

MEMORANDUM TO: Directors of Education

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SUBJECT: **College Mathematics Project 2008 Report –
Findings and Implications**

We would like to share with you the findings from the *College Mathematics Project 2008: Final Report* that have implications for the delivery of mathematics courses, and post-secondary pathways choices for students in grades 7-12.

Background

The Ministry of Education and the Ministry of Training, Colleges and Universities funded the College Mathematics Project (CMP) 2008. A team of researchers from the York/Seneca Institute for Mathematics, Science and Technology Education (YSIMSTE) based at Seneca College led the project. You can find a brief summary of the report along with the research questions in the appendices attached. The *College Mathematics Project 2008: Final Report* is available at <http://collegemathproject.senecac.on.ca/cmp/>

The CMP is a collaborative program of research and deliberation concerning mathematics achievement of first-year college students in Ontario. The first project was in 2007. CMP studies focus solely on college programs that have a mathematics requirement at college and a mathematics pre-requisite in secondary school.

Involving 11 colleges and 28 District School Boards the CMP 2008 goals were:

- to analyse the mathematics achievement of first semester college students, particularly in relation to their secondary school mathematics backgrounds;
- to deliberate with members of both college and school communities about ways to increase student success in college mathematics.

CMP 2009 is underway and it is now a province-wide study which includes all English-language and French-language district school boards and all colleges in Ontario. It will be the first time that the records of graduates of the revised mathematics curriculum (published in 2007) will be available for study. The CMP 2009 research database will be made available to authorised representatives of all school boards, enabling them to track the success of their graduates in college mathematics. Information on obtaining access to the database will be sent to all district school boards in the fall.

Findings from the CMP 2008 data analysis were deliberated with stakeholders through regional forums in which college and school representatives discussed ways of increasing student success and helped form the recommendations in the report. Students also participated in each forum, recounting their own transition experiences from secondary school to college. CMP 2009, in cooperation with School College Work Initiative (SCWI) regional planning teams, will host forums to address math transitions from school to college in all regions of the province this fall. All boards will receive invitations to participate from the local organizers.

Key Findings of CMP 2008

Among the findings of the CMP 2008 is that learning skills (independent work, teamwork, organization, work habits/homework and initiative) are key to success in college.

As with the CMP 2007, findings in the CMP 2008 show that choices of secondary school mathematics courses and achievement in the chosen courses have a major impact on first-semester achievement in mathematics-related college programs.

For more information and details on these key findings, please see the brief summary of the CMP 2008 report in the appendices attached. Reports CMP 2007 and CMP 2008 can be found on the CMP web site: <http://collegemathproject.senecac.on.ca/cmp/>

Implications for Action

The findings from both the CMP 2007 and 2008 have implications for the delivery, availability and accessibility of all destination-related mathematics courses for all secondary school students.

Program choices made during the transition between elementary and secondary grades, and the instructional strategies and learning, specifically in Grades 9 and 10 Applied Mathematics, impact on course selection for Grade 11 and 12 Mathematics and success in the first-semester of technology and business programs at college.

For example, students who are choosing a post-secondary pathway that includes college-level technology programs should consider the Mathematics for College Technology (MCT4C) in Grade 12, a course specifically designed for college technology programs. We encourage you to work with your secondary principals to ensure that this course is available to students in various venues and formats, such as, e-learning, twinning, pooling, summer school and night school.

The newly-formed Student Achievement Division continues to support and encourage board strategies that target efforts towards assisting struggling students: focusing on the performance of students in applied courses specifically Mathematics; providing engaging, quality programs with four strong pathways; and developing solid literacy and numeracy skills for all students in Ontario's public education system.

The Ministry of Education's recent announcement of new funding for job-embedded professional learning on teaching mathematics Grades 7 to 12 supports board efforts to close the performance gap between Applied and Academic Mathematics and give students a better foundation in Mathematics related to their pathway.

This support builds on the work of the Literacy and Numeracy Secretariat's Grades 1 to 6 job-embedded professional learning for primary and junior educators. This year additional funding for Mathematics will be provided for Grades 4 to 10 to support the work of selected school boards and their families of schools

Your leadership is important in prioritizing and maintaining a focus on improving student achievement in Mathematics in Kindergarten to Grade 12. We encourage you to share the findings of the CMP 2008 with your senior administration team and to monitor the progress of CMP 2009 which involves your board and the success of your students in college.

