastered before the certificate will be issued.

While William L. Smith, Acting Deputy Commissioner for Development, U. S. Office of Education wrote in a prolegomenon in a paper written by Schmieder (1973:vi) as follows:

The quest for methods and programs which will improve the quality of instruction in American schools must be an unending
one. For in the pursuance of betterment there is always one more challenge to encounter, a design to further perfect, one more refinement to make. The cultivation of competency-based approaches to education is one of the most influential and important developments in the progressive effort to advance the process of schooling.

Of all the areas presently being explored to ensure an increased quality of instruction, competency-based education and performance-based certification have, perhaps, the greatest promise for effectively and finally meshing theory and reality into an integral, operational program design.

The model for implementation of a competency-based curriculum in this paper is designed for use by the Bozeman Public School system, but the basic ideas could be used elsewhere. The purpose of the model is to show a step-by-step process for reaching the goal of CBE. An accompanying time line and fact sheet will explain everything from the beginning stages through the final evaluation steps.

General Questions to be Answered

Listed below are a series of questions which will be answered by the model for implementation:

1. Who will be responsible for the program implementation?

2. What areas of the curriculum will be involved in the CBE implementation?

3. Who will be involved in setting the program goals, course objectives and indicators designed to meet the competencies?

4. Will there be community, staff and student involvement in the decision-making process?
5. Will the certification be a requirement for graduation from high school?

6. What will be the alternatives for those students who don't meet the competency requirements, if that should happen?

7. What evaluation procedure will be used?

8. Will there be standardized testing or specific kinds of tests used to evaluate the students' progress?

9. Who will be responsible for evaluation of the specified competencies?

10. What alternatives are available for those students with mental and/or physical impairments who are incapable of meeting the minimum competencies?

General Procedures

Personal investigations and review of literature will be the central methods of data collection in this study. The personal investigations will be made on a visitation trip to several schools in the Portland, Oregon area school districts which have implemented and are using the competency-based approach.

There is no statistical hypothesis or necessary analysis of data in this study. It is basically a gathering of information and ideas to provide a means for establishing a framework or set of guidelines to follow in a CBE program implementation.
There were three procedures used in this study:

Procedure One was to write for literature concerning CBE in colleges, universities and public schools in the United States who are presently using this concept. This was to establish what is presently being done in the field and to possibly update the available information from the literature.

Procedure Two was to arrange for a three-day visitation to several schools (the primary one being Parkrose Public Schools, Multnomah County School District No. 3, Portland, Oregon) using the competency-based approach to education. Other schools were the Portland Public Schools and Dallas Public Schools, District No. 2, Dallas, Oregon. It was at these institutions the investigator, along with three administrators from the Bozeman Public Schools, interviewed individuals (teachers, students, and administrators) who work on a daily basis with the CBE concept.

Procedure Three was to use all of the data collected to develop the implementation model for use in the Bozeman Public Schools.

Limitations

The only serious limitation to the completion of the study was a lack of literature concerning competency-based education - especially in public schools on the elementary and secondary levels.

The fact that it is a relatively new facet of education and that
there are a limited number of schools who have adopted the concept made it difficult to arrive at much information pertinent to model development along the CBE lines.

Summary

The competency-based approach to education is interesting and has some valid points to lend to those interested in curriculum innovations and educational advancements. However, one must keep in mind the CBE program will require considerable time and energy on the part of all involved. The fruits of labor will be students who are competent in the basic skill areas of communication and computation. In addition, the program can give rise to curriculum articulation, improved staff relations, community-school relations and an improved education for all students. The Bozeman system is interested in, as was stated in the chapter, the good that can be done in terms of curriculum and instruction and assuring individuals of at least a minimum competence in the basic skill areas.

This concept appears to be a growing impetus and may, to a degree, spread across the nation as a result of public pressure. Whether competency-based education or competency certification does, in practice, succeed in accomplishing what it is supposed to do will depend upon the degree of involvement of the individual school districts using the approach.
Chapter 2

REVIEW OF LITERATURE

The purpose of this chapter will be to develop, through appraisal of the material available on the subject, a greater understanding of what is involved in organizing and implementing a competency-based curriculum in the public school system. This chapter is divided into six sections: Definitions, Concepts of Competency-Based Education, Program Implementation, Comparison of Competency-Based Education and Traditional Methods, Planning and Model Development, and the Summary.

CBE, Goals and Objectives

Competency-based education (hereafter denoted CBE) is a system of education designed to emphasize specification, learning, and demonstration of those abilities which will be important in a profession or career at some point in the individual's future. CBE is also a term used to identify the current national movement in education and certification (Schmieder, 1973).

According to Place the CBE curriculum is:

An information system designed to provide instructional data to interested parties. The interested parties, eager to measure educational attainment, include students, teachers, administrators, school board and community members (1973:2).

