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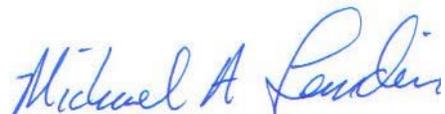
Members of the Curriculum Proposal Committee:

I am responding to your solicitation for information about adapting curricula to the new Washington state mathematics standards. In what follows, I propose a scalable solution to implementing a grade 12, state-wide College-Readiness Mathematics Course (CRMC). This course will align with the Transition Mathematics Project (TMP) College Readiness Standards. The proposed solution solicits, involves, and rewards grass-roots participation among teachers, students, parents, and other stake-holders in mathematics education.

What I propose here is backed by 30 years of experience in mathematics education; I am currently Associate Professor of Mathematics at Central Washington University. In what follows, I draw on experience as Professional Development Co-chair and Assessment Coordinator for the Systemic Initiative for Montana Mathematics and Science (SIMMS) Project. That project earned a "top five" ranking among 30 National Science Foundation systemic initiatives and culminated in a published secondary mathematics curriculum and award-winning professional development program.

Additionally, I will show how this proposal subscribes to best practices for mathematics reform. How successful the state of Washington will be in its curriculum alignment will depend on how well it adheres to these best practices.

Sincerely,



Michael A. Lundin
Associate Professor of Mathematics
Central Washington University

Best Practices in Curriculum Implementation

1. Choose curricula wisely. New teachers will use it religiously, and seasoned teachers need to learn from curricular paradigms and approaches. Students will adopt weaknesses and strengths. Hence, it pays to choose materials that “stretch” teachers and students, encouraging them to think about content in a new way. We propose using an integrated curriculum, infused, if needed, with traditional components. It is our experience that it is far easier to infuse traditional topics into integrated material than vice-versa. Also, a good integrated curriculum spirals around “deeper” mathematical ideas, while traditional texts are often organized linearly, giving undue but equal emphasis to relatively unimportant topics.
2. Support professional development that fosters ownership of a curriculum. The best teachers often create their own materials to increase their effectiveness. Also, a superior professional development program fosters ownership of philosophy, content, scope, and sequence of a curriculum. We highly recommend that teachers spend time in workshops creating lessons and sharing with peers what they know and do best. By creating and sharing, teachers transform each other and thus learn to teach more effectively.
3. Devote time and resources toward implementing a rich, effective curriculum. There are no quick (or cheap) fixes. Implementing an engaging, rich curriculum, that has a positive impact on both students and teachers, takes time. Such a curriculum employs authentic problem-solving activities, spirals through deeper mathematical notions, and connects mathematical and scientific ideas. A rich curriculum evolves as a synthesis of professionally produced materials and teacher-created lesson plans.
4. Support practices that foster authentic assessment. Build into the curriculum seamless and authentic assessments at various levels, thereby instituting a modern approach to educational measurement. Here, “seamless” means “with the least amount of unnatural disruption,” while “authentic” means “approximating a real world challenge.” Designing a relatively seamless, authentic assessment system takes effort, resources, and planning. In any case, the system must fairly document student achievement. *Importantly, assessments within a curriculum must be similar to those designed to measure large scale achievement.*
5. Reward excellent teaching. Teachers who are leaders deserve recognition and reward. We recommend state recognition of those teachers who establish themselves as leaders, based upon electronic portfolios that include: 1) evidence of professional development in curriculum alignment to the state standards; 2) evidence of student achievement on standards-based assessments; and 3) evidence of leadership within school, district, or state in standards-based education.

Declaration of Interest

Central Washington University houses the Center for Excellence in Science and Mathematics Education. It also supports the Department of Mathematics, which graduates more qualified mathematics teachers than any other institution in the state of Washington, and offers a Master of Arts in Teaching Mathematics. The Department of Mathematics supports the Cornerstone Mathematics Program statewide in which qualified high school instructors teach college mathematics in their classrooms in a dual enrollment model. Mathematics department faculty have worked with the Transition Mathematics Project since its inception, and they have substantial experience in curriculum writing, professional development, and service to the mathematics education community. Consequently, Central Washington University has resources to support the proposal at hand, and seeks to house the proposed College-Ready Mathematics Course Program within its Center of Excellence in Science and Mathematics Education.

