A Mathematics Consortium Project Prospectus

To design and develop mathematics resources for students who have a history of poor performance in mathematics and are "at risk" of dropping out of school

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About CORD

CORD has been a leader in contextual education for more than a decade. As a nonprofit organization dedicated to excellence in education and training, CORD has formed several national and multinational consortia to produce groundbreaking curricula in mathematics and science. Through the Roney Teaching Center in Waco, Texas, CORD has offered professional development workshops in support of these curricula to over 6000 participants since 1993. CORD recently created the Virtual Teaching Center (VTC) with five videoconferencing studios using high-technology video and audio communication equipment to communicate with sites all around the world over high-capacity telephone lines. Using the VTC, CORD is able to deliver professional development, field support, and technical assistance effectively and efficiently without the burden of travel. CORD continues to seek solutions that can aid teachers in their efforts to transform education, particularly in the areas of professional development and curriculum reform.

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Executive Summary

CORD has developed materials in physics, biology and chemistry, and mathematics that are groundbreaking in their contextual approach to learning. These contextual materials emphasize real-world problems, hands-on activities, and workplace applications of academic concepts. Previously, CORD has targeted these materials to students whose academic achievement is within the middle fifty percent—those who generally learn more effectively through a concrete, rather than abstract, approach—and millions of these students have benefited.

At-risk students are typically characterized by a variety of socioeconomic, educational, and personal factors that tend to diminish their chances for scholastic success. Many of these students find mathematics, and especially algebra, the greatest perceived or real obstacle to school completion. Satisfying mathematics standards, meeting mathematics course requirements, and passing state-mandated mathematics exams often become the divide between those who graduate and those who leave school early.

With this prospectus, CORD proposes to collaborate with teachers and other educators to develop a highly motivating and effective mathematics program to specifically meet the needs of at-risk students. Combining CORD's expertise in developing materials for the concrete learner with the knowledge and best practices developed by teachers and administrators who have worked with at-risk students, the program will be a model for academic rigor achieved through a multiplicity of teaching strategies within a holistic approach to the student. In practical terms, CORD proposes to develop a highly motivating middle/secondary school mathematics program that will 1) substantially enhance the mathematics skills of these targeted students, 2) enable many of them to successfully move into existing mathematics courses, 3) encourage them to remain in school and graduate, and 4) provide the mathematics skills necessary to compete for jobs in today's workforce.

This prospectus addresses the development of a set of mathematics learning materials to help educators meet the needs of these underachieving students. The project proposes to:

- Develop a set of middle/secondary student materials that can be delivered over a span of two years, either as a stand-alone course or infused into an existing program, to students historically performing poorly in mathematics.
- Develop a corresponding set of teacher materials that provide an extensive resource of classroom activities, workplace examples and applications, hands-on exercises, equipment lists, multimedia ancillaries, and day-by-day lesson plans.
- Develop, deliver, and promote a professional development program for teachers.
- Develop an orientation/awareness program for school board members, administrators, counselors, parents, elected officials, and other interested parties.
- Convene three national consortium meetings to obtain crucial input from project members and to involve members in the project's progress and implementation.
- Field test the new materials.
- Fund the project through a combination of grants from foundation sources and contributions from a consortium of state agencies. The project development schedule spans a period of about 36 months at a projected cost of $1.5 million.

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A Mathematics Consortium Project Prospectus

Despite the best intentions and reform efforts of conscientious educators, many of today's schools continue to produce students who are labeled as either successes or failures. By and large, students who do well in school go on to achieve personal and economic fulfillment as adults, while students who do poorly leave school, in many cases prior to graduation, without having acquired the skills they need to realize their potential. Many underachieving students eventually join the ranks of the working poor. The professed goal of our educational system is that *all students* be given the tools necessary to develop and use their abilities to the fullest, but the realization of that goal remains elusive.

The problem may lie in the way student performance is assessed. Educators have long recognized that the distribution of student performance usually forms a bell curve, that is that, within any given student population, 25 percent will perform well, 50 percent will exhibit average performance, and 25 percent will perform poorly. Bell-curve analysis of student performance can be useful, but it also has serious limitations. For instance, the bell curve reflects only numerical scores, without taking into consideration personal factors that can affect student performance. Moreover, the bell curve, or, rather, the bell-curve mentality that it fosters, assumes that there will always be a certain percentage of students who fail. This assumption can encourage the belief that, if no one fails, the standard is too low, and, in turn, the belief that a certain amount of academic failure is acceptable, even desirable, since it indicates that high academic standards are in force.

Fortunately, although this bell-curve mentality may still dominate school systems as a whole, dedicated and innovative teachers and administrators daily challenge it. Resolute in their belief that failure is categorically unacceptable and that every student is capable of success at some level, these educators approach students as individuals, taking into account the totality of the personal and social factors that can affect academic performance. Drawing upon every available resource, these educators endeavor to overcome the pessimism and sense of failure that are the hallmarks of at-risk students and to develop the resiliency and responsibility that are necessary for success in school and in the working world.