The instructional data Place refers to is based on instructional objectives, which can also be referred to as behavioral objectives or
performance objectives. These objectives, as defined by Place, are "an aim or desirable outcome of action."

Plowman expanded on this idea by stating:

Those objectives that are of greatest value not only describe the behavior sought, but also identify expected levels of proficiency, mediating conditions, and methods for assessing whether or not the expected level of proficiency has been attained (1971:xxii-xxiii).

The goals in Montana for a CBE curriculum amount to an interest in developing policies which would accommodate a competency-based certification alternative. The feasibility of CBE programs are being studied through model training programs at Northern Montana College in Havre, Carroll College in Helena, and at Eastern Montana College in Billings (Schmieder, 1973).

Teacher education, goals, objectives, rationale, and policy areas such as those enacted by the State Department of Education in Oregon are being studied in a CBE context. Hall listed three changes that helped move Oregon towards a CBE system:

1. Changes in minimum requirements for graduation from high school.
2. Changes in the standards on which personnel are certified.
3. Changes in the minimum school standards used by the state to accredit elementary and secondary schools (1975:3).

The CBE curriculum, according to Schmieder (1973), offers the student a chance to be somewhat selective in his instructive activities. The emphasis is placed on goals and objectives and not on the means for attaining each of these. This type of educational program liberates
the student and individualizes the entire process.

The goals refer to the specific objectives and how they are to be met, what is required of the student, and the conditions under which the student action will be performed, along with the minimum performance criteria. Preoccupation with student failure should be eliminated to allow for student-centered, self-paced learning. There should be a removal of the time constraints placed on students to allow the emphasis to be switched to individual achievement (Harlacher, 1974).

Concepts of CBE

Jones in his paper on competency-based education stated:

Competency-based education as a general concept does not restrict education, nor does it necessarily change what is to be measured; it rather makes public in advance the criteria for acceptable performance in those measures, and holds the student responsible for meeting those criteria. Accordingly, the nature of the assessments is the same, but now achievement is the constant instead of time (1975:12).

CBE is limited in scope and measures only a few of the goals and objectives in a system. It isn't a whole new method of teaching or a whole new curriculum, and the use of performance goals and objectives should not be "feared" or rejected on that basis. The CBE curriculum concept, according to Place (1973:5) should be "teacher-free", free of individual teacher bias and interpretation. Theoretically a teacher in a system could be replaced by a different individual
and the instructional program, using performance objectives, would not be seriously interrupted. Even though the teaching styles and methods of the instructors may have differed, the limited learning outcomes of a CBE program would be the same or similar.

CBE places a sharp focus on objectives, responsibility for teaching, and learning (individualized), individual differences are looked at, and there is individual evaluation and feedback. The evaluation focuses not only on what the learner knows but on how well and to what degree he performs the competencies. In the CBE curriculum process, there is also a change in the role of the teacher— from dispenser of knowledge to enabler of learning (Schmieder, 1973).

Harlacher found that the competency-based learning system at Brookdale Community College in New Jersey allowed for individual differences and learning styles in this era of rapidly expanding industrial and technological knowledge. The competency-based learning system means:

1. That required competencies (learning objectives) are defined in advance for all units, courses and programs.
2. Course and program competencies must be mastered if credit is to be given and a degree awarded.
3. A wide diversification of learning methods is used.
4. All learning experience must be evaluated to determine whether learning has occurred.
5. Learning pace must be adjusted to the needs of individual students (self-pacing).

Facing a myriad of new demands from new students and from
society, the educational system cannot continue with the same old-fashioned or traditional methods. We cannot fail to recognize the individual differences and the wide range of human diversity (Harlacher, 1974). This can be emphasized by the following fable:

**Fable of Animal School**

Once upon a time, the animals decided they must do something heroic to meet the problems of 'a new world', so they organized a school. They adopted an activity curriculum consisting of running, climbing, swimming and flying, and to make it easier to administer, all the animals took all the subjects.

The Duck was excellent in swimming (better in fact than his instructor), and made passing grades in flying, but he was very poor in running. Since he was slow in running, he had to stay after school and also drop swimming to practice running. This was kept up until his webbed feet were badly worn and he was only average in swimming. But average was acceptable in school so nobody worried about that except the Duck.

The Rabbit started at the top of his class in running, but had a nervous breakdown because of so much make-up work in swimming.

The Squirrel was excellent in climbing, until he developed frustration in the flying class where his teacher made him start from the ground-up instead of from the tree-top down. He also developed charlie-horses from overexertion and then got a C in climbing and a D in running.

The Eagle was a problem child and was disciplined severely. In the climbing class he beat all the others to the top of the tree, but insisted upon using his own way to get there.

At the end of the year, an abnormal Eel that could swim exceedingly well and also run, climb and fly a little had the highest average and was valedictorian.

The Prairie Dogs stayed out of school and fought the tax levy because the administration would not add digging and burrowing to the curriculum. They apprenticed their child to a Badger and later joined the Ground Hogs and Gophers to start a successful private school.

