

Annual General Education Report to the University Academic Planning Council

May 18, 2006

In its role as trustee of the campus-wide General Education requirements and as agreed at the University Academic Planning Council of December 18, 1997, the College of Letters and Science is pleased to present the annual report on the General Education requirements at UW-Madison. As has been the case for the last several years, this report is prepared and submitted by the University General Education Committee (UGEC). This report consists of three requests to act on UGEC recommendations, as well as a series of progress reports regarding ongoing committee activities.

ACTION ITEMS

Action Item 1: Credit for more than one Comm A course

We ask the UAPC to approve the following policy:

Students may receive degree credit for only one Communication A course taken in residence.

Background: In its reports to the UAPC in December, 1997 and November, 1998, the General Education Committee asked that the UAPC approve a policy that allowed students to receive credit for only one Communication A course. This policy was developed because Comm A courses were designed to be similar to each other; since it would be redundant for students to take and receive credit for more than one Comm A course, allowing them to take multiple Comm A courses would not be an effective use of campus (or student) resources. After approval of this policy, the UGEC worked with school/college curriculum committees and the divisional committees to effect these changes. Since that time, we have learned that this policy inadvertently creates problems for transfer students and for students who receive AP credit. The intentional redundancy in our local Comm A courses is not shared by the many transfer courses and AP credits that meet the goals of the Comm A requirement but are not direct equivalents to UW-Madison Communication A courses. For example:

- A student takes courses or receives AP credit for two courses, both of which are considered equivalent to Comm A on this campus, but which differ in content (e.g., AP in English Language/Composition and AP in English Literature/Composition--under current policy, this student may receive credit for only one course or exam.)
- A student takes a course off-campus or receives AP credit for a course that fulfills the Comm A requirement but is not a direct equivalent to a UW-Madison Comm A courses. The student also takes a Comm A course on campus. Under current policy, the student may receive credit for only one of these experiences in which credit was earned. (Note: Under the proposed policy, if a student receives transfer credit for an exact UW-Madison equivalent--e.g., Communication Arts 100-- the student may not receive degree credit for another Communication A course taken in residence.)

The current policy has therefore led to loss of credit and confusion for students; in addition, various schools and colleges use a variety of *ad hoc* transcription “fixes” that have included

removing transfer courses from the academic record. Such adjustments to the transcript are not regarded as a desirable practice. The proposed policy has been endorsed by the UGEC (a subcommittee of which studied the issue and composed the proposed policy in consultation with the Office of Admissions), and by the campus-wide Associate Administrative Council. No UW-Madison resources are expended when students earn these additional credits, and Comm A course directors agree that additional instruction in writing should benefit students. We ask that the UAPC approve this policy. Once approved, we will work with the necessary campus groups to implement it.

Action Item 2: Change in nomenclature and rhetorical framework for discussing General Education

We ask that the University Academic Planning Council consider the following proposal:

That the University of Wisconsin-Madison change the way in which the university-wide undergraduate general education requirements are presented to facilitate clearer communication about those requirements and to preserve the integrity of those requirements unique to UW-Madison.

Please note that, if adopted, this proposal would not alter the requirements. Rather, the impact is limited to the nomenclature we use to discuss UW-Madison's requirements with external audiences. These audiences include the UW System administration and other UW System institutions as well as other colleges and technical schools across the state and potential transfer students to UW-Madison from these institutions.

Background: In recent months, the UGEC has, like the UAPC and the UW System Provosts, been engaged in discussion of various proposals related to the development of some type of "core" general education for all UW System campuses. The UGEC's views on this issue were shared with the UAPC in a letter dated March 1, 2006 (addressed to Interim Provost Virginia Sapiro). Since that time, the UGEC met with Assistant Director of Admissions Mary Schey, who worked with the UGEC to develop a tool for communicating more effectively with prospective transfer students about how "general education" courses transfer into the UW-Madison transcript.

It is clear from our discussions that the UW-Madison general education requirements are unique within the UW System for two reasons. First, we have only a modest set of shared campus-wide requirements, which is a function of the number and variety of undergraduate schools and colleges at UW-Madison, and the additional degree and major requirements imposed by each school and college. Second, that set of shared requirements extends beyond what is frequently seen elsewhere as "first-year work" by requiring Comm B and QR B, each of which require students to become proficient in these areas in courses taken in the major or at a similarly advanced level. The "'B" requirements are a distinctive feature of UW-Madison's General Education program.

In consideration of this question, however, it seems the issue may not be that we must change our requirements, but rather, that it would ease understanding if we change the way we describe them. When we consider the UW-Madison requirements in the context of similar programs in place across the UW System, we find that “General Education” refers to basic composition, math, and divisional breadth, but not to building advanced communication or quantitative skills. Hence, our nomenclature may confuse transfer students and others in the System. The UGEC therefore voted to address this communication issue by changing the nomenclature and framework used to describe the requirements. In consultation with the UGEC, the Office of Admissions has already prepared documents intended to communicate more clearly about our general education curriculum with external audiences (e.g., transfer students and institutions from which they transfer).

The UGEC would like to adopt these changes formally, and promote use of this language consistently in university documents and other publications (including the Undergraduate Catalog, the university website, and the General Education website).

We propose, as illustrated in [Attachment A](#), that instead of the current terminology which presents all requirements as the “General Education Requirements”, we describe them instead with a bisected structure under a general heading of “University-Wide Undergraduate Requirements”. The two sections would be comprised of “General Education ”and “Core Proficiencies.