In practical terms, however, these educators are often overwhelmed by their students' needs. Many at-risk students have been subjected to serious adverse conditions, including personal abuse, family dysfunction, poverty, malnutrition, homelessness, and drug abuse. Some have learning disabilities, such as attention-deficit disorder. Consequently, the classroom teacher must be not only a teacher in the conventional sense but a psychologist and counselor—diagnosing each student's problems and determining what teaching strategy to use, all the while maintaining an atmosphere of optimism and support. Even under the best circumstances, this is an extremely difficult task.

In the case of mathematics, the task is made all the more difficult by lack of specialized resources and teaching strategies. There is an urgent need for *tools* that will empower teachers to meet the special needs of America's growing population of at-risk students.

The project described in this prospectus will develop a mathematics program for at-risk students that trains and supports the classroom teacher by integrating academic standards, a wide variety of strategies and activities, and a holistic, cooperative approach to teaching and learning.

I. Background

In the United States, about 380,000 students aged 15 and above leave school each year without graduating from high school. Nearly two-thirds of the dropouts leave before the tenth grade and 20 percent leave by the eighth grade.[1] Many of these children come to school as composites of the broken pieces in their lives—single-parent households, homelessness, and mental illness—and from homes where they are forced to become self-sufficient at far too early an age. Some must deal with crime, drugs, and gangs in their neighborhoods; suffer abuse and neglect from adults; or become parents while still children themselves. The consequence of this trend is that approximately 3.4 million persons in the United States between the ages of 16 and 24 have not completed high school.[2] Those who leave school without the skills and training that schools should provide face a lifetime of limited opportunities, inadequate wages, unemployment, or worse—should they choose a life of delinquency or crime.

Although there are programs that deal with students who have already left school, the challenge we face is to develop programs that address the needs of at-risk students *before* they drop out—programs that will help them to obtain academic, social, and vocational success.

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1 Coley, R. J. *Dreams deferred: High school dropouts in the United States*. Princeton: Educational Testing Service, Policy Information Center. 1995.

2 McMillen, M., P. Kaufman, E. Germino-Hausken, and D. Bradby. *Dropout Rates in the United States: 1992*. Washington, DC: U.S. Department of Education, National Center for Education Statistics, NCES 93-464. 1993.

Learning theorist David Kolb observes that learners tend to perceive the information taught to them either *abstractly* (by conceptualizing and thinking about it) or *concretely* (by experiencing and feeling it).[3] Traditional curricula, for the most part, work very well when teaching *abstract learners*, i.e., students in the upper 25 percent (Figure 1). However, the remaining 75 percent of students are largely *concrete learners* who struggle and often fail to learn with abstract teaching methods and materials.

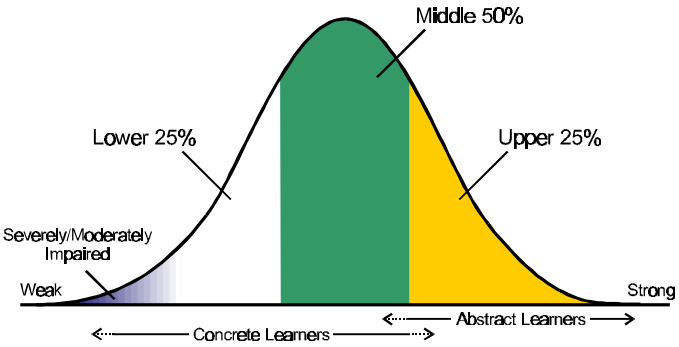

Figure 1. Math performance of secondary students

Involved in education reform since the 1970s, CORD has been very active in addressing the needs of concrete learners. With financial assistance from 49 state education agencies and the guidance of mathematical and technical educators across the country, CORD has developed *CORD Applied Mathematics*, *CORD Algebra*, and *CORD Geometry* to address the need for sound mathematics education for concrete learners. CORD materials have enjoyed widespread success in serving the middle 50 percent for whom they were chiefly designed.

Unfortunately, students in the lower 25 percent have seen only limited success with CORD materials. These students struggle with the required reading, the structure and pace of the delivery, and basic skills prerequisites.

CORD was challenged to investigate the development of a program of learning materials specifically for at-risk students, most of whom fall within the lower 25 percent. To that end, CORD convened a national panel consisting of mathematics teachers, a counselor educator, a school principal, a special education representative, a representative of an organization that counsels at-risk students, and a Job Corps Center educational director. This project prospectus is an outgrowth of that meeting. For a list of participants in the meeting, see Appendix A.

[3] David A. Kolb, *Experiential Learning: Experience as the Source of Learning and Development* (New Jersey: Prentice Hall, 1984).