The moral of the fable shows that people are different and
cannot be molded or fashioned in the same shape, size or color. All individuals do not learn at the same rate in all subject areas nor does everyone have the same interests. Educators have to capitalize on the individual strengths and potentialities or the outcome will be one of overall mediocrity resulting in individual talents escaping unrecognized, untapped and undeveloped (Harlacher, 1974:2-3).

**CBE Implementation**

Essential to the success of any program innovation is the involvement of those individuals who will be directly responsible for the actual carrying out of the plan. In implementing a CBE curriculum, the teachers and first-level administrators must be involved in the decisions required in planning, development, and operation of the program (Place, 1973).

Utz and those working with him in a study of the Toledo (Ohio) Public Schools and the Toledo Diocesan Schools states:

In developing and implementing any competency-based curriculum, there are several contextual considerations which must be made. These involve assessments of the social environment, the student profile, school resources, and the values of the school community. Once this general needs assessment has been accomplished, we then proceed to the business of curriculum building itself; determination of the goals and objectives; identification of assessment procedures, development of instructional strategies, selection of instructional resources, and the development of information feedback mechanisms for monitoring evaluation functions. The curriculum building process develops modules, the basic organizing unit of a CBE system (1974:1-2).

From the above statement, this investigator can find five
component parts to the implementation process: (a) the needs assessment; (b) an instructional program (based on objectives); (c) development of a budget based on resources available; (d) a process for the diffusion of information; and (e) development of an evaluation system.

In addition, Popham (1971:11) developed a criterion-referenced model that consisted of only four components: (a) specifying objectives; (b) preassessing learner (in relation to the objectives); (c) design instructional sequence to get him there; and (d) evaluating whether the instructional sequence worked.

Whichever model is used, one must also incorporate a method of monitoring such as pretesting, trend testing and mastery testing to strengthen the evaluation tool. The information system includes a cybernetic effect, feedback, to allow for needed corrections or changes in the program. Emphasis is placed on acquiring, organizing and providing data on the teaching-learning process and product. According to Place (1973:3) "the overriding purpose of any system is to provide results and to improve the existing order."

Place (1973) also feels the planning, implementation and responsibility for the information system belongs to the "line" personnel. With this approach, Place feels the program can be implemented in a shorter period of time with a greater degree of success.

Along with the components are a few generalizations one
could assume in the implementation of any competency-based program: (a) the program will be accepted best in a climate where there was voluntarism in the staff and administration; (b) the degree of implementation in the school and by the teachers is based on how the building principal perceives the concept and how involved the teachers were in the innovation, respectively; (c) if the CBE program is perceived as a system for organizing and evaluating curriculum procedures and not as a method of teaching, the program stands on firmer ground; (d) if inservice training is rewarded in some way, participation will be enhanced; (e) if teachers are required to develop their own curriculum modules it will create a psychological investment and a stronger appeal towards the program; (f) diversified staffing enhances individualizing for students; (g) lastly and the most difficult component to operationalize are the evaluation tools. These are also the most important in effecting change because they furnish data pertaining to the relevance and validity of the objectives and effectiveness of the instructional methods (Utz, 1974).

Comparison of CBE and Traditional Methods

Brownfield (1974:1) contends "that children learn in their own unique styles, at varying rates, and best when they are actively involved in the education process." She also believes that students can be trusted to set goals for themselves, evaluate their performance
and progress, make decisions and display a degree of self-responsibility.

She compares a good traditional classroom with a poorly-organized attempt at an open-type of classroom.

Johnson (1975) compared thirteen classes taught using the performance-based or competency-based instruction with fifteen classes taught using the traditional (conventional) method of instruction. The results of this study indicated that performance-based instruction developed a better general attitude toward the classwork, as compared to the attitudes developed by the traditional teaching method.

Planning and Model Development

In developing the CBE approach, we must establish a means or a model for the problem of arriving at competence in the basic skill areas of reading, writing and computation. Corrigan (1969) defines the term "model" as "a graphic and/or symbolic representation of reality." The use of models in education can allow "for (1) prediction, (2) communication, (3) planning, (4) implementation, (5) simulation, (6) analysis, (7) synthesis, (8) clarification or relationships, (9) evaluating, (10) comparing, (11) sensing, (12) controlling, and (13) correcting."

Another method, according to Kaufman (1972), is the systems approach, "... a type of logical problem-solving process which is
applied to identifying and resolving important educational problems." He further states that this approach is a means "to assure that a system is humane (education focuses on the learner) and responsive."

Kaufman's definition of a systems approach is as follows:

A process by which needs are identified, solutions are chosen from alternatives, methods and means are obtained and implemented, results are evaluated, and required revisions to all or part of the system are made so that the needs are eliminated.

The terms "system" and "systems approach", according to Corrigan (1969) relate "to applied methods for increasing the efficiency of (a) overall planning, (b) organization, and (c) performance in the development and implementation. . ." of the program.