Action Item 3: Update and clarify language in Office of Admissions materials related to High School math preparation

Background: In 2000, Chancellor Wiley (then Provost) was called upon to respond to inquiries from two Wisconsin school districts regarding the acceptability of “Core Plus” or “Integrated Math” curricula for admission to UW-Madison. Chancellor Wiley's response established an interim practice in which the three years of sequential Core Plus curriculum were deemed to satisfy the existing minimum three-year math requirement for admission. (The Chancellor also noted that 85-90% of students admitted exceed the 3-year minimum, and encouraged students to take an additional year of high school math to be competitive.) The Chancellor, the Provost, and the Director of Admissions asked the UGEC to study this issue and proceed with recommendations. The General Education Subcommittee on High School Mathematics Curricula was convened in 2003-04 and chaired by Professor of Sociology Charles Halaby, the Research Director for Assessment in General Education. The subcommittee completed its work and submitted a report in March 2005 (**Attachment B**). In May 2005, the UGEC discussed the report and the committee's recommendations, and charged the chair of the UGEC to explore the feasibility of implementing these changes with both the Office of Admissions and the Mathematics Department, both of which would be required to adjust the language they use in communicating with students about math preparation. Having obtained the endorsement and cooperation of these units, the UGEC now presents the committee's recommendations to the UAPC for further consideration and action appropriate to governance procedures.

We note that these recommendations do not propose to alter admissions policy, but to clarify existing policy on minimum math preparation in light of the State of Wisconsin's high school

math standards and the curricular innovations that implement those standards. We are concerned that failure to recognize these high school curricular changes will unintentionally discourage students from seeking admission to UW-Madison. Therefore, Recommendation 1 clarifies the existing minimum requirement for math preparation to explicitly include three years of Core Plus/Integrated Math; Recommendations 2 and 3 focus on clearly communicating about these minima in light of actual admissions results and what constitutes a “competitive advantage”; Recommendation 4 further clarifies expectations by providing good advice about math preparation to potential students; and the final recommendation offers guidance to UW-Madison admissions counselors who will consider transcripts of students who have taken traditional and “core-plus/integrated math” curricula.

- *Three-year sequential integrated curricula like Core Plus and the three-year traditional curriculum (i.e., algebra 1, geometry, and advanced algebra) should be treated as equivalent for the purpose of satisfying the UW-Madison minimum requirement of three years of college preparatory mathematics for admission.*
- *The Office of Admissions should state in its printed and internet documents that the three-year traditional and integrated curricula both satisfy the minimum requirement.*
- *The Office of Admissions should state explicitly in its public documents that four or more years of high school mathematics, including a precalculus course, is recommended for an applicant to be competitive for admission.*
- *The Office of Admissions should include at its internet site a link to the Department of Mathematics's statement for incoming freshmen (<http://www.math.wisc.edu/~maribeff/highschool.html>).*
- *For the purpose of ranking applicants with respect to their preparation for college mathematics, the Office of Admissions may use as a rough guide the following order: 1) two or more years of (AP) calculus; 2) one year of (AP) calculus; 3) four years of mathematics, including a fourth year of precalculus within a traditional or (supplemented) integrated curriculum; 4) three years of mathematics within either a traditional or integrated curriculum.”*

As noted above, the Mathematics Department has considered and endorsed this report. The department also recommended that the university undertake a carefully designed study to look at the variable mathematics preparation of high school students who ultimately attend UW-Madison. The department suggested that such a study should examine the effect on college math performance that can be attributed to types of high school math courses, timing of these courses, overall number of math courses, etc. The UGEC is prepared to incorporate this project in its ongoing assessment of student learning in the General Education program.

NEW ACTIVITIES AND UPDATES ON ONGOING PROJECTS

Furthering the Understanding of the Goals of General and Liberal Education.

Over the past year, the UGEC met with representatives of campus initiatives that are considering our students’ academic and other experiences from the first year to well past graduation. Wren

Singer, Director of the Office of Orientation and New Student Programs, presented the committee with a draft of proposed “Developmental Goals for First Year Students”. Since many General Education courses are taken by first-year students, UGEC members saw great potential for working with ONSP to further refine those goals and communicate with instructors about these goals and their first-year students' experiences.

The UGEC also met with Professor Jolanda Vanderwal Taylor of the German Department. Professor Taylor and Nancy Westphal-Johnson are the UW-Madison representatives for the American Association of Colleges and Universities’ “Liberal Education and America's Promise”, a 10-year campaign for which Wisconsin has served as the pilot state. They are also involved with a related UW System effort, the System Advisory Group on the Liberal Arts. Both of these projects have been convened to increase awareness of range of intellectual skills and experiences liberal education encompasses. In meeting with Professor Taylor, the UGEC discussed the vital importance of our faculty, staff, and students both understanding and being able to articulate the content and importance of liberal education, as both a private and a public good. In addition, the UGEC discerned a natural alignment between these efforts and its desire to communicate more clearly about the role and purpose of General Education, and (after considering the results of the General Education Articulation Survey currently in the field) hopes to begin a project that would encourage instructors to use their course syllabi to discuss the broad goals of courses offered in each academic division.