II. Rationale

Mathematics Performance and "At-Risk" Students

Most of us would readily surmise that the lower 25 percent of students are largely at risk of dropping out of high school, probably for many reasons in addition to their poor mathematics performance. What is less obvious, though equally true, according to many accounts of mathematics teachers in the field, is that at-risk students include not only the majority of students in the lower 25 percent but a significant proportion of the students in the middle 50 percent and even some in the upper 25 percent. Figure 2 shows an example distribution of at-risk students' math performance. Notice that considerable numbers of students in the middle 50 percent and even some in the upper 25 percent are at risk of dropping out, for any number of reasons—socioeconomic, educational, and personal. The latter groups are probably well served by existing curricula. In addition, students at the very low end of the distribution are presently being served by special education materials.

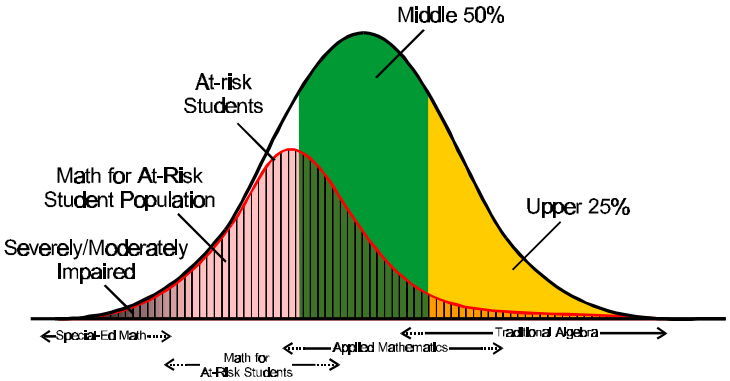

Figure 2. Distribution of "at-risk" high school students' mathematics performance

CORD's objective in this project is to develop and deliver materials that will have a positive, meaningful impact on the mathematics educational experience of "at-risk" students in the lower 25 percent. Relying on CORD's contextual mathematics expertise and the experience and collaboration of others, the project team will develop a mathematics program for students and a supporting professional development program for teachers that will substantially enhance the mathematics skills of these targeted students, enabling many of them to successfully move into mainstream mathematics courses, to remain in school and graduate, and to learn the mathematics skills necessary to compete for jobs in today's workforce.

Mathematics Learning Styles

Students in the upper 25 percent have demonstrated an ability to learn mathematics with traditional mathematics curricula, which are largely abstract in their delivery. The middle 50 percent have found success using *CORD Applied Mathematics* and, more recently, *CORD Algebra* and *CORD Geometry*. These learning materials provide a rich contextual, concrete experience for students, confirming that students in the middle 50 percent are largely "concrete learners."

Discussions with teachers and administrators confirm that the lower 25 percent are also concrete learners.

Teachers tell us that it is quite likely that, when the target students regain their confidence, they can quickly get "pumped" by the rebuilding of the basic skills missed in previous years. Students in this program may be encouraged to transition to more abstract mathematics courses. The goal of this program is not to lock out students from any preferred course or path, but rather to provide choices that best match their learning styles and levels of achievement—and to increase the students' chances for staying in school.

III. Uniqueness of This Program

The learning materials to be developed in this project can be used as the sole text for a course or as an enhancement to an approved textbook. The students might receive instruction with these materials in various settings: 1) in an all-inclusive (heterogeneous) classroom setting, 2) in a supplemental or compensatory class session for those students needing additional mathematics instruction, or 3) in a "pull-out" group of students that supplants the regular mathematics class.

Teachers have repeatedly told CORD that at-risk students don't learn well in structured classrooms with rows and columns of desks. They quickly lose interest in texts filled with abstract examples and historical lessons. To succeed, this program requires teachers who are 1) equipped with a host of activities and contextual exercises and 2) trained as facilitators of contextual learning methods to capture the imaginations of these students and help them to see that mathematics is indeed within reach and important to their futures. The emphasis will be on solving problems and helping students become aware of problem-solving and learning strategies, both cognitive and affective. The program will seek to build the students' repertoire of problem-solving skills as well as to increase their resiliency in the learning process. Conversations with many mathematics educators and the National Council of Teachers of Mathematics (NCTM) representatives confirm that very little curriculum using these approaches is available to teachers of this target audience.

Teacher as a Facilitator

Rather than assuming the typical role of sole authority in the class, standing at the board to lecture on the topic of the day, teachers in this program will be equipped to serve largely as facilitators and mentors to the students as they encounter the mathematics used in solving workplace problems and examples. This role will be conveyed in the teacher training workshops as well as on every page of the teacher resource guide. The activities and exercises supporting each mathematics concept will be written to support this teacher facilitation. Teachers will also find in the guide suggestions on how to help students analyze their own learning process and

recognize and build upon their strengths as learners. The goal of this program will be to develop in each student a sound set of mathematics skills as well as a sense of responsibility and confidence as a learner.

Student as a Team Player

At-risk students often are expected to look out for themselves. When they have failed in previous mathematics classes, they have failed alone. The social context of learning will be emphasized in this program, involving students on a daily basis as members of cooperative learning teams that work together to solve problems.