McManama (1971:20-21) notes, "a systems approach is basically a set of operations which is designed to help solve problems more effectively and efficiently." He further states it is "a scientific method from a goal to its attainment. The primary purpose of this procedure is to eliminate the discrepancy between the stated goal and the actual output."

As you can see, the systems approach is both a process tool, which is used for effectively and efficiently achieving educational outcomes, and a way of thinking which emphasizes problem identification and problem resolution (Kaufman, 1972).

The effectiveness is a measure of how the output corresponds to the stated goal. The efficiency is determined after a comparison
is made between the time and energy invested and the cost in relation to other methods (McManama, 1971).

In Kaufman's discussion on change and planning he states:

There seems to be a trend in many educational circles away from raw intuition and toward precision and placing the learner at the center of planning and doing (learner orientation). This shift is not in content of curriculum alone but also in design and implementation of curriculum (1972:5).

He feels that all planning must start with the identification of the needs and defines an educational need as "the measurable discrepancy (or gap) between current outcomes and desired or required outcomes." The "gap" he refers to could be stated as the difference between "what is" and "what should be" or "what is required."

After defining the needs, the next step is in designing the system (McManama, 1971). This is done through understanding the structure of what is to be designed. After examining the existing design one must select an appropriate model which will aid in the development of the desired instructional system.

The instructional system approach for the design and development of instructional systems is discussed by Corrigan (1969). He feels the instructional system approach "is a learner-centered or a 'closed-loop' model of instruction." The general operating specifications required for this instructional model are as follows:

1. It begins with specifying in exact measurable "knowing and doing" performance terms what the student is to be able to do and to know at the completion of instruction, defines accept-
able proficiency levels, and states how this will be tested.
2. It requires a careful pre-selection of only relevant material and skills that represent the final learning objectives.
3. It provides for the design of instructional steps best suited to the progressive and successful understanding by each learner, based on his existing knowledge and background.
4. It provides for continuous, active response by each student at each learning step in the instructional sequence.
5. It provides for the pacing of instruction based solely on the measured student understanding.
6. It provides for predictable student learning achievements which are controllable and measurable.
7. It provides for empirical evaluation of whether objectives have been achieved as the basis for revision of parts or the whole, for the purpose of upgrading performance.

The "closed-loop" instructional model, as seen in Figure 1, Appendix A, is "designed to achieve carefully established learning objectives for students who present the necessary prerequisite skills for entrance into the instructional sequence." The model is based on what is to be learned, the outcomes or levels of proficiency to be achieved, and to show the most sequential instructional learning steps for the learner to follow in attaining success at reaching the prestated objectives.

Student achievement is measured by criterion-referenced tests, tests designed to measure all relevant skills stated in objectives, as opposed to the norm-referenced tests, how each student performs in relation to every other student, used with the traditional teaching methods (Corrigan, 1969).

Another management tool for the implementation of a change in curriculum, in this case the CBE concept, is called PERT (Program
Evaluation Review Technique), and its close relative CPM (Critical Path Method). They are time-line, sequential graphic representations of particular events, Kaufman, (1972), which can show the consequences of change in implementation activities, including changes in the categories dollars, time, and resources. The PERT technique, as stated by Immegart and Pilechi (1973:155), "is a viable means for intelligently scheduling the time necessary for accomplishing a task. In itself PERT solves no problems."

McManama (1971:55) reports that whenever there are problems which involve factors of time, cost and size, PERT should be considered. He states, "here is how it works":

1. Take each operational objective and outline in time sequence order the tasks which must be accomplished in order to achieve it.
2. On a flow chart indicate the anticipated elapsed time for performing each task and identify those tasks which are to be performed simultaneously. Identify as critical paths any tasks which consume time while simultaneous tasks stand and wait.
3. Revise the flow chart based on a reallocation of resources in order to reduce the estimated time for critical paths, and also for adjustment of other inefficient procedures by substitution of alternatives.
5. Continuously review performance in order to improve efficiency. The first three steps of this procedure are the Planning stage, step four is Evaluation, and step five is Review.

By using the systems approach, Kaufman (1972), and the related tools, a means and ends will be placed in more proper prospective and will be based on the probability of meeting high priority needs.
Summary

In the review of literature, this investigator has attempted to present a critical overview of the many aspects of implementing a competency-based curriculum in the public schools.

Competency-based education is designed to emphasize the learning and demonstration of basic skills which are based on behavioral or performance objectives. The emphasis is placed on the goals and objectives and not on the means for their attainment.

In CBE, individual achievement is emphasized while the learning is basically self-paced and student-centered. The students are held accountable for meeting the criteria, which is made public in advance. What is to be measured is not changed by using the CBE approach - just announced beforehand.