Our proposal involves a combination of hard-copy and on-line components. However, the brief period between the proposed start date of July 1, 2009 and the beginning of the 2009 academic year poses a challenge to piloting Phase I curriculum materials.

We foresee only minor issues with online resources, which will develop naturally when delivering the CRMC course. However, students *must have access to hard copies of the primary curriculum materials*, because a significant portion of the state population lacks convenient internet access. Consequently, we advise administrators in the state of Washington against the development or employment of solely on-line, core curriculum components. Core curriculum materials must be available in hard copy. Districts will be responsible for printing core materials, and the state should seek bids from printer/publishers to provide hard copies at a reasonable rate and within a reasonable time frame. Ancillary materials will be solicited in an open manner and made available on the web. (Should a completely web-based curriculum be the goal for the state of Washington, the state should construct a comprehensive, well-conceived plan, backed by (much) funding, and guided by legislated initiative to build internet access capacity.)

Proposal: College-Ready Mathematics Course (CRMC)

The following program proposal aligns with the needs of the State of Washington, its standards for mathematics education, and the above best practices. This program shall have two integrated functions:

- (1) To develop a curriculum in a scalable manner that meets TMP and Washington state mathematics standards; and
- (2) To utilize mathematics teachers in a curriculum writing program that simultaneously provides them with professional development.

This program will evolve into “trainer of trainers” model, open to quality improvement via an on-line bulleting board system.

Teachers Create the CRMC Curriculum

Mathematics Teachers will develop a grade 12, College-Ready Mathematics Course (CRMC) curriculum that aligns with the Transition Mathematics Project (TMP) College Readiness Standards and the Washington State Mathematics Standards. The course curriculum will NOT subscribe to the traditional calculus-readiness model. Instead, the content of the CRMC will be module-based, each module developing an integrated mathematics and science theme. The modules will be written by teacher teams, who will test and improve them in their classrooms. A CRMC Steering Committee will make final edits to the curriculum. The curriculum will be made available on-line, with hard copy rights belonging to curriculum developers via a share-holder model. Shareholders will retain rights to any profits from sale, distribution, or dissemination of hard copy content, subject to decisions of the CRMC steering committee. However, electronic versions of the curriculum shall remain in the public domain. Furthermore, the CRMC Steering Committee shall establish, operate, sustain, and manage a bulletin board system by which students, parents, teachers, and other stakeholders can download the curriculum and other information, exchange information, post information, or otherwise participate in the process and improvement of teaching and learning.

Teachers Lead Module Writing and Professional Development Workshops

We propose three phases of development in three consecutive years, beginning summer 2009. In Phase I, Central Washington University's Center for Excellence in Science and Mathematics Education (CESME), along with the TMP, will sponsor two types of workshops: Module Writing Workshops, and Module Testing Workshops. In two-week summer Module-Writing Workshops, 20 teachers will work in teams to produce testable modules, each based on a mathematical or scientific theme. Teachers will receive a stipend and graduate course credit for successful completion of their module. Subsequently, during the academic year, teachers will participate in an on-line Module Testing Workshop. During this phase of development, teachers will earn graduate credit for classroom testing and improving several modules written during the summer, including their own. In Phase II and Phase III, summer workshops will double in size. Program veterans will teach new teachers to write modules and to test them, thus beginning a Trainer of Trainers model of professional development.