Carefully Paced Instructional Materials

While the traditional mathematics classroom can be free for improvisation by the instructor, teachers tell us that, in dealing with at-risk students, they find predictable delivery is very important. The materials developed by this project will be carefully sequenced and paced to provide a predictable stream of contextual examples, hands-on activities, workplace exercises, multimedia components, and cooperative learning sessions. For stand-alone implementation, lesson plans in the teacher resource guide will detail the progress of each classroom session.

Frequent Assessment

At-risk students are so accustomed to failure in mathematics that they often have lost hope; hence, repeated encouragement is imperative. Teachers tell us that one way to overcome the students' negative perception of mathematics is through frequent assessment to demonstrate small steps of success. This program will include diagnostic material at the start of each lesson, practice problems after each concept, a bank of real-world problems, sample standardized test questions, and a set of closing assessment problems.

Maturation of Delivery

At-risk students will typically begin this program with poorly developed mathematics skills and little confidence. Consequently, the delivery at the outset must be paced more slowly than would be common in a mainstream mathematics program. However, as the students' confidence grows, the pace can be quickened, the concrete delivery can be integrated with abstract concepts, and opportunities for discovery, critical thinking, and multiple problem-solving strategies can be introduced. The students will thus be prepared to make a transition into, and succeed in, a mainstream mathematics program.

Student Text Versus Teacher Resource Guide

A typical mathematics student text is designed so that a gifted student could probably learn the material with minimal teacher involvement. However, teachers report that at-risk students do not read their texts. They are easily distracted by large amounts of reading. Hence, this student text will contain a minimum of

required reading, relying on real-world examples to convey the mathematics content. In contrast, the teacher's resource materials will consist of three to five times as much material as the student text.

IV. Learning Materials

Objectives

CORD shares the vision of NCTM in its goals[4] for modern-day students:

1. Students learn to value mathematics.
2. Students become confident in their ability to do mathematics.
3. Students become mathematical problem solvers.
4. Students learn to communicate mathematically.
5. Students learn to reason mathematically.

These skills are necessary for students not only to graduate from high school, but also to compete in the highly technical workforce of the twenty-first century, with or without the benefit of postsecondary education. The short-term goal for students in the target population is to graduate from high school rather than "drop out" and enter the workforce with low skills and low wages. As stated previously, mathematics requirements are often one of the largest stumbling blocks to achieving this goal.

Success in the algebra course is generally required to pass a typical state exam required for high school graduation. Hence, the minimum pedagogical goal for students who complete these course materials over a two-year period will be to achieve mastery of basic prealgebra concepts, sufficient to enable them to enroll and be successful in the algebra 1 class. This process could begin in the middle school years or early in the high school experience. In either case, the curriculum will not preclude students with higher ambitions from continuing with geometry and algebra 2.

Since these students typically have experienced repeated failure in prior mathematics courses, the course will begin with a review of basic arithmetic skills needed for the rest of the course. Following this review, the materials will address basic prealgebra concepts and introductory geometry topics. A likely sequel to this course will be a more thorough coverage of geometry topics delivered in a similar manner. CORD will consider such a project at the conclusion of this development.

To increase the chances for success where other programs have failed, this program will include a variety of delivery methods, as discussed in other sections of this prospectus. The following list gives a summary of the topics, not necessarily to be delivered in the order shown below.

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[4] *Curriculum and Evaluation Standards for School Mathematics.* National Council of Teachers of Mathematics, March 1989. page 5.

Topics for Proposed Course

A. Work with Numbers

- Compare and order real numbers
- Round whole numbers
- Relate fractions, decimals, and percents
- Use scientific notation

B. Identify and Use Metric and English Units of Measure

- Work with length, area, volume, time, angular measure, rate
- Form ratios (1 foot = 12 inches $\rightarrow \frac{1 \text{ foot}}{12 \text{ inches}}$)
- Identify precision of simple measuring instruments

C. Solve Problems Involving Whole Numbers, Fractions, Decimals, and Percents

- Use addition to solve problems and estimate answers
- Use subtraction to solve problems and estimate answers
- Use multiplication to solve problems and estimate answers
- Use division to solve problems and estimate answers

D. Introduce Basic Algebraic Concepts and Relations

- Find squares and square roots
- Find inverses
- Decode and extend patterns of numbers
- Identify ordered pairs and solution sets in one and two dimensions
- Apply valid operations to an algebraic equation
- Solve simple algebraic equations
- Evaluate formulas involving numbers, symbols, and word expressions
- Set up and solve ratio and proportion problems

E. Work with Plane and Solid Geometric Figures

- Define the basic elements: points, lines, line segments, rays, angles, arcs
- Use plane geometric figures and determine properties, perimeters, areas
- Use solid geometric figures and determine properties, surface areas, volumes
- Use right-triangle properties
- Use ratio and proportion with similar triangles

F. Work with Probability and Statistics

- Use counting procedures
- Find probability of simple and compound events
- Determine mean, median, and mode

G. Solve Word Problems

- Develop general strategies for solving problems
- Solve problems involving percent, ratio and proportion, measurement, graphs, charts, tables, maps, diagrams, probability and statistics, and plane and solid geometric figures

Student Text

Students in the target population typically have struggled for several years with the traditional abstract delivery of mathematics concepts found in texts designed for the successful mathematics learner. The course proposed here will seek to overcome this obstacle by engaging the students in group activities, cooperative learning, workplace scenarios, multimedia technology experiences, and so on.