Implementation of the CBE concept involves many steps - from the needs assessment to curriculum articulation to the development of an evaluation system. The implementation can be enhanced through the use of management and process tools such as the systems approach and PERT charts.
The purpose of this paper is to gather information supporting the development and implementation of a competency-based education (CBE) program. The CBE program is to become part of the curriculum in the junior and senior high schools in Bozeman, Montana. It will be designed to deal with the competencies expected of literate adults in our society. Consideration is being given to developing graduation requirements in the areas of reading, writing, and computation by 1978. This chapter explains the design and detailed procedures by which the study will be investigated.

Investigation Design

The first step in successful action is planning. This paper is organized around four critical aspects of planning for improved programs: needs assessment, obtaining institutional and personal commitments to the program development, developing the program, and implementing the program in the Bozeman Public School system (Houston, 1974).

Needs Assessment

Set up a development team to decide what is needed, what is wanted and the why's and how's for reaching those goals and/or
objectives. Emphasis should be on team planning for the generation of ideas useful in program development.

Obtaining Commitments

Development of new programs is hard work. It takes commitment from the people working with the program to make the development process worthwhile. The degree of commitment of those people is going to affect the quality of the program delivered.

Program Development

The development process for CBE consists of four stages: design, implementation, evaluation, and revision. The design phase is the most important in planning for program development.

Program Implementation

The implementation program may be based solely on two words - cooperation and participation. Without cooperation and participation from the beginning stages through the developmental stages there can be no installation (Houston, 1974).

Kingery, in Houston (1974), while discussing program development stated "we will define the competency-based program development process as consisting of four phases: design, implementation, evaluation, and revision." He further stated:

Any program design effort begins with identification of what the major elements or parts of the program are - thus
identifying areas that must be given attention during development. The Texas Commission for Professional Competencies identified six critical elements of Professional Education Programs. These are:

1. Written statements of the description of reality (or assumptions) in which professionals and programs must function.

2. Written and/or graphic representations of the program in the form of a conceptual model. In this model, assumptions are tied to research, empirical and/or practical bases underlying the program; program elements or parts are defined in terms of the functions and tasks that must be carried out; and relationships between program elements are described.

3. The stated competencies that are the behavioral descriptors of the program's 'products.' Development of the competencies becomes the program goal which focuses and guides the functions of all other program elements.

4. The instructional program which has the function of providing instructional experiences to assist in the attainment of competencies.

5. Assessment and evaluation procedures which provide data to help determine that extent to which competencies are being attained and how well the program elements are functioning toward the end.

6. Management and governance subsystems which identify and interpret policies affecting the program and which facilitate, support, and monitor its operation.

The above is basically the format being followed in the development of the program for the Bozeman public schools. However, between the second and third items could be a step showing the development of a goal-based scope and sequence of knowledge and skills.

Methods of Collecting Data

Many schools and individuals were contacted in a search for materials and information concerning CBE. This was accomplished through correspondence by mail, conversations on the telephone, and by
on-site visitations to other CBE projects. In addition, there was extensive reading and library research to expand on the methods and concepts centered around CBE.

Information, which was helpful in developing the CBE approach in Bozeman, was gathered from many sources. Listed below are just a few of the individuals and agencies who provided pertinent materials on CBE to this investigator:

- Dr. George Dickson, Dr. Leo Leonard, Dr. Robert Utz, University of Toledo, Toledo, Ohio.
- Dr. Del Shalock, Teaching Research, Monmouth, Oregon.
- Ms. Marcy Kirks, University of Houston, Houston, Texas.
- Mr. Harry Jones, Austin, Texas.
- Mr. Ed Dambruck, Rhode Island State Department of Education.
- Mr. Robert Gabrys, Syracuse University, Syracuse, New York.
- Dr. Gil Shearon, University of Georgia, Athens, Georgia.
- Mr. Franklin Cain, Jr., State Department of Education, Richmond, Virginia.
- John Davis, Ed Caillier, Robert Cantonwine, Dallas Public Schools, Dallas, Oregon.
- Clarence Mershon, Max Brunton, Dave Cole, Iris Collins, Parkrose School District, Portland, Oregon.
- Ron Smith, Fred Forester, George Ingebo, Glenn Hill, Floyd Harmon, Ray Malo, Portland Public Schools, Portland, Oregon.
Several CBE projects were studied before the decision was made to make an on-site visitation to three districts in the state of Oregon. The trip was made during the month of April, 1976 with this investigator accompanying three administrators from the Bozeman School District. The purpose of the trip was to visit area and city schools, in the Portland vicinity, that are involved with competency-based education programs and have implemented the concept as an integral part of their curricula. Much information was gathered through discussions with administrators, teachers, and students who deal with the concept on a day-to-day basis. Their personal experiences, both rewarding and frustrating, provided a first-hand look at CBE and served to expand and update the information gathered from the literature and from other CBE projects.