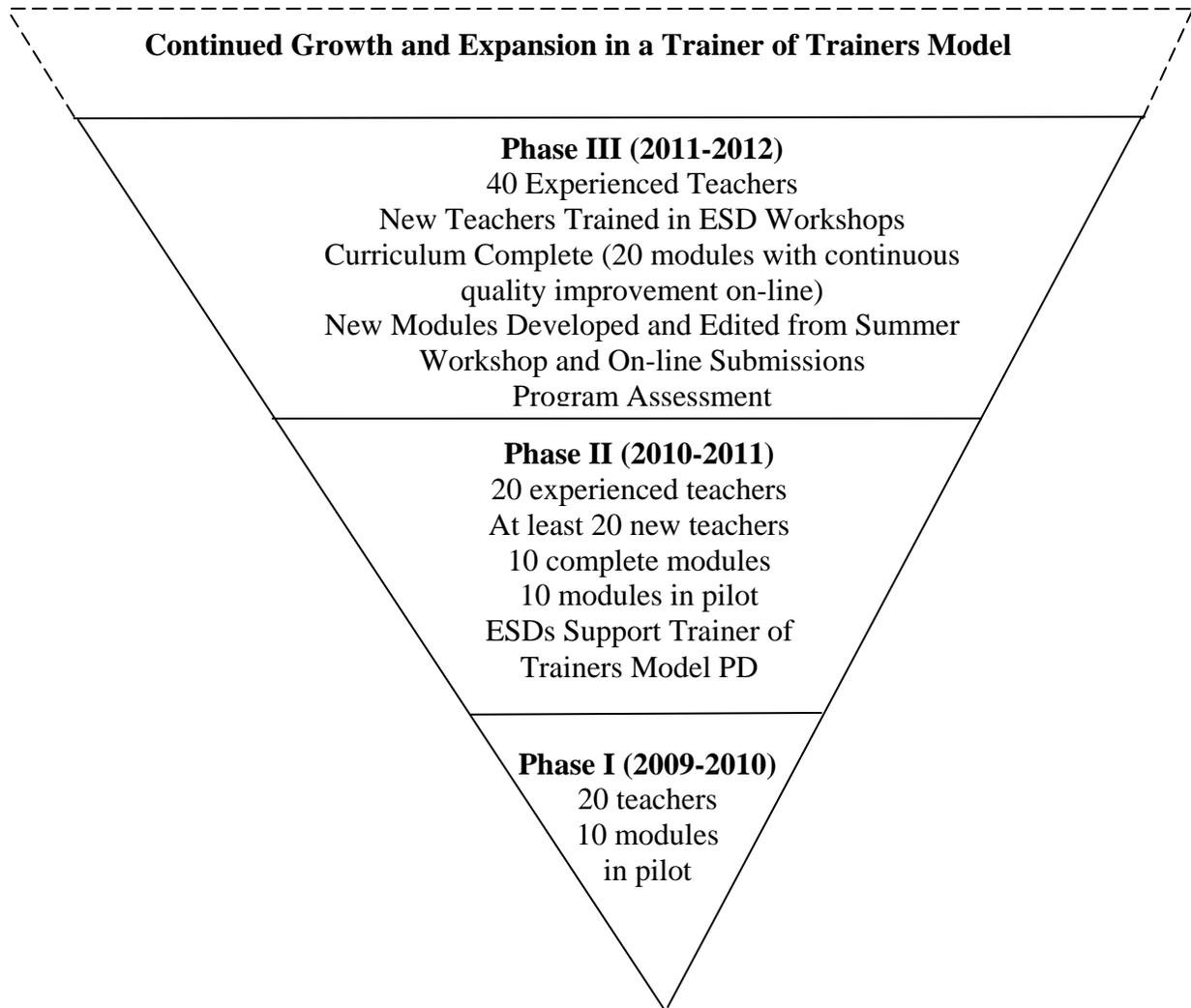
The CRMC Steering Committee will begin editing and selecting modules to be used in classrooms during Phase I of the curriculum implementation. Necessarily, the duties of the CRMC Steering Committee include planning the one-week summer Module Writing Workshops, and planning the on-line Module Editing Workshops. Funding for all aspects of CRMC development will come from the State of Washington and, possibly, from other grantors. The CRMC Program Director will be chosen by the Steering Committee, which, in turn, will be chosen by CWU's CESME members.