Assessment of Student Learning in the General Education Curriculum: A presentation on this topic was made at the April 2006 UAPC meeting; for more information, please refer to the UGEC website on Assessment of the General Education Requirements, <http://www.ls.wisc.edu/gened/assessment/default.htm>. ([LINK to presentation.](#))

Incorporation of Ethnic Studies into the University-Wide General Education Requirements: In June 2005, the responsibility for administration of the Ethnic Studies Requirement (ESR) was formally transferred to the UGEC. The UGEC convened a faculty subcommittee (chaired by Professor J. Mark Kenoyer, who also served on the Ethnic Studies Implementation Committee). The subcommittee has reviewed requests to add several courses to the Ethnic Studies course array, including such courses as:

- History 278, "Africans in the Americas, 1492 - 1808"
- History 279, "Afro-Atlantic History, 1808 - Present"
- Languages and Cultures of Asia 222, "Islam in America: From Slave Narratives to Hip-Hop and Punk"
- Dance 153, “Asian American Movement”
- French & Italian 248, “Ethnic Studies in the French/Francophone World”

There are currently 293 courses in the current catalog in the ESR course array; these represent approximately 200 distinct courses, or about ten more courses than were available to students at the time of the last report to the UAPC. In addition to these new courses, the committee has considered *ad hoc* requests to allow ESR credit (e.g., for courses offered as one-time topics courses, for specific courses taken while on study-abroad, or for courses taken at another institution). The existence of a standing committee to address these issues has fostered a single

point of contact” for requests, as well as consistency in application of the ESR criteria by a group of faculty and staff committed to apt management of this aspect of our curriculum.

An issue of continuing concern for some members of the UGEC has been the exclusion of questions related to broader diversity issues in the ESR. The committee has debated this point at some length, and recently invited Professor Mariamne Whatley (Curriculum and Instruction, Women's Studies Program, LGBT Certificate Program) to explore ways in which instructors might incorporate these broader issues of diversity in existing courses. A subcommittee of the UGEC has been formed to brainstorm around these issues this coming summer.

Policy Clarifications and Implementation Issues: In 2005-2006, several aspects of the ongoing administration of the requirements were refined and clarified.

- It has long been a concern that students who receive transfer credit for certain courses receive credit not only for that course's content, but also for having satisfied the Comm B requirement, whether or not the course transferred included instruction in written and oral communication. A transcript analysis of a cohort of students who received UW-Madison undergraduate degrees determined that approximately 300 of those students received transfer credit for courses carrying the course-level” Comm B designation. A subcommittee of the UGEC determined that a cost effective strategy to address this issue would be to ask departments to create “non-Comm B” versions of the courses for which transfer credit is most frequently awarded. These courses could be used primarily to award transfer credit; departments might also offer these courses during periods where Comm B instruction is inappropriate or hard to accomplish (e.g., when TAs are unavailable, or during the compressed Summer sessions).

The Departments of Geography, Communication Arts, and Zoology, and the School of Journalism and Mass Communication were contacted about this issue. The faculty of Geography and Comm Arts acted on the invitation and created Geography 104 and Comm Arts 273, which are the non-Comm B versions of Geography 101 and Comm Arts 272. The School of Journalism reported that their assessment of student skills in courses for which Journalism 201 is a prerequisite detected no difference in performance between “local” students and those who had received transfer credit for this course, which suggests that it may be appropriate to award Comm B credit with the transfer course. Finally, Zoology is continuing to consider the proposal to create a “non-Comm B” version of Botany/Zoology/Biology 152, but in light of that course’s university-wide impact, the department will consult broadly about the feasibility of creating a new course for this purpose.

- As the course array has evolved over the years, it has come to light that a number of Comm B courses are now offered as variable-credit courses. The UGEC endorsed the intention that Comm B credit should be awarded for courses carrying no fewer than two credits. In rare cases, a two-course package (that is, two courses in which students enroll concurrently) might also convey Comm B credit; such courses would be approved only on a case-by-case basis. These courses must be approved by the Communication liaison.
- Consistent with current practice, Comm B and QR B course instructors are sent a reminder each semester explaining the criteria for courses carrying these key

designations. The letter to Comm B instructors also includes information about the availability of online instruction for library users (C.L.U.E.), and information on incorporating oral communication in course as well as tips for assigning library research projects. Beginning this year, as recommended by the Ethnic Studies Implementation Committee, instructors of courses carrying the Ethnic Studies designation also receive letters describing the course criteria and broad learning goals associated with those courses.

We would be pleased to answer any questions you may have about these proposals and activities.

Respectfully submitted by:

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Nancy Westphal-Johnson, Associate Dean for Undergraduate Education, College of Letters and Science

Attachments:

A: Action Item 2 General Education Communication Structure Diagram

B: Action Item 3, "Report of the General Education Subcommittee on High School Mathematics Curricula and the UW-Madison Mathematics Admissions Requirement "(March 2005)

University General Education Committee, 2005-2006

Nancy Westphal-Johnson, Letters and Science Administration, Chair

Term Members:

Larry Bank, Civil and Environmental Engineering

Cary Forest, Physics

Susan Johnson, History

J. Mark Kenoyer, Anthropology

Mary Ellen Murray, Nursing

Mary Rossa, Communication Arts

Ellen Sapega, Spanish & Portuguese

Susan Smith, Nutritional Sciences

Ex Officio:

Richard Brualdi, Math, Quantitative Reasoning Liaison

David Fleming, English, Comm A Director

Charles Halaby, Research Director for General Education Assessment, Sociology and Assoc.
Dean-Soc. Science, L&S

Brad Hughes, Director, Writing Center and Writing Across the Curriculum

Elaine Klein, Assistant Dean, L&S Academic Planning, Program Review & Assessment

Abbie Loomis, Coordinator, Library & Information Literacy Instruction Program

Sherry Reames, English; Communication Liaison

Virginia Sapiro, Associate Vice Chancellor for Teaching and Learning, Interim Provost
(November, 2005-April 2006), Political Science and Women's Studies

Greg Smith, L&S Student Academic Affairs

Tim Walsh, Cross College Advising Service

Mo Noonan Bischof, Assistant to the Provost, Co-Chair, University Assessment Council

Student Member:

Matthew Berg, '06

Core Plus Subcommittee (2003-04)