Visitations were made with three districts - Parkrose, Portland Public, and Dallas Public. Each was approaching the idea of CBE somewhat differently in their attempt at meeting the Oregon State Department of Education mandated graduation requirements. These requirements involved certification through meeting specified competencies in all subject areas. Regardless of the differences in their approach, the basic ideas of needs assessment, curriculum articulation, scope and sequence of goals, competencies and indicators, testing, and program evaluation/analysis were fairly consistent with
the Oregon schools and other CBE projects.

Curriculum councils, staff, and administration, in the Bozeman system, have worked extensively with the scope and sequence of goals for the areas designated to be under the heading of CBE—reading, writing, and computation. At present, teams are gathering and developing criterion-referenced test materials for use in the evaluation stages. Other planning, such as budget allocations, development of competencies and indicators is also in progress.

Summer workshops, during June, 1976, will be run to try and finalize the scope and sequence of goals, competencies, indicators, and testing materials in hopes of a September, 1976 implementation target date.

Criterion-referenced tests will be administered in the fall and spring of the year. These will be given to students that range from grades three through eight and later through grade ten. A major portion of the testing materials will be from the computer scored and analyzed test program copyrighted by McGraw-Hill in 1975. The testing program is entitled ORBIT (Objective Referenced Bank of Items and Tests), CTB/McGraw-Hill, Del Monte Research Park, Monterey, California 93940.

Richard W. Burns (1972:40) states in an article on achievement testing in CBE, "in norm-referenced testing, scores are generally reported as ranks, percentile ranks, age levels, grade levels, curved
scores, decibles, etc. In criterion-referenced testing, scores are
generally reported as attainment or non-attainment of a prescribed
level of behavior. . ."

He further states that a criterion-referenced test

. . . is a measure of the degree of effectiveness of the
interaction between the elements of instruction, the strategy
presented for learning and the learning style and ability of
the learner.

This information, in its entirety, will serve to lay the
groundwork for a CBE program in the Bozeman school system.

Method of Organizing Data

The information gathered through the methods mentioned above
will be sorted and organized into a model in the form of a Program
Evaluation and Review Technique/Critical Path Method (PERT/CPM)
chart.

PERT relates to the nature, sequence and interdependence of
tasks to be accomplished in the project. Time estimates for
completing each task provide a realistic idea of personnel specifica-
tions, and suggest areas where additional resources may be required
to keep the total project on time. An example of PERT for the initial
stages of project development is illustrated in Figure 2, Appendix
B (Houston, 1972:65), as taken from Johnson and Shearon (1971:17).

Following Figure 3, Appendix C, is a sample of the curriculum
revision done by the Bozeman system in preparation for CBE development. Figure 4, Appendix D shows a process model for the implementation of CBE in the Bozeman Public School system. This particular model begins where the articulation of the scope and sequence of reading, writing, and computational skills ended. From position 3.0 on the model, the research and developmental stages begin the process toward implementation and, possibly, the adoption of the CBE program in the near future.

The curriculum revision took place through the years of 1971-75. The study of CBE began in the fall of 1975 and the target date for program adoption will be 1978. By the 1978 date, there may be graduation requirements tied to the competencies in reading, writing, and computation. The graduating seniors will have shown, at some point in their high school careers, competence through performance in specified skill areas.

After the entire program is pieced together - goals, competencies, indicators, testing, graduation requirements - and piloted for a given period of time, the next step is program adoption.

**Summary**

After a search through the literature and visitations to other districts carrying on CBE programs, the final phases of CBE development and implementation began to take place in the Bozeman system.
Teams have been set-up to develop competencies, indicators, and criterion-referenced testing programs to be used throughout the district in grades K-10. The results of the testing data will aid in the evaluation and analysis of the CBE program.

Development and implementation models have been designed and drawn on PERT charts and include accompanying time-lines. These serve as visual aids to assist in defining what has been done and what is left to be accomplished.
Chapter 4

SUMMARY AND CONCLUSIONS

The competency-based education concept proposed for the Bozeman system can be broken into three segments - none of which can be considered CBE by itself. Below, are the three segments:

A. Curriculum Development and Articulation
   1. Rationale
   2. Scope and Sequence of Goals
   3. Instructional program

B. Criterion-Referenced Testing Program
   1. Scope and Sequence of Goals
   2. Performance objectives
      a. Competencies
      b. Indicators
   3. Testing program
      a. Grades K-6 criterion-referenced reading tests
      b. Grades 3-10 criterion-referenced writing tests
      c. Grades K-8 criterion-referenced computation tests
      d. Grade 9 competency tests in each area
      e. Grades 10-12 competency tests to be given to those who fail to achieve competency level in grade 9

C. Competency-Based Graduation Requirements
   1. Identification of graduation competencies
2. Performance objectives
3. Performance indicators
4. Tests
   a. objective
   b. subjective
   c. 9th grade CB graduation requirement tests
      1. Reading
      2. Writing
      3. Computation
   d. Analysis of test data
   e. Remedial sessions
   f. Retests (for remedial students)

CONCLUSIONS

Some of the major conclusions reached as a result of this project were: (1) many competency-based programs have been implemented without a clear set of criteria for the goals of the program, (2) the most successful programs were developed through the use of cooperative committees and departments to plan the program and develop materials for use in CBE, (3) the best programs provided leadership, feedback, and evaluation techniques for program improvement, and (4) inservice training for all personnel in the program, staff and administration, is crucial to the development and continuation of the CBE program.
REFERENCES
REFERENCES


Houston, W. R. Strategies and Resources for Developing a Competency-Based Teacher Education Program. Albany: New York State
Educational Department, Division of Teacher Education and Certification, and Multi-State Consortium on Performance-Based Teacher Education. 1972.