The following elements are critical to the successful employment of this plan.

Critical Elements in the CRMC Program Plan

1. The State of Washington must agree to grant sufficient resources to support the plan for at least three years. Continued support will enable (1) feedback for program improvement, (2) growth of on-line resources, and (3) research into student achievement.
2. The process of module improvement from one year to the next must remain open. Any person may submit on-line a module for editing. Any person may offer suggestions for improving the curriculum. The CRMC Steering Committee will make final decisions in every case.
3. Districts employing the curriculum MUST agree to a course timeline, so that all stakeholders have a rich and lively forum for feedback. That is, students taking the CRMC course must study the same material at (roughly) the same time during the academic year. The state of Washington must approve this process.
4. The State of Washington must agree to fund and test a "seed" curriculum during Stage 1 of implementation. The CRMC steering committee will develop and/or choose that seed curriculum from materials produced during the first Module Writing Workshop (summer 2009). The first full curriculum (ten fully edited modules and ten pilot modules) will appear fall 2010.
5. The Office of the Superintendent of Public Instruction (OSPI) must agree to endorse Module Writing Workshops and the Module Editing Workshops. Those workshops will then be co-sponsored by the Transition Mathematics Project, OSPI, and Central Washington University's Center for Excellence in Mathematics and Science Education. (Other grant support is a possibility.)
6. The Central Washington University Center for Excellence in Mathematics and Science Education shall deliver both Module Writing Workshops and Module Editing Workshops in conjunction with input from the TMP and from state ESDs. Module-Writing Workshop delivery will be scalable, with face-to-face and distance delivery components.
9. The state of Washington must agree that CRMC administration and writers earn shares in CRMC products, and the state must support the legal structure associated with such a system. Proportions among stakeholders must be determined before the delivery of the finished product in fall 2010.
10. The state of Washington must be committed to sustaining the CRMC Program after the three-year trial period, pending favorable results from an outside evaluator. Outside evaluation must be funded by the state that outside evaluation.
11. Participating school districts must agree to commit qualified teachers and suitable resources to the CRMC program. They must agree to allow program assessment practices commensurate with accepted qualitative and quantitative research paradigms.
12. Participating school districts must be responsible for printing costs. The state will make available by bid a printer/publisher to provide hard copy versions of the core curriculum. This solution helps optimize flexibility in terms of curriculum implementation.

Growth Model



Timeline

Phase I

Pre-notification of Funding	Spring 2009	<p><i>ISSUE: The CRMC Steering Committee must be chosen by Project PIs early in the 2009 year based on notification of funding.</i></p> <p><i>ISSUE: Teachers who participate in this program must apply and be chosen early enough in 2009 to permit program operation. This could be done in conjunction with planning for the annual summer TMP workshop, <u>given that funding is imminent.</u></i></p> <p><i>ISSUE: Planning for summer workshops must be done in Spring 2009</i></p>
Funding	Late Spring 2009	<p>Module Writing Workshop Final Organization</p> <p>On-line Course Creation for Module Editing Workshop</p> <p>Creation of web bulletin board for module improvement and resource</p>
Module Writing Workshop 1	Early August 2009	<p>First cohort (20 teachers) develops, writes and edits 10 modules.</p>
CRMC Steering Committee Edit 1	Middle August 2009	<p>Steering Committee Members edit modules to be placed on-line.</p> <p>Modules Placed on Line</p> <p><i>ISSUE: Finding 20 teachers to participate for graduate credit only may not happen. A professional stipend would greatly increase the pool.</i></p>
Teachers Begin Testing Modules	August 2009 to May 2010	<p>Teachers begin testing on-line modules in their own classrooms, returning comments for further editing.</p>