James Anderson, Philosophy

Melania Alvarez-Adem, Quantitative Assessment Program (on leave Sem II)

Richard Brualdi, Math

Charles Halaby, Sociology and Associate Dean for Social Sciences, L&S, Chair

Susan Smith, Nutritional Sciences

Ethnic Studies Subcommittee

Susan Johnson, History

J. Mark Kenoyer, Anthropology (Chair)

Elaine Klein, L&S Administration

Michael Olneck, Sociology and Educational Policy Studies

Christina Greene, Afro-American Studies and Women's Studies Programs

Tori Richardson, L&S Student Academic Affairs

REPORT OF THE GENERAL EDUCATION SUBCOMMITTEE ON HIGH SCHOOL MATHEMATICS
CURRICULA AND THE UW-MADISON MATHEMATICS ADMISSIONS REQUIREMENT

*Committee Members: James Anderson, Melania Alvarez-Adem, Richard Brualdi,
Charles Halaby (Chair), and Sue Smith*

March 2005

REPORT OF THE GENERAL EDUCATION SUBCOMMITTEE ON HIGH SCHOOL MATHEMATICS

CURRICULA AND THE UW-MADISON MATHEMATICS ADMISSIONS REQUIREMENT

1. Why was this subcommittee convened; what was its charge?

This committee was convened to address the apparent confusion that has developed in some high school districts regarding the fit between the mathematics requirement for admission to UW-Madison, which is stated in terms of units (i.e., years) of traditional curricular categories like algebra and geometry, and the newer "standards-based" curricula like *Contemporary Mathematics in Context* (hereafter, Core-Plus) and *Interactive Mathematics Program* (hereafter, IMP), which integrate the different traditional subjects within a given course.¹ The difference between the traditional and "standards-based" integrated curricula has raised questions about the "equivalence" relation that holds between the number of years of mathematics taken in the different curricula.² For example, is four years of Core Plus equivalent to four years of a traditional curriculum, or is it more like three years of the traditional curriculum? Should three years of sequential Core Plus satisfy the three-year minimum requirement for applying to UW-Madison?

Exactly the latter question was addressed by Chancellor Wiley on two different occasions in the

¹The committee focused virtually all of its discussion on Core Plus, since the materials we saw and the people we interviewed suggested that it was the integrated curriculum most relevant for UW admissions. Hill and Parker (2005) quote the description from the Core Plus website as follows: "[Core Plus] is a four-year curriculum that replaces the traditional Algebra-Geometry-Advanced Algebra/Trigonometry-Precalculus sequence. Each course features interwoven strands of algebra and functions, statistics and probability, geometry and trigonometry, and discrete mathematics. The first three courses in the series provide a common core of broadly useful mathematics for all students. They were developed to prepare students for success in college, in careers, and in daily life in contemporary society. Course 4 continues the preparation of students for college mathematics."

²The curricula also differ with respect to emphasis, with integrated curricula skewed toward "understanding" and concept acquisition, while the traditional curriculum accents symbolic manipulation and reasoning skills.

year 2000. The matter of non-traditional curricula came to Chancellor Wiley's attention in the first place because the UW-Madison mathematics requirement, established by the university senate in 1991, makes no mention of integrated curricula, nor do current public statements made via the internet by the Office of Admissions. In response to inquiries from two school districts,³ Chancellor Wiley established that the UW-Madison "official position will be to accept three years of sequential Core Plus as satisfying our minimum admissions requirement." He went on to note that, although three years of college preparatory mathematics is a minimum requirement, about 85-90% of applicants and entering freshmen have at least four years of high school mathematics.⁴ Hence, Chancellor Wiley emphasized, and the Office of Admissions indirectly suggests,⁵ that UW-Madison recommends four or more years of high school mathematics if an applicant is to be competitive for admission. In his letters to the school districts, Chancellor Wiley encouraged students taking the Core Plus curriculum to continue with a fourth year or to augment it with a fourth year of traditional advanced mathematics.

The charge of this committee was to draft a statement that would propose a UW-Madison policy that clarifies the status of non-traditional integrated high school mathematics curricula in the admissions process. As the committee interviewed interested parties and familiarized itself with the issues, the charge was sharpened to include addressing the following questions:⁶

- Should a sequential three-year integrated mathematics curriculum (e.g., Core Plus) be considered as meeting the UW-Madison minimum three-year requirement for applying for admission?

³The school districts of which the committee is aware are Wisconsin Rapids and Beaver Dam; there may have been others that also contacted the Chancellor.

⁴It is not clear whether the 85-90% figure applies to applicants, admitted students, or incoming freshmen, since committee documents show it used in each of these ways.

⁵The Office of Admissions notes in its printed and internet documents that more than four years of high school mathematics is "typical" for admission.

⁶We interviewed Rob Seltzer, Director of Admissions, and Terry Millar, Professor of Mathematics and Associate Dean of the Graduate School.

In other words, should the policy that Chancellor Wiley declared as official on an "interim" basis be adopted as permanent?

- Should the Office of Admissions state explicitly in its printed and internet documents that applicants who hope to be competitive for admission will have four or more years of mathematics in high school?
- Is there an appropriate role for the Department of Mathematics in communicating with districts and students about recommended high school preparation in mathematics?
- For the purpose of ranking applicants by their high school mathematics preparation, how should the various high school curricula be evaluated by the Office of Admissions?

