

**Proposal for Consideration by the HECC:
“Math Pathways” Convenings
Joint Boards Articulation Commission (JBAC)**

Overview of the proposal:

Consistent with the HECC’s Common Course Numbering Equivalencies and Outcomes (House Bill 2979) Report of December 2013, and its goal of accelerating student progress through attention to common learning outcomes and cross-sector collaboration, the Joint Boards Articulation Commission (JBAC) proposes that HECC sponsor faculty convenings designed to ensure that Oregon students master the mathematics that is relevant for their future study or work. We have focused on math because it is currently a barrier to academic progress for many students, but we believe that Oregon has the appropriate expertise to solve this problem and that the approach described in this proposal can be applied in other disciplines to improve horizontal and vertical alignment across the state. Specifically, we propose cross-sector convenings of instructors in mathematics and related disciplines to clarify the desired learning outcomes and pedagogy in the study of mathematics for students preparing for a variety of programs or careers. These convenings will focus on the current AAOT prerequisite requirement of Intermediate Algebra for transferable, entry-level mathematics courses and could result in changes to the math requirements and/or alternative pathways through the mathematics that is most relevant for particular career goals.

Background:

What kind of math is necessary for students to succeed in life and in education after high school?

This question is at the heart of current efforts nationwide to prepare students for participation in our fast-paced, data-rich society, and to achieve Oregon’s specific goal of a highly educated citizenry, 80 % of whom have earned some sort of postsecondary credential. The importance of math in the routines of contemporary work and personal life is undisputed, but it is also clear that too many students cannot effectively use everyday math – that is, arithmetic, basic geometry, descriptive statistics, and the fundamentals of algebra. Addressing this alarming state of affairs is one of the principal goals of the national Common Core initiative. We applaud this goal and the increase in availability of high-quality pedagogical materials that the Common Core has already brought about. We intentionally include participants from the Oregon Department of Education, District-Level Mathematics Teachers on Special Assignment, and High School math instructors in the activities of this proposal.

We think that further progress across the P-20 continuum depends on instructors from both secondary and postsecondary levels developing a finer understanding of the math skills that will be expected for students’ success in postsecondary academic or career/technical programs that require quantitative thinking and the pedagogical best practices necessary to teach these skills well. Among these

programs, of course, is the continued study of math itself – by students aspiring to be mathematicians or teachers of mathematics. But we are equally concerned with the mathematical foundation of students heading into other areas that might be considered direct “consumers” of mathematics – that is, the basic sciences, psychology, economics, business and engineering, as well as all of the trades that use elements of engineering. Moreover, we must not ignore the mathematics foundation that is necessary for other social science and humanities fields.

We think that Oregon is uniquely positioned to answer this question and thereby make progress on math literacy. Our advantage comes from our integrated educational leadership and our habit of cross-sector communication. Together, these qualities should facilitate candid examination of our math education goals and strategies by a group of educators with the requisite intellectual diversity. The group we envision would span educational levels from high school through community college and university (public and private), and would include instructors of math as well as instructors of representative disciplines that depend on math. We propose to initiate this examination by focusing on the content and pedagogy of a particular math course, Math 95, which currently serves as a universal indicator of college-readiness because it is the prerequisite for transferable, entry-level, credit-bearing math courses throughout Oregon. Students who enter colleges and universities directly from high school are expected to have learned the material covered in Math 95, and students who wish to transfer from community colleges to 4-year schools are expected to pass this course with a grade of C- or better as a prerequisite to college-level math. Because Math 95 plays a pivotal role in our education system and should assist with achievement of greater math competence, we think that a close look at its content and pedagogy is appropriate and timely.

We therefore seek your support for bringing the appropriate faculty together. To our knowledge, this would be the first time such a cross-disciplinary group has been assembled in Oregon for the specific purpose of improving the outcome of our math education across these levels. In the past, K-12 teachers and college and university faculty have been consulted about potential educational reforms, but the consultations have typically been along traditional disciplinary lines. That is, biologists have been consulted about biology, mathematicians about math, and so on. Moreover, only rarely have K-12 educators talked directly with their college and university counterparts to address such systemic concerns. Because math is so widely used, we think there is untapped potential in fostering direct communication among mathematicians, math educators, and the community of math users at multiple levels. This is in no way a criticism of mathematicians or teachers of math, nor an effort to impose the views of one discipline on another. Rather, our goal is to tackle a serious problem by bringing varied perspectives to bear. Fundamentally, it is confidence in this kind of approach that motivates investment in public education in the first place. As stewards of that enterprise, we hope you will critically consider the detail of our proposal that follows. If you are persuaded of its merit, we ask for both financial and philosophical support. We will need your voices to promote widespread awareness,

and more importantly, understanding, of this initiative. Without that, any effect is likely to be small. On the other hand, if you find weaknesses in our proposal, we would be grateful for your candid feedback and suggestions of better strategies to enhance math competence in Oregon.