Plowman, Paul D. Behavioral Objectives - Teacher Success Through Student Performance. (Chicago: Science Research Associates,


APPENDIXES
APPENDIX A

Closed Loop Instructional Model
Figure 1. A Closed-Loop System Management Process Model for Education
APPENDIX B

Illustrative Pert Chart
List of Stages, Events and Activities for Designing a Preliminary Plan

Stage I Self-Orientation (2-11)
3-7 Study present program.
4-8 Study nature of assumptions, goals and objectives
5-9 Make preliminary search for statements of goals, objectives, assumptions, etc.
6-10 Search for and examine strategies for development of statement of assumptions, goals, and objectives

Stage II Synthesize Ideas (12-13)
12-13 Bring together information from Stage I and formulate a tentative notion of the kind of plan that is needed for the target project

Stage III Preparation of Plan (14-22)
15-17 Identify resources
16-18 Prepare tentative PERT chart
19-20 Submit tentative plan to others for helpful input
21-22 Prepare tentative proposed plan and reproduce for distribution

Figure 2. Illustrative PERT Chart
APPENDIX C

Bozeman Language Arts Curriculum Revision
<table>
<thead>
<tr>
<th>Date</th>
<th>Number</th>
<th>Group</th>
<th>Description</th>
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<td>Jan. 1972</td>
<td>1.0</td>
<td>Administrative Cabinet</td>
<td>Decision to revise language arts curriculum K-12</td>
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<td>Jan.-June</td>
<td>2.1</td>
<td>Curriculum Office</td>
<td>Complete needs assessment</td>
</tr>
<tr>
<td>June 1972</td>
<td>2.2</td>
<td>Curriculum Office</td>
<td>Present program variables described</td>
</tr>
<tr>
<td>Jan. 1972-</td>
<td>2.3</td>
<td>Curriculum Office</td>
<td>Curriculum materials gathered</td>
</tr>
<tr>
<td>Sept. 1973</td>
<td></td>
<td>Language Arts Council</td>
<td>Complete draft rationale for language arts program</td>
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<tr>
<td>Jan. 1972-</td>
<td>3.0</td>
<td>Language Arts Teachers</td>
<td>Revision and adoption of language arts rationale</td>
</tr>
<tr>
<td>June 1972</td>
<td></td>
<td></td>
<td>Revision and ratification of language arts rationale</td>
</tr>
<tr>
<td>Sept. 1972</td>
<td>4.0</td>
<td>Language Arts Teachers</td>
<td></td>
</tr>
<tr>
<td>Nov. 1972</td>
<td>4.1</td>
<td>Administrative Cabinet</td>
<td></td>
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<td>Feb. 1973</td>
<td>5.0</td>
<td>Board of Trustees</td>
<td>Review and approval of language arts rationale</td>
</tr>
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<td>April 1973</td>
<td>6.1</td>
<td>Evaluation Office</td>
<td>Change variables described</td>
</tr>
<tr>
<td>April 1973</td>
<td>6.2</td>
<td>Evaluation Office</td>
<td>Preconditions described</td>
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<td>Aug. 1973</td>
<td>7.0</td>
<td>Evaluation Office</td>
<td>Selection of design of evaluation instruments</td>
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<td>June 1973</td>
<td>8.1</td>
<td>Language Arts Council</td>
<td>Written analysis of new curriculum and instructional programs</td>
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<tr>
<td>June 1973</td>
<td>8.2</td>
<td>Language Arts Council</td>
<td>Selection of pilot programs</td>
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<tr>
<td>Sept. 1973</td>
<td>9.0</td>
<td>Language Arts Council</td>
<td>Implementation of pilot programs</td>
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<tr>
<td>Sept.-Nov.</td>
<td>10.0</td>
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<td>Collection of base data</td>
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<td>11.1</td>
<td>Evaluation Office</td>
<td>Determination of goals achieved</td>
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<td>Description</td>
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<tr>
<td>May 1974</td>
<td>Evaluation Office</td>
<td>Evaluation of pilot teachers</td>
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<tr>
<td>March 1974</td>
<td>Principals</td>
<td>Cost benefit analysis</td>
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<tr>
<td>May 1974</td>
<td>Language Arts Council</td>
<td>Evaluation of pilot teachers</td>
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</tr>
<tr>
<td>May 1974</td>
<td>Administrative Cabinet</td>
<td>Based on evaluation Council will recommend whether to continue piloting one more year or to adopt new programs</td>
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<td>June 1974</td>
<td>Superintendent</td>
<td>Consideration of language arts council decision in 12.1 and recommendation to superintendent</td>
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<td>June 1974</td>
<td>Board of Trustees</td>
<td>Review of cabinet decision</td>
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<tr>
<td>June 1974</td>
<td>Language Arts Council</td>
<td>Final review of piloting results and consideration of administrative recommendations</td>
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<td>June 1974</td>
<td>Curriculum Office</td>
<td>New programs and methods selected</td>
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<td>June-July 1974</td>
<td>Language Arts Council</td>
<td>New program variables described</td>
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<td>July 1974</td>
<td>Administrative Cabinet</td>
<td>Written synopsis of K-12 language arts programs</td>
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<td>Aug.-Sept. 1974</td>
<td>Language Arts Council</td>
<td>In-service training program planned</td>
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<td>Sept. 1974</td>
<td>Language Arts Teachers</td>
<td>Review and decision on language arts adoption and decision on budget allocation for new materials</td>
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<td>Apr.-May 1975</td>
<td>Evaluation Office</td>
<td>In-service training for all teachers</td>
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<td>March 1975</td>
<td>Principals</td>
<td>Implementation of new language arts program</td>
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<td>May-June 1975</td>
<td>Superintendent</td>
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<td>1975-76</td>
<td>Principals</td>
<td>Evaluation of language arts teachers</td>
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<td>Group</td>
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<td>1/15/76</td>
<td>20.2</td>
<td>Evaluation Office</td>
<td>Final evaluation of determination of goals achieved</td>
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<td>Apr. 1976</td>
<td>20.3</td>
<td>Evaluation Office</td>
<td>Cross benefit analysis</td>
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<tr>
<td>May 1976</td>
<td>21.0</td>
<td>Administrative Cabinet</td>
<td>Review and analysis of the new language arts program and decisions for change or approval</td>
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<td>May 1976</td>
<td>22.0</td>
<td>Superintendent</td>
<td>Final review of administrative cabinet recommendations and decisions on program change or approval</td>
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<tr>
<td>June 1976</td>
<td>23.0</td>
<td>Board of Trustees</td>
<td>Final decision on language arts revision</td>
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<tr>
<td>Sept. 1976</td>
<td>24.0</td>
<td>Curriculum Office &amp; Language Arts Council</td>
<td>Monitoring of research and development in language arts</td>
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</table>