These issues directly touch upon questions of curricular effectiveness in preparing high school graduates for college courses. The committee had expected to bring a significant amount of research evidence to bear on the question of effectiveness, especially as it pertains to the contrast between traditional and Core Plus curricula. As it turned out, the evidence we had hoped would shed light on these issues simply does not exist in the quantity and quality needed to arrive at definitive conclusions. Although we do invoke the results of a few studies in support of one of the recommendations made below, the relevant data are not nearly as abundant and strong as we would like. This appears to be characteristic of this area of inquiry. A National Research Council (2004) study that was designed to judge the quality of research on the effectiveness of K-12 mathematics programs and reform curricula came to the following conclusion:

On the basis of the committees analysis of these 147 studies [that met our minimal criteria for consideration], we concluded that the corpus of evaluation studies as a whole across the 19 programs studied does not permit one to determine the effectiveness of individual programs with a high degree of certainty, due to the restricted number of studies for any particular curriculum, limitations in the array of methods used, and the uneven quality of the studies. This inconclusive finding should

not be interpreted to mean that these curricula are not effective, but rather that problems with the data and/or study designs prevent confident judgments about their effectiveness. Inconclusive findings such as these do not permit one to determine conclusively whether the programs overall are effective or ineffective.

Similarly, Hill and Parker (2005) embarked on their comparison of high school graduates of Core Plus and a traditional mathematics curriculum with the following observation:

[T]he preparation of students for college courses is an obviously important goal of any high school mathematics curriculum. It is surprising, then, that there has been no systematic effort to measure the success of curricula (new and old) by examining how well those curricula prepare students for the next level of their education.

Effectiveness is not the only consideration that must inform evaluations of alternative curricula. The committee believes that such evaluations must be sufficiently sensitive to the nature of the changing educational environment within which UW-Madison admissions decisions are made. We need to be cognizant not only of the practices that prevail among peer institutions, as discussed below, but of the changing landscape of secondary education in our state. On this latter score, reliable quantitative data on trends in the prevalence of alternative mathematics curricula in Wisconsin schools might have proved instructive. Instead, the committee relied on impressionistic and anecdotal evidence suggesting that integrated curricula were becoming increasingly prevalent and displacing the traditional curriculum in some districts.

2. Should Integrated Curricula Satisfy UW-Madison's Minimum High School Mathematics Requirement?

The committee recommends that Chancellor Wiley's interim policy on sequential integrated high school mathematics curricula be adopted as the permanent official policy governing the three-year minimum mathematics requirement for applying for admission. This recommendation is driven by

three considerations: 1) It would bring UW-Madison officially into line with the majority of peer institutions; 2) The three-year minimum requirement itself is becoming less and less relevant for actual admissions; 3) Abandoning Wiley's interim policy after four years would serve no useful purpose, but could have harmful consequences.

Consider first UW-Madison's high school mathematics requirement as it compares to peer institutions. The insert "Freshman Admission Expectations 2005-06" on the following page is from the UW-Madison Office of Admissions internet site. The table labelled "Academic Course Preparation" displays for various subjects the minimum number of high school units required for applying to UW and the typical number of units achieved by the population of admitted students. The three-year minimum requirement for applying includes algebra, geometry, and a third unit of "advanced math," which typically would be advanced algebra, but could also be satisfied by trigonometry, analytic geometry, or calculus. There is no mention of non-traditional curricula like Core Plus, even though the interim policy declares that a three-year integrated sequence would satisfy the requirement.

Table 1 below summarizes the policies of UW-Madison and its peer institutions with regard to the minimum and recommended number of units of high school mathematics needed for admission. The second column shows that all eleven universities require as a minimum three years of college preparatory mathematics for admission; the last column shows that for eight of these peers a three-year sequential integrated curriculum satisfies the required minimum, while for three others the policy on integrated curricula could not be ascertained. These data are compelling evidence for our first point: accepting a three-year sequential integrated high school mathematics curriculum as satisfying our three-year minimum for applying would bring UW-Madison into line with peer institutions.

The committee's second point is that the distinction between traditional and integrated three-year college preparatory curricula is, as a practical matter, too fine to sustain given current populations of applicants and trends in admissions requirements. First, students with only three years of college

preparatory mathematics are a marginal admissions case at best, since they are becoming increasingly rare among applicants and among admits to major universities, including Wisconsin and peer institutions. We have already noted that upwards of 90% of admits to UW-Madison have had four or more years of high school mathematics. Among applicants with only three years of high school math, it is hard to imagine a defensible admissions decision hinging on whether a student's high school college preparatory math program was traditional or integrated. This is especially the case when there is little scientific evidence that students with only three years of high school mathematics differ in their preparedness for college math depending on whether they graduated from a traditional or integrated curriculum. Even if the integrated curriculum, say, were demonstrably less effective than the traditional curriculum, students from both types of programs may still surpass minimum competency requirements.

Second, trends in admissions requirements point away from instituting a strict policy that revolves around types of three-year curricula. Table 1 shows that while all institutions currently require three years of mathematics in high school, they also explicitly *recommend* four years. Most admissions offices at these institutions emphasize that applicants with only three years of high school mathematics will be at a competitive disadvantage. We believe it may be only a matter of time before four years of mathematics is widely adopted as the required minimum for application. Indeed, starting in 2005-06 the University of North Carolina-Chapel Hill will require for the first time a minimum of four years of high school mathematics; UNC may just be the first point in a future trend among peer institutions. Hence, the whole issue of which types of college preparatory curricula will satisfy three-year minimum requirements may soon be moot. Note, too, that UNC's new four-year requirement can be satisfied by either a traditional or sequential integrated curriculum, a provision that may well be part and parcel of future trends.