When would the activities associated with the proposal take place?

Immediately: Create a Coordination Team and a Resource Team. We are aware of other efforts, led by the Developmental Education Redesign group and ORMATYC (Oregon Mathematical Association of Two-Year Colleges), to re-think a variety of math courses that are developmental or college-level, as well as algebra-based or not. Oregon is fortunate to have the talent and energy that is behind this work and we want to ensure that our initiative does not compete with it or weaken it in any way. Rather, we see our responsibility as providing the coordinating assistance that has historically been expected of JBAC. Therefore, our first step will be to create a Coordination Team that includes two stakeholders from the statewide Community College Developmental Education Math Redesign work group, two university math faculty and two K-12 math representatives. This team will work with a core group of six from JBAC to ensure ongoing connections and collaboration on related efforts in math education. The Coordination Team will develop the Fall activities and design the Pathways Convenings.

The Coordination Team will also identify a larger Resource Team to serve as consultants providing advice and input to the project. The Resource Team will include mathematics faculty, instructors, and educators as well as Mathematics Teachers on Special Assignment.

Fall 2014: Preliminary work

Survey current Math 95 students. Math 95 is a useful focal point for getting started because it currently serves as a universal gateway to college-level mathematics throughout Oregon. One of the things we want to understand is whether Math 95, as presently taught, should play this role. Ultimately, faculty will be responsible for answering this question, but, we believe it will be useful to begin by understanding the experiences of our current students. Instructors of Math 95 will be recruited to conduct focus groups with their students, from which we will gain perspective on the arc of student learning that leads to Math 95 and beyond, on students' impressions of Math 95 as it is currently taught, and on the implications of creating alternative math pathways.

Summarize the content of Math 95 and math courses immediately above and below it. All of the work we propose will depend on faculty knowing where students encounter various quantitative ideas now, and even more important, understanding the kinds of work students do to master those concepts. Therefore, we will use the fall to gather sample problems and quantitative reasoning exercises from Math 95 and the courses with which it connects. We will seek to draw upon the expertise of math educators to assist with the analysis of the student survey and math course data.

February 2015: Convene the first cross-sector/cross-disciplinary group. In February 2015 (adjacent to the annual Student Success and Retention Conference), the initial cross-disciplinary convening of math instructors with their counterparts in “consumer” disciplines will be held. This convening will investigate the common assumption that all STEM fields require students to have the same algebraic-based background. Participants will also consider the degree to which alternative pedagogies could influence the effectiveness of students’ math preparation. The product of this discussion will be a detailed report of the kind of math needed for each STEM field, together with pedagogical suggestions, if appropriate. Funding for this convening has been secured from the Core to College Optional Activity grant.

Fall 2015: Convene a second cross-disciplinary group that includes additional consumer disciplines. This second cross-disciplinary math-focused convening will include faculty from economics, business, engineering, other social sciences and humanities and will identify the math background(s) needed by students with these interests. We anticipate considerable divergence within this group, and the potential emergence of additional pathways through mathematics.

Who would benefit from the proposal?

This proposal has the potential to benefit all levels of education stakeholders in Oregon: faculty and instructors at all levels, instructional administrators, Teachers on Special Assignment (TOSAs), state education officials and agents, employers, and, most importantly, 21st century students.

How would they benefit?

The professional development activities of the convenings will benefit university, community college, and high school instructors and administrators as they work to align learning outcomes in math and to clarify the math foundation needed by students for other fields. The aligned and differentiated learning outcomes will support the HECC’s goals and help to assure employers that students’ math education has been thoughtfully and intentionally planned. This project will also take advantage of a wider discussion of the role of foundational courses in preparing students for different kinds of careers. As the Position Statement on The Appropriate Use of Intermediate Algebra as a Prerequisites Course by the American Mathematical Association of Two Year Colleges argues, “(a) Intermediate algebra is generally an appropriate prerequisite for mathematics courses in a STEM path leading to calculus; and (b) Survey courses, mathematical modeling courses, mathematical literacy courses, statistics courses and other courses not leading to calculus are better served by more appropriate prerequisites than intermediate algebra.”