Since teachers have told CORD that students in the target "at-risk" population are reluctant to read, most of the details for the above-mentioned activities will be relegated to the teacher resources. The student text materials will consist primarily of the mathematics content (see Topics list) demonstrated in lively and illustrated workplace examples, followed by short, quick practice exercises.

The final binding format of the printed materials will be at the recommendation of the consortium members. CORD knows that confidence and image are important to these students, so the course material must have a respectable look that is comparable to other texts.

Teacher's Resource Guide

An extensive teacher resource guide will accompany the student text. Since the student text will be succinctly written, the teacher's guide will include an extensive array of pedagogical procedures, additional workplace examples, quick activities, and demonstrations to capture the attention and imagination of students who are typically intimidated by mathematics concepts. These resources will be detailed lists and recipes for day-to-day success.

Complete solutions will be provided for every practice exercise. In addition, the teacher's resource guide will offer frequent suggestions for extensions and activities that might logically follow an interesting exercise. For the case in which a teacher feels that additional practice is needed, the guide will include additional exercises and skill drills for photocopy duplication and distribution.

Frequent assessment is a vital part of teaching. The teacher's resource will contain multifaceted test instruments, alternative assessments, and other suggested evaluation tools, such as computer test software, with which the teacher will be able to monitor and acknowledge a student's progress.

V. Pedagogy for Typical Class

The classroom delivery for this curriculum will be different from most middle or high school mathematics courses. Rather than the teacher serving as the "sage on the stage" imparting wisdom to the students by way of the chalkboard, the teacher

will be more a "guide on the side" facilitating learning activities and problem solving. The teacher resource guide will provide detailed lesson plans for each day's activities and assessments.

Acknowledging these students' lack of mathematics confidence, at the outset the materials will cater to dependent learning styles, gradually maturing the delivery to a more independent approach. This will facilitate the transition of these students, now equipped with greater confidence and a history of success in mathematics, to a more traditional classroom approach in subsequent years.

Introductory Problem or Activity

The starting point of each lesson will be an activity or problem posed to students that requires their collaborative discussion, action (using selected materials, instruments, found objects, or other manipulative or technological tools such as calculators, multimedia programs, or spreadsheets), and/or research. This will typically be a problem requiring from five to fifteen minutes to solve, but could be a problem requiring as much as a full class period to solve later in the course.

Clarifying Discussion and Questions

The students will be encouraged to share how they solved the problem presented to them. There typically will be several ways to approach and solve the problem. Teachers will be prepared to identify these various approaches from the student discussions.

Clarifying Text

The student text will clarify the nature of the problem and possible approaches for solving similar problems by way of detailed examples.

Quick Assessment

The students will be presented with a similar problem or a variation on the original problem and asked to solve it in the small group. They will also be asked to describe their approach to solving the problem.

Troubleshooting

The teacher will work with students who have difficulty with the quick assessment. This may occur through orchestrating a second problem-solving session within a group or pair of students or with an individual. The second problem will be stated somewhat differently, or a different strategy will be suggested, in an effort to find

an approach that works for the student. After working with the students on the alternative problems, the teacher will conduct a second quick assessment.

Hands-on Measurement Activity

The students will work in cooperative groups to solve a measurement activity related to the concepts at hand. This will involve measurement tools (e.g., vernier calipers, micrometers, tape measures, pan balances, stopwatches), multimedia learning technology (e.g., educational computer simulations, spreadsheets), and so on. The cooperative learning approach assigns each student a specific role in the group—responsibilities that change from activity to activity.

Learning Technology Activity

The teacher's resource guide will include activities appropriate to each lesson that use the latest computer, multimedia, and calculator technology. Suggestions for resources will direct the teacher to other applications of technology that are available.

Follow-Up Exercises

The students will exercise their problem-solving ability in the skills being learned with a mixture of real-world workplace problems and drill problems that contain a mixture of new and old concepts.

Closing Assessment

A final assessment activity or exercise will be conducted by the teacher to determine the students' understanding of the new concept.

VI. Development and Implementation

Project Time Line

A detailed project time line is shown later in this prospectus. The goal of this project is to complete, field test, and revise sufficient curriculum materials to enable duplication and implementation to begin by the fall of 2000. This is an ambitious schedule that will require the dedication of all partners to ensure a timely delivery.

Teacher Training

Professional development will be an integral part of any successful implementation of this unique mathematics program. CORD is committed to this teacher training, whether by on-site workshop, interactive videoconference, or in-service sessions. For this program CORD will collaborate with state-level professional development staffs in the member states to develop a comprehensive training program that will

include such components as 1) two- to three-day on-site workshops conducted by master teachers, 2) interactive videoconference workshops and in-service sessions, and 3) a teacher training workshop "tool kit" to enable and guide master teachers in all states to deliver successful workshop experiences.