In light of the above, abandoning Chancellor Wiley's interim policy of accepting both traditional

and sequential Core Plus curricula as satisfying the UW-Madison minimum requirement for admission cannot serve any useful purpose in the long run. In the short run, turning back the policy risks causing confusion among high school districts and alienating the widespread support that UW-Madison currently enjoys among secondary school education professionals. In the absence of strong scientific evidence against the effectiveness of the integrated curriculum, assuming such risks is not defensible.

As Table 1 shows, there are a number of more or less equivalent ways to express the policy recommended here. One possibility is that UW-Madison adopt a statement similar to the following:

A minimum of three years of college preparatory high school mathematics is required for admission. Topics covered would include those typically treated in elementary and advanced algebra and two- and three-dimensional geometry. This requirement is satisfied by 1 year of algebra, 1 year of geometry, and 1 year of advanced algebra, trigonometry, analytic geometry, or calculus; or integrated mathematics 1, 2, and 3.

3. The Office of Admissions Should Explicitly Recommend Four or More Years of College Preparatory Mathematics

Table 1 shows that the Office of Admissions informs prospective applicants that more than four units of college preparatory mathematics in high school is "typical for admission" to UW-Madison.⁷ While this is useful information and should continue to be made available, this statement stops short of explicitly recommending that students obtain four years of college preparatory mathematics to be competitive for admission. As Table 1 indicates, most peer institutions explicitly affirm the value of four years of high school mathematics for admission and successful preparation. The committee recommends that the Office of Admissions develop a statement to this effect to be included in its printed materials and on its internet site.

⁷This can also be seen in the insert given above, "Freshman Admission Expectations 2005-06."

The statement we recommend would echo the sentiments expressed by Chancellor Wiley in his correspondence with school districts, and have the added advantage of closing the apparent gap between UW-Admissions policy and the position of the Department of Mathematics regarding the mathematics preparation of incoming UW-Madison freshman. In a statement (see below) adopted fall 2004, the Department of Mathematics

“...strongly recommends that students take four years of mathematics preparation in high school. Students with only three years of mathematics preparation will be at a competitive disadvantage to other students for admission.”

Some of the confusion about mathematics admissions requirements that has cropped up in districts has been rooted in inconsistent messages from Admissions and the Department of Mathematics. One possible source of confusion would be eliminated if Admissions and Mathematics voiced the same message regarding the advisability of four or more years of high school mathematics for strong preparation and admission.

4. A Role for the Department of Mathematics?

Freshman admissions requirements for the UW-Madison are authorized by the Board of Regents, UW System, the Faculty Senates, and individual schools and colleges; they are not authorized by individual departments. Yet there is an appropriate role for cognizant departments in shaping admissions requirements and communicating university expectations to prospective students. The committee believes that, in the case of high school mathematics curricula, the document “Department of Mathematics Statement on Mathematics Preparation of Incoming UW-Madison Students” may be a suitable vehicle by which the department may accomplish these goals. The statement, reproduced in full, is as follows:

**Department of Mathematics Statement on Math Preparation of Incoming
UW-Madison Students**

Three years of mathematics preparation in high school (algebra, geometry, and a third year unit in algebra, trigonometry, analytic geometry, or calculus) satisfies the minimum requirement in mathematics for admission to UW-Madison. The Department of Mathematics strongly recommends that students take four years of mathematics preparation in high school. Students with only three years of mathematics preparation will be at a competitive disadvantage to other students for admission.

Students who wish to have the possibility of a major that requires calculus (e.g. the physical and biological sciences, business, economics, engineering, some majors in agriculture and life sciences, ...) will be at a disadvantage in college without a rigorous college-preparatory mathematics sequence in high school. Such a sequence should emphasize both understanding and problem-solving in algebra, geometry, and trigonometry, and should include substantial work in algebraic manipulation and equation-solving (without the use of calculators), algebraic and geometric proofs, mathematical modeling, trigonometric manipulation and equations, hand-graphing of functions, and 3-dimensional geometry.

Admission to one's first mathematics course at UW-Madison is based on the mathematics placement exam. For a sample of the type of questions that occur on the placement exam, see <http://www.math.wisc.edu/xxxxxx>. We strongly suggest that students look at the collection of problems available at <http://www.math.wisc.edu/yyyyy> for an indication of the skills, knowledge, and understanding expected from a rigorous high school mathematics curriculum.

This statement has a number of desirable features: it describes the UW-Madison three-year minimum requirement and the recommended four years of college preparatory mathematics; it expresses the department's views on subject matter and emphasis in high school curricula; it provides links to examples of placement examination and additional other problems that prospective students would undoubtedly find useful. Nor is the statement controversial: it does not take a stand on the issue

of type of curriculum, either traditional or integrated, and in that respect is appropriately agnostic. One problem with it, however, is that the first sentence does not accurately capture this committee's recommended revision of the information put out by the Office of Admissions, because it omits any mention of a three-year sequential integrated curriculum as satisfying the minimum mathematics requirement. As written, it appears, like the statement currently advanced by the Office of Admissions, that only the traditional curriculum, not the integrated curriculum, satisfies the minimum requirement. If the first sentence were revised accordingly, the committee would recommend that the Office of Admissions consider including at its internet site a link to a site, maintained by the Department of Mathematics, at which the department's statement would appear along with a collection of representative placement examination and other problems that may serve as examples to high school teachers and students of institutional expectations with respect to subject matter and rigor.

5. Calibrating High School Mathematics Preparation at Four Years and Beyond for Admissions Decisions

How should high school mathematics course work that exceeds the minimum three-year requirement be evaluated for the purpose of admissions? If applicants with four or more years of college preparatory high school mathematics are to be ranked for the purpose of admissions, the key distinction would separate a higher tier of students who have had AP calculus (or, if not AP, a close substitute) from a lower tier who have not had AP calculus. In terms of identifying differences in readiness for college mathematics among students with at least four years of high school mathematics, there may be no better indicator than AP calculus. Despite the range of extant opinions regarding the effectiveness of different curricula, there is widespread agreement among educators at secondary and post-secondary levels that AP calculus is excellent preparation for college mathematics (Dickey 1986; Dodd et al. 2002).