The process of curriculum revision should be an ongoing one. The Language Arts Council will continue to meet and keep the program up to date.
APPENDIX D

CBE Program Development and Implementation Model
Program Development and Implementation Model

1.1 Math - scope and sequence of computational skills
1.2 Writing - scope and sequence of skills
1.3 Reading - scope and sequence of skills
2.0 Final articulation of curriculum goals, etc.
3.0 Study of competency-based education (CBE)
   3.1 Analysis of curriculum development completed to date
   3.2 Determination of curriculum development needed to implement CBE program
   3.3 Determination of budget allocations for program development and testing program
   3.4 Gather tests for criterion-referenced testing program
   3.5 Planning with curriculum council, staff
      a. Plan for test development (criterion-referenced)
      b. Identify specific competencies
      c. Identify indicators of competencies
   3.6 Review of literature
   3.7 Contact other CBE projects
   3.8 On site trip to Oregon (Parkrose, Portland, Dallas districts)
4.0 Model for CBE in Bozeman
   4.1 Final review of curriculum goals
   4.2 Involvement of curriculum council, staff
   4.3 Identification of CBE areas of attack (reading, writing, computation)
   4.4 Identification of specific competencies in each area
      a. Indicators of competencies
      b. Identify changes in scope and sequence of skills
   4.5 Develop criterion-referenced testing
   4.6 Budget allocations for program development and testing
5.0 Make necessary changes in scope and sequence of skills
6.0 Report to the Board
7.0 Inservice training for administrators
8.0 Inservice training for staff
   8.1 Rationale
   8.2 Testing program
9.0 Implementation of CBE program
10.0 Administration of tests (Sept.)
11.0 Administration of tests (May)
12.0 Evaluation of testing data (May)
13.0 End of school term
14.0 Analysis of test data (June)
15.0 Review of program - competencies, indicators, scope and sequence - (June)
16.0 Program evaluation and analysis
17.0 Make necessary changes - scope and sequence, competencies, indicators, etc.
18.0 Report to Board
19.0 Recycle - administration, evaluation and analysis of testing program
20.0 Continuation of program evaluation - making necessary changes as needed
LANGUAGE ARTS CURRICULUM REVISION PROGRAM
BOZEMAN PUBLIC SCHOOLS
Department of Planning, Research, and Evaluation