Phase II

Solicit Module Writers for Phase II	January 2010	Solicit module writers for Summer Module Writing Workshop II
Planning for Phase II	Spring 2010	Planning for Summer Module Writing Workshop II
Select Module Writers		Select and Notify 20 Module Writers for Summer Module Writing Workshop II
Final Phase I Module Editing		The CRMC Steering Committee completes editing of the first 10 modules.
Planning for Phase II	Late Spring 2009	Module Writing Workshop II Final Organization
		On-line Course Creation for Module Editing Workshop II
Module Writing/Testing Workshop 1	Early August 2009	Second cohort (40 teachers) develops, writes, edits and tests 10 new modules and 10 Phase I modules.
CRMC Steering Committee Edit 2	Middle August	Steering Committee embers edit Phase II modules to be placed on-line.
		Phase II Modules Placed on Line
		ISSUE: Finding 20 teachers to participate for graduate credit only may not happen. A professional stipend would greatly increase the pool.
Full Course Testing Begins at Module Writers' Schools.	August 2010 to May 2011	Teachers at Module Writers' Test Sites Begin Prototype Course Delivery with 10 finished modules and 10 "first edit" modules.
Teachers Begin Testing Modules		Phase II Writers begin feedback cycle in conjunction with the on-line Module Editing Course.
On-line Solicitation for Modules Begins		On-line Solicitation for Modules begins with remuneration equivalent to Module Writing Workshop Funding, if the Module is selected for use.

Phase III (NOTE: Stage III represents a transition. Teachers who have written and tested modules will now teach other teachers to do so.)

Solicit Module Writers/Teachers for Phase III	January 2011	Solicit module writers/teachers for Summer Module Writing/Teaching Workshop III
Planning for Phase III	Spring 2011	Planning for Summer Module Writing Workshop III
Select Module Writers		Select and Notify Module Writers for Summer Module Writing/Teaching Workshop III
Final Phase II Module Editing		The CRMC Steering Committee completes editing of the second 10 modules.
Planning for Phase III	Late Spring 2009	Module Writing Workshop III final organization
		On-line Course Creation for Module Editing Workshop III
Module Writing/Testing Workshop III	Early August 2009	Third cohort (40 teachers) develop, write and test modules.
CRMC Steering Committee Edit 2	Middle August	Steering Committee members edit any new modules developed in Phase III
		Phase III Modules Placed on Line
		ISSUE: Finding 20 or more teachers to participate for graduate credit only may not happen. A professional stipend would greatly increase the pool.
Full Course Testing Begins at Module Writers' Schools.	August 2010 to May 2011	Teachers at Module Writers' Test Sites Continue Prototype Course Delivery with 20 modules and prototype testing of new modules.
Teachers Begin Testing Modules		Phase III Writer/Teachers begin feedback cycle in conjunction with the on-line Module Editing Course.
On-line Solicitation for Modules Begins		On-line Solicitation for Modules continues with remuneration equivalent to Module Writing Workshop Funding, if the Module is selected for use.
Program Assessment	August 2011	Assessment by outside evaluators

Continuing the CRMC Program After the Initial Three Year Term

Given a favorable assessment after three years, the following actions are suggested.

1. The CRMC Steering Committee should be funded to edit modules for quality improvement, to manage on-line resources for the CRMC, and to manage the business of decision-making for the CRMC.
2. A trainer of trainer's model has been developed in the first three years of the CRMC program. The ESD's should assume responsibility for continued professional development within their districts via this model: Those who have written and taught modules train others to write and teach.
3. The stage has been set for writing curricula at other levels, using this model. Based on the outcomes of the first three years' of the CRMC Program, a formula for producing curricula can be extended to these other levels
4. The College Math Placement Test Program, run by the University of Washington, will have developed a "General Test" by 2009. Students who pass that test are guaranteed to place into a non-developmental mathematics course in Washington state institutions of higher education. The CRMC course can be modified to fulfill current enrollment criteria, so that seniors who have passed the General Math Placement Test may be eligible for college credit when passing this course. Planning for this transition includes increasing the number of teachers qualified to teach such a course. Future funding should prioritize this goal.