Field Testing

Two stages of product testing are planned for this project: 1) concept development testing, and 2) consortium-member site testing. In the first phase, project personnel will be involved in teacher and classroom preparation, research into student histories, pretesting and posttesting of students, interviews with teachers and students, and follow up with students after their course involvement. Confidentiality of the students and teachers will be maintained. The formative evaluation results from this research will be used to revise and improve the final version of the learning materials. To minimize the travel costs associated with this initial phase, CORD plans to use one or more local schools that have significant at-risk populations of poor performers in mathematics.

The second phase of field testing will be managed by an external evaluator and will begin after the completion of the course materials and requisite teacher training. Professional development sessions will prepare the teacher to deliver the new materials. Each field-test site will be provided with print materials, lab equipment, and copies of the assessment and logging materials. The external evaluator will accumulate the resulting data and produce a field-test report. In addition, content feedback from the sites will be used in the revision of the materials prior to nationwide implementation.

Feedback from Sites

As part of the nationwide implementation, CORD will request feedback from all users in an effort to document the effects on the at-risk population of students. A reply form in each teacher resource guide will facilitate the responses, which will be collected for use in a follow-up report and/or a graduate-level research project.

VII. Project Operations

Consortium Development Process

The curriculum, instructional materials, and professional development component will be designed, developed, and tested through a cooperative process that includes representatives of participating state education agencies in content reviews, field-test evaluation, and contributions at meetings. Several reasons exist that support pursuit of a consortium approach as opposed to looking to the private sector for this program development.

First, the private sector does not see the curriculum gap that exists in serving these students. Publishers normally do not take an innovative approach to instructional material development. They tend to pursue the sure market opportunities and are not interested in new development approaches or market segments that may not yield an attractive return on investment.

Second, this project is not solely about course material development. It embraces the development of a comprehensive mathematics program that will consist of course materials for teachers and students, teacher professional development (not in-service), ongoing implementation support, and evaluation components. CORD has found that, through the consortium approach, participating state agencies possess an ownership in the development of the program and help ensure appropriate and effective implementation of the program components.

Third, the consortium approach creates synergy. Through a multistate consortium, CORD is able to pool resources and national expertise to create a comprehensive mathematics program that reaches beyond what any one state agency could likely produce with the same individual commitment of resources. Each state ultimately benefits from the investment of the whole.

Project Management and Qualifications

The project will be managed by CORD located in Waco, Texas. Working in cooperation with local, state, and federal agencies, educational institutions, and industries, CORD has developed more than 20 national and internationally used sets of learning materials for vocational, technical, and science and mathematics education. These developments include materials such as *Principles of Technology*, *CORD Applied Mathematics*, *Applications in Biology/Chemistry*, *CORD Algebra*, *CORD Geometry*, and *CORD Biology*. CORD has also developed, in conjunction with Quicksilver Software, Inc., multimedia CD-ROM curriculum components for mathematics education entitled *Math at Work*.

CORD's facilities include the Roney Teaching Center, a 10,000-square-foot facility especially equipped for applied academic teacher training, and the Virtual Teaching Center, a five-studio facility equipped with the latest interactive videoconference equipment using high-capacity telephone-line-based communication to deliver teacher training sessions to sites across the country.

CORD will have responsibility for designing the proposed curriculum and professional development program, developing the proposed student and teacher materials, and assisting in their field testing and dissemination. These activities will be reviewed by representatives of the participating state agencies to whom CORD will be accountable.

Deliverables

A student text and a teacher's guide will be created, as described earlier in this document. During the implementation phase, each state will receive a camera-ready set of masters and will be allowed to reproduce the student and teacher texts, or the states may purchase the texts at a preferred rate. The consortium members will reach a consensus to determine the final binding format of the printed materials to meet the textbook needs of their states. In addition, since professional development is an essential ingredient for success of this project, a teacher training workshop "tool kit" will be provided to each consortium member. With this kit, each member state will be able to equip master teachers to successfully sponsor and deliver their own local training sessions.

During the field-test phase, curriculum materials, special assessment materials, and logging forms for the purpose of field testing will be provided for one classroom site per member agency. States wishing to field test at more than one site may do so at an additional cost. CORD will provide teacher training programs for the teachers at these field-test sites to prepare them for the contextual, hands-on approach of classroom instruction and the activities included in the new materials. The training will be delivered via interactive videoconferencing and Internet.

To assist states in their implementation of this program, CORD will make available a master teacher training course deliverable via on-site workshops, interactive videoconferencing, and Internet. These sessions will be designed for preparing master teachers in each state to use the teacher training workshop "tool kit" to conduct their own workshops for teachers unfamiliar with the contextual, hands-on approach to mathematics instruction.