Nor should it matter for the purpose of admissions whether AP calculus is preceded by a traditional or integrated curriculum. There is no evidence of which we are aware to suggest that preparation for college mathematics among students who have completed successfully AP calculus depends on whether prior training was within a traditional or integrated curriculum. Hill and Parker (2005), two mathematicians who are critical of reform curricula in general and Core Plus in particular, suggest that students of integrated curricula who take AP calculus are as successful in college mathematics as are students who passed through the traditional curriculum. They write, “The apparent success of AP calculus students who go on to higher-level mathematics suggests that AP calculus might buffer the transition to college mathematics” (2005 p. 14). One committee member put it this way: “Once they’ve had AP calculus, it doesn’t matter how they got there.”

Falling between applicants who satisfy the minimum three-year requirement and those with AP calculus are prospective students with only four years of mathematics within either a traditional or integrated curriculum. Regardless of high school curriculum, such students would, in terms of their preparation for college mathematics, typically rank higher than those who just satisfy the application minimum, but lower than their counterparts who have completed AP calculus. This ranking corresponds to the way the UW-Madison Office of Admissions evaluates the mathematics backgrounds of applicants, and squares well with the bulk of the evidence generated by educational research on the effectiveness of various types of secondary school training for college.

The issue that naturally arises concerns the relative effectiveness of the four-year integrated and four-year traditional curricula in preparing students for college. The committee spent a great deal of time debating this question, although we must admit that it is not obvious that the answer would have significant practical consequences for admissions.⁸ The main problem we faced in addressing

⁸The practical significance of this issue hinges directly on the proportion of applicants with exactly four years of high school mathematics.

this question had to do with the nature of the relevant research evidence: as noted above, there is not much of it, and what there is draws conflicting conclusions about the two curricula.

We conducted our discussion of the two curricula under the assumption that the integrated curriculum is at least as effective as the traditional. This seemed to be the appropriate “null hypothesis”, since the traditional curriculum has enjoyed a privileged status for UW-Madison admissions and the claim in some quarters is that four-year integrated curricula like Core Plus are less effective in preparing high school students for college mathematics. Approaching the question in this fashion meant that we were looking for positive evidence that the newer integrated curricula are less effective, and hence our null hypothesis could be rejected.⁹

There are only three comparative quantitative studies that yield data on the relative performance in college courses of students from the different high school mathematics curricula, and all involve a comparison of graduates of a Core Plus program with graduates of a traditional program. Two of these studies, Milgram (2001) and Schoen and Hirsch (2003), are nicely summarized by Hill and Parker (2005), the authors of the third study, as follows:

“There are two studies that examine the graduates of two high schools in an affluent Detroit suburb; one of these schools was a pilot site for the Core-Plus program and the other did not use Core-Plus material. Information from a sample of these students was collected and analyzed by mathematicians G. Bachelis and R. J. Milgram. On all four of the measures they examined — ACT Math scores, SAT Math scores, level of college courses taken, and grades in those courses — the students from the Core-Plus school performed less well, by a statistically significant amount, than the students from the non-Core-Plus school. However, those conclusions are based on a non-random sample of student-reported data (volunteered responses from 50% of the graduates at the Core-plus school and 25% of those at the non-Core-Plus school).

In a subsequent study, A. Coxford obtained data on the mathematics courses taken and grades

⁹Even clear-cut evidence of statistically significant differences in effectiveness would not settle the larger issue: how big a difference in effectiveness is necessary in order for curricular differences to matter for admissions.

received by the students from these same two high schools who subsequently enrolled at the University of Michigan at Ann Arbor. His data are reported by H. Schoen and C. Hirsch, who conclude that the preliminary evidence suggests that students who experienced the pilot Core-Plus curriculum were at least as well prepared for calculus (AP or college level) as students in a more traditional curriculum. However, the University of Michigan is a highly selective university and hence this was a population of top students, many of whom had taken AP Calculus in addition to Core-Plus courses.” (Hill and Parker 2005, pp. 4)

This last sentence is, in the present context, ironic, because Wisconsin’s greater similarity to a highly selective university like Michigan than to MSU, the university Hill and Parker studied, would make the Schoen and Hirsch results more relevant for us, not less. Be that as it may, Hill and Parker’s findings for MSU students must be acknowledged: cohorts of graduates from four Michigan high schools who had been trained under Core Plus and then entered MSU ended up placing into less challenging mathematics courses and receiving poorer grades than did earlier cohorts who had graduated from the same high schools, but had been trained in a traditional mathematics curriculum.

One problem with the Michigan and Michigan State studies for our purposes is that they do not directly compare students who have had no more or less than four years of either the traditional or Core Plus curriculum. On the contrary, they compare groups that combine in unknown proportions students who have had as few as three years of mathematics with students who have gone as far as AP Calculus. The exact comparison of interest for our purposes would contrast students who have completed a precalculus course that typically follows advanced algebra in the four-year traditional curriculum, with students who have completed the fourth year of an integrated curriculum, such as Core Plus Course 4.

One study that makes the relevant comparison is reported by Schoen and Hirsch (2003). Schoen and Hirsch administered “a mathematics placement test that is currently used at a major university”

to students at the end of Core Plus Course 4 and at the end of a traditional precalculus course. The sample consisted only of students who intended to attend a four-year college or university in the next school year, thereby making the results more relevant than they might otherwise be. The main findings were that the two groups of students performed equally well on the algebra and advanced algebra subtests, but the Core Plus students performed better by a statistically significant margin on the “calculus readiness” subtest. This led Schoen and Hirsch to conclude that “[Core Plus] students are at least as well prepared for entering college mathematics as students from more traditional curricula” [2003 p. 337].

Before generalizing on the basis of these results, it is important to recognize that the Core Plus Course 4 students studied by Schoen and Hirsch were taught under a special edition of the integrated curriculum, one that was designed especially for mathematics, engineering, and the sciences, and that had been revised to take account of known weaknesses in Core Plus by giving “increased attention... to the analysis of symbolic representations of functions and associated symbolic manipulation and reasoning skills” (Schoen and Hirsch 2003).¹⁰ In effect, the tested version of Core Plus brought the subject matter and skill emphasis of this integrated curriculum into closer alignment with the subject matter and emphasis of the typical precalculus course of the traditional curriculum.¹¹ Slim as this evidence is, the committee tentatively suggests that preparation for college among students with

¹⁰The students in the tested version of Core Plus were also given after each subject unit a practice test that was modelled after items found on the typical university placement test.

¹¹Hill and Parker (2005) also report data from two schools that supplemented an integrated curriculum by incorporating additional algebra and precalculus material directly into Core Plus. In contrast to their main analysis comparing cohorts from “pure” versions of the two curricula, the data from these schools failed to show that a consistent decline in college mathematics performance followed the introduction of the Core Plus curriculum. Although Hill and Parker are appropriately cautious given their small sample size, their data are compatible with the Schoen and Hirsch findings regarding the benefits of supplementing integrated curricula.

only four years of high school mathematics depends less on the nature of the approach, be it integrated or traditional, in the fourth-year course, and more on adequate coverage of so-called "precalculus" subject matter together with sufficient emphasis on symbolic representation and manipulation.

This last conclusion may not be of much practical value when it comes to evaluating applicants for admission who have exactly four years of high school mathematics under the two different curricula. Admissions officials may be able to identify whether an applicant comes out of an integrated or traditional curriculum, but may not have detailed information regarding the content and emphasis of the fourth year integrated (or traditional) course.¹² Similarly, the committee does not know the extent to which integrated curricula as implemented in school districts in 2005 tend to be of the "supplemented" variety, with extra attention given to symbolic representation and manipulation, two curricular features that mathematicians tend to associate with more "rigorous" preparation. Nor do we know the extent to which Core Plus Course 4 implementations are the versions designed for engineering, mathematics, and the sciences. Even with such information, the dearth of reliable evidence on the relative effectiveness of the different curricula advises against strong preferences one way or the other.

In light of all this, the committee recommends that, insofar as the Office of Admissions ranks applicants with respect to their preparation for college mathematics, a four-year traditional curriculum and a four-year integrated curriculum should be treated as more or less equivalent. We are comfortable with this broad recommendation to the extent that integrated high school mathematics curricula like Core Plus include a "supplemented" version of the fourth-year "precalculus" course. Yet the committee would not go so far as to suggest that the Office of Admissions explicitly recommend supplementation of integrated high school mathematics curricula in its printed or internet documents. Rather, greater emphasis on symbolic representation and manipulation, especially for students plan-

¹²In a personal communication, Rob Seltzer, director of admissions, confirms that this is indeed the case.

ning an engineering or science major, is advocated by the statement for incoming freshmen drafted by the Department of Mathematics; it suffices that the Office of Admissions references that statement.

6. Summary and Conclusion

The committee recommendations are as follows:

- Three-year sequential integrated curricula like Core Plus and the three-year traditional curriculum (i.e., algebra 1, geometry, and advanced algebra) should be treated as equivalent for the purpose of satisfying the UW-Madison minimum requirement of three years of college preparatory mathematics for admission.
- The Office of Admissions should state in its printed and internet documents that the three-year traditional and integrated curricula both satisfy the minimum requirement.
- The Office of Admissions should state explicitly in its public documents that four or more years of high school mathematics, including a precalculus course, is recommended for an applicant to be competitive for admission.
- The Office of Admissions should include at its internet site a link to the Department of Mathematics' statement for incoming freshmen.
- For the purpose of ranking applicants with respect to their preparation for college mathematics, the Office of Admissions may use as a rough guide the following order: 1) two or more years of (AP) calculus; 2) one year of (AP) calculus; 3) four years of mathematics, including a fourth year of precalculus within a traditional or (supplemented) integrated curriculum; 4) three years of mathematics within either a traditional or integrated curriculum.

Which, if any, of these recommendations need to be formally authorized by a vote of the Faculty Senate in order to be adopted is unknown. From our vantage point, these recommendations are fairly

innocent and may need nothing more than the approval of the General Education Committee and the Chancellor to become UW-Madison policy. Indeed, only the first recommendation could possibly require more than routine administrative approval.

In evaluating these recommendations, it is important to maintain perspective. We should not lose sight of the fact that there is a great deal more information that goes into admissions decisions than the number of years of high school mathematics and the type of curriculum. To be sure, our recommendations could have been more serious in their implications had they tightened requirements and thereby precluded from admission groups of students who had been previously eligible. But none of the recommendations could possibly have that effect. Nor do we believe that implementing these recommendations would loosen admissions standards and thereby place at risk the major improvements in the quality of incoming freshmen that UW-Madison has witnessed over the last 14 years. Our goal was to fashion a set of quality-neutral recommendations that would clarify admissions requirements and expectations. It is in that spirit that the committee offers its recommendations.

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