Please forward this information to all Principals, Guidance Heads and Mathematics Leads.

Thank you for your participation in the College Mathematics Project, and your board's efforts to create a positive learning environment that supports all our students.

| (Original Signed By) (Original Signed By) (Original Signed By)

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College Mathematics Project (CMP) 2008

Background

Mathematics is a critically important foundation for many occupations, particularly those in the business, and technology fields. For this reason, courses in mathematics are found in the first semester curriculum of most business and technology programs at Ontario Colleges of Applied Arts and Technology. The College Mathematics Project (CMP) was set up at Seneca College in 2005 because of a general awareness within the colleges of the low achievement of these first semester students. Following two pilot projects in which data collection methods were developed and refined, the first full-scale CMP was mounted in 2007 involving 20,000 students at 6 colleges in the Greater Toronto Area. Researchers from the York/Seneca Institute for Mathematics, Science, and Technology Education (YSIMSTE) based at Seneca College conducted the research, and representatives from both colleges and school boards in the GTA participated in deliberations that led to the project's first published set of conclusions and recommendations in the CMP 2007 Report.

Reports from previous years can be found on the CMP web site:
<http://collegemathproject.senecac.on.ca/cmp/>

Goals of CMP 2008

The CMP2008, an expansion from CMP 2007, is a collaborative program of research and deliberation concerning mathematics achievement of first-year college students in Ontario. Its goals are:

- to analyse the mathematics achievement of first-semester college students, particularly in relation to their secondary school mathematics backgrounds;
- to deliberate with members of both college and school communities about ways to increase student success in college mathematics.

Funded by the Ministry of Education and the Ministry of Training, Colleges and Universities, CMP 2008 included 11 colleges and 28 District School Boards.

Students involved in the study

The student cohort in this study entered college in the fall of 2007. The CMP Data Collection Protocol called for the records of all students in postsecondary programs including Ontario College Diploma, Ontario College Advanced Diploma and Ontario College Certificate programs. The study did not include students enrolled in applied degrees, Ontario graduate certificate or apprenticeship programs (as these programs have different admission and curriculum standards).

The CMP research team analysed the secondary school and college records of over 50,000 students from 28 district school boards who enrolled in all program areas of the 11 colleges in fall 2007. Of these, nearly 20,000 took a first-semester mathematics course and the research focused on their achievement in these courses, relating this to a variety of factors, including the choice of mathematics courses taken at secondary school.

Recent Ontario graduates (students under the age of 23 on December 31, 2007 *and* who graduated from an Ontario secondary school) formed 68% of these first-semester mathematics students.

Because the data relates only to students who enrolled in college in fall 2007, it is not representative of *all* the graduates of any Board, nor even of all the graduates who went on to postsecondary education. In addition, since not all colleges were included in CMP 2008, there are many boards where students went to non-CMP colleges as well as to CMP colleges and so the data obtained to date may not be representative.

It is important to note that while the current Ontario Mathematics Curriculum was published in 2007, students whose records were analysed for CMP 2008 completed secondary school under the previous Mathematics curriculum. CMP 2009 will be the first time that the records of graduates of the current curriculum will be available for study.

(See Appendix B for research questions)

Sources of information

All data used in the CMP is obtained from participating colleges. The principal data sources include students' secondary school transcripts as provided to colleges from the Ontario College Application Services (OCAS) and students' first semester grades in mathematics courses. These files are combined and student identifiers are then removed in order to ensure student anonymity. Finally, the data is validated by each college prior to its being mounted on an interactive web-based database, from which more specific analyses can be made and to which colleges, school boards and individual secondary schools have access to further analyze their results.

Findings from the data analysis above is deliberated with stakeholders through 4 regional forums (Greater Toronto Area, Ottawa, Hamilton, and Thunder Bay) in which college and school representatives discuss ways of increasing student success and help form the recommendations in the report. Students also participated in each forum, recounting