Three consortium group meetings are planned. The first meeting of the consortium members will be held midway through the development phase to inform the members of early results of concept testing, encourage discussion and refinement of the learning materials design, and discuss strategies for the field testing and implementation. Expenses for travel and lodging will be covered for **one** representative from each member state. Member states may elect to send additional participants. CORD anticipates that this meeting would be most appropriately attended by project officers or state content experts familiar with the project goals.

A second meeting to discuss implementation issues and preliminary field-test results will be held near the end of the development phase. Expenses for travel and lodging will be covered for **two** representatives from each member state. Again, member states may elect to send additional participants. CORD anticipates that this meeting would be most appropriate for master teachers, teacher educators, and training officers.

A third and final meeting will review implementation and textbook adoption issues, field-test results, and the impact of the materials on the nation's "at-risk" student population. Expenses for travel and lodging will be covered for **one** representative from each member state. Again, member states may elect to send additional participants. CORD anticipates that this meeting would be most appropriately attended by project officers or state content experts familiar with the project goals.

Schedule Summary

Concept design meeting	February 1998
Seek consortium funding	April 1998 through July 1999
Concept testing	Begins August 1998
Design review meeting	Spring 1999
Consortium meeting #1	Fall 1999
Develop curriculum materials	October 1998 through May 2000
Field testing	August 1999 through May 2001
Consortium meeting #2	Spring 2000
Implementation	Begins August 2000
Consortium meeting #3	Spring 2001
Bound first-year text available	Spring 2001
Bound second-year text available	Spring 2002

A detailed time line is shown in Appendix B.

Budget

Task	Amount (thousands)
Consortium Formation	$197
Concept Design and Pilot	138
Materials Development	178
Teacher Training	469
Field Testing	188
Materials Revision and Polish	177
Consortium Meetings	126
Implementation	27
TOTAL	**$1,500**

Source of Funds	Amount (thousands)
Anders Foundation	$ 400
Consortium	1,100
TOTAL	**$ 1,500**

Fees for Participating Agencies

Based on this budget, significant private sector funding from the Anders Foundation (Seattle, Washington), and the participation of at least thirty states, the fee for each state is listed in Table 1. These fees were calculated using a sliding scale of 2.5 cents times the K-12 student enrollment in each state plus a base fee of $15,000.