(http://c.ymcdn.com/sites/www.amatyc.org/resource/resmgr/amatyc_in_anaheim/amatyc_position_paper_on_int.pdf)

How does this proposal contribute to the goal of 40-40-20 and the HECC Strategic Plan?

Lack of academic preparedness for college-level math coursework poses a significant challenge for students pursuing postsecondary certificates and degrees; national research indicates that over 60 percent of entering community college students are referred to developmental math (<http://ccrc.tc.columbia.edu/publications/improving-students-college-math-readiness-capsee.html>).

Furthermore, there is increasing evidence that students placed into traditional developmental education sequences may be unlikely to ever complete a college credential.

(<http://ccrc.tc.columbia.edu/presentation/developmental-education-why-reform.html>.) We believe that the structural work to align math outcomes and clarify the foundational skills necessary for advancement relative to disciplinary expectations will increase student attainment of postsecondary degrees and credentials (40-40-20). The development of this proposal intentionally aligns to the HECC strategic plan “steering” goals to accelerate student progress, emphasize common learning outcomes, straighten the pathways to attainment of certificates and degrees, and promote cooperation, inter-institutional transfer and articulation of programs in coordination with K-12.

How does this proposal relate to other statewide efforts?

This proposal is timely because it fits with recommendations from the Developmental Education Redesign work group, as well as with current efforts of individual community colleges to pilot alternatives to Math 95. All of this work must be coordinated within and among sectors and we propose to use JBAC’s traditional cross-sector coordinating function to ensure a properly-aligned result. To that end, we propose a close partnership with the Developmental Education workgroup and are ready to assist with the recruitment of educators who are truly committed to this work and who represent all sectors and relevant disciplines.

One critical consideration is whether alternative math pathways will be effective for students who transfer from community colleges to our public universities. Presently, the AAOT degree requires completion of a “Mathematics course for which Intermediate Algebra [that is, Math 95] is a prerequisite”. Would a course other than Math 95, though suitable as a prerequisite for Math 105 or Statistics, nonetheless render Math 105 and Statistics unusable for the AAOT? Again, JBAC can help everyone think through the articulation consequences of changes to math courses and could facilitate revision of the AAOT, if necessary.

It has been observed that the timeline for this project is somewhat long, given the urgency of helping students succeed in math. We agree, and would respond by noting the importance of laying the groundwork for collaboration and effective cross-sector communication at the outset. The preparatory work done in coordination with the Developmental Education Redesign Workgroup in the fall will meaningfully set the stage for the February 2015 convening. We propose to educate participants in

advance of the first convening by giving them homework in the form of detailed materials from current math courses, results from the survey of Math 95 students, and a set of questions that probe the issues of content and pedagogy that we aim to address. The timing of the second convening (Fall 2015) is determined in part by the HECC budget cycle, but we think there are also practical advantages to waiting this long. Primary among these is our ability to use the results from the community college experiments with new math course content and pedagogy.

Our ultimate goal is to identify a small number of math courses that are common in outcome, viewed as equivalent across the state, and effective in enhancing math competence for a wide range of students. This is an ambitious goal, which has so far eluded educators across the nation. We think that taking deliberate well-planned steps, accompanied by data, is the surest way to success.

What funding would be necessary to support the proposal?

Funding for the first convening in February 2015 has already been secured. JBAC looks to HECC to fund the second Math Pathways convening in Fall 2015, at an anticipated cost of \$25,000. The requested funding from HECC would support travel costs of participants, release time for math TOSAs and high school math instructors, meals and facilities rental. In order to fulfill the broader recommendations of the Common Course Numbering/Equivalencies/Outcomes recommendations, additional investments will of course be necessary to sustain the work of such convenings in the future.

Item	Total
Meals	3570
Conference Room Rental	1350
TOSA Stipends	2500
National Speaker Stipends	5000
Institutional Stipends	11100
Printing, etc.	1250
	<u>24770</u>

Future Convenings

We anticipate that the two meetings proposed here will serve as a springboard for the larger project of bringing faculty together regularly, in discipline specific groups, to establish and maintain statewide equivalence for key courses and course sequences. This was at the heart of our recommended approach to statewide Common Course Numbering, Equivalencies and Outcomes. In many disciplines, there are courses that appear to have common outcomes but that are taught differently and under somewhat different titles throughout the state. While it is not uncommon for faculty in these

disciplines to meet, such meetings seldom bridge the sector divide in the ways that are intended here. We think that regular cross-sector communication among disciplinary faculty is necessary for statewide alignment and smooth student transfer. We look forward to preparing a proposal to support this subsequent discipline-focused work.