Table 1. State Participation Fees

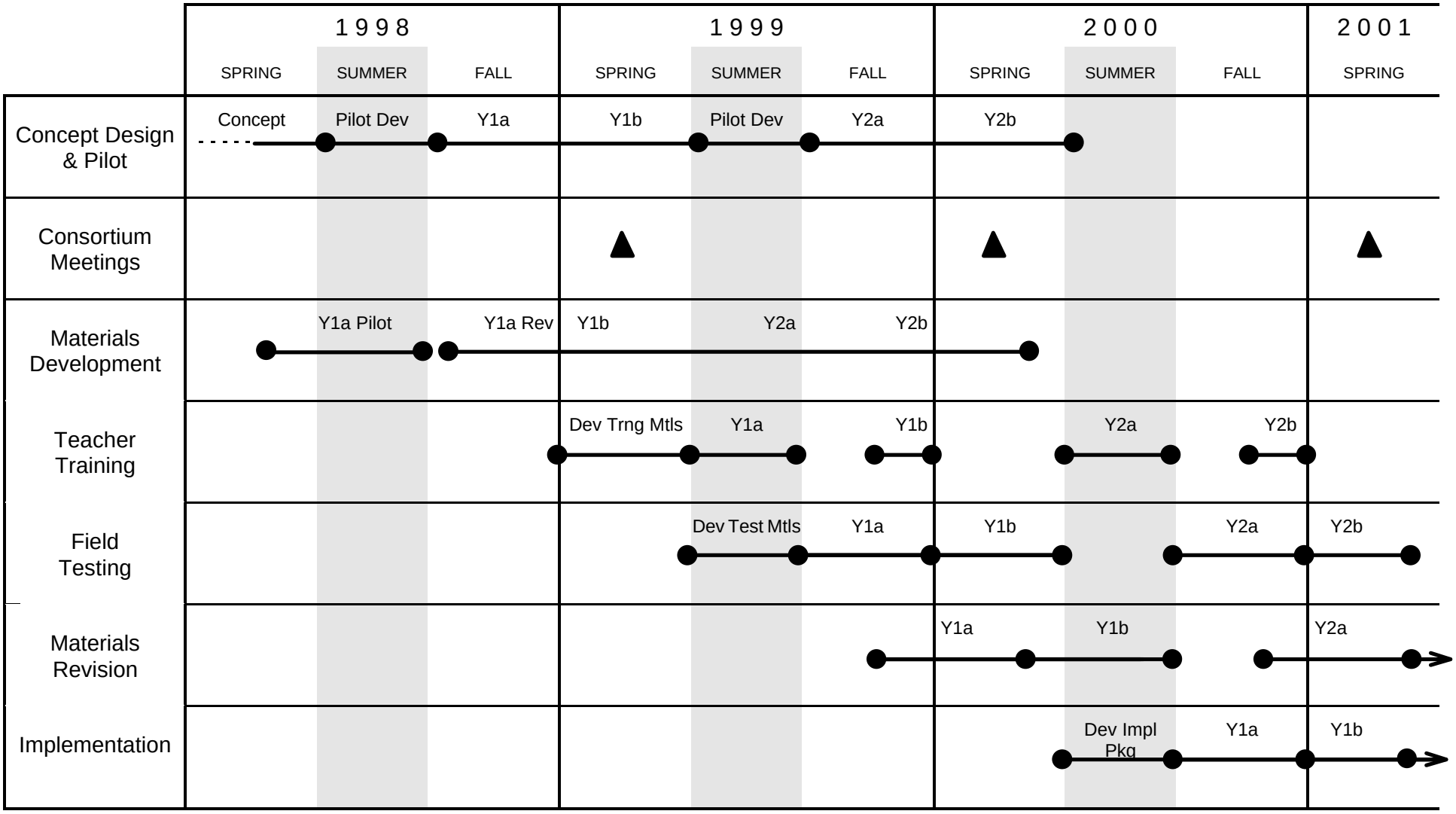
State	K-12 Student Population[5]	State Fee	State	K-12 Student Population[5]	State Fee
Alabama	741,933	$33,548	Montana	166,909	$19,173
Alaska	126,015	$18,150	Nebraska	292,121	$22,303
Arizona	749,759	$33,744	Nevada	282,131	$22,053
Arkansas	457,076	$26,427	New Hampshire	194,581	$19,865
California	5,535,312	$153,383	New Jersey	1,221,013	$45,525
Colorado	673,438	$31,836	New Mexico	330,522	$23,263
Connecticut	523,054	$28,076	New York	2,825,000	$85,625
Delaware	110,549	$17,764	North Carolina	1,199,962	$44,999
District of Columbia	79,159	$16,979	North Dakota	118,427	$17,961
Florida	2,240,283	$71,007	Ohio	1,841,095	$61,027
Georgia	1,321,239	$48,031	Oklahoma	620,379	$30,509
Hawaii	188,485	$19,712	Oregon	537,783	$28,445
Idaho	245,252	$21,131	Pennsylvania	1,807,250	$60,181
Illinois	1,961,299	$64,032	Rhode Island	151,181	$18,780
Indiana	984,610	$39,615	South Carolina	648,980	$31,225
Iowa	504,511	$27,613	South Dakota	142,910	$18,573
Kansas	465,140	$26,629	Tennessee	891,101	$37,278
Kentucky	663,071	$31,577	Texas	3,809,186	$110,230
Louisiana	777,570	$34,439	Utah	478,085	$26,952
Maine	218,560	$20,464	Vermont	106,607	$17,665
Maryland	818,947	$35,474	Virginia	1,096,093	$42,402
Massachusetts	936,794	$38,420	Washington	971,903	$39,298
Michigan	1,662,100	$56,553	West Virginia	303,441	$22,586
Minnesota	836,700	$35,918	Wisconsin	884,738	$37,118
Mississippi	504,168	$27,604	Wyoming	98,777	$17,469
Missouri	883,327	$37,083			

[5] *Digest of Education Statistics 1997*, January 1998. Table 40. "Enrollment in public elementary and secondary schools, by level and state." U.S. Department of Education, National Center for Education Statistics, Source: Common Core of Data surveys (table prepared April 1997).

Appendix A. Concept Design Meeting
Waco, Texas February 20-21, 1998

Name	Representing	Home location
Tony Martinez (*CORD Applied Mathematics* teacher/trainer)	Math Department Chair	Leander, Texas
Roger Berkbuegler (National Association of Secondary School Principals)	School Principal	Rolla, Missouri
Pamela Beeman **(**Education Trust, Inc, Washington, D.C.)	At-risk organization representative	Pueblo, Colorado
Amanda Beard (*CORD Applied Mathematics* teacher/trainer)	At-risk math teacher	Gulfport, Mississippi
Jana Gaddis (*CORD Applied Mathematics* teacher/trainer)	At-risk math teacher	Choctaw, Oklahoma
Doris Coy (Counselor Education, former ASCA President)	School counselor representative	Denton, Texas
Linda Johnston (Special Education Department Chair)	Special education representative	Leander, Texas
Jan Clayburn (Job Corps Center Educational Director)	Job Corps representative	Salt Lake City, Utah
John Souders (Vice President, Curriculum Materials)	CORD	Waco, Texas
John Chamberlain (Senior Associate; Project Director)	CORD	Waco, Texas
Leno Pedrotti (Chief Scientist Emeritus)	CORD	Waco, Texas
Bennie Lucroy (Vice President, Education Partnerships)	CORD	Waco, Texas
Chris Sadler (Director, Consortium Development)	CORD	Waco, Texas

Appendix B. Project Time Line



Key: **Y1a** → Year 1, 1st Semester; **Y1b** → Year 1, 2nd Semester; **Y2a** → Year 2, 1st Semester; **Y2b** → Year 2, 2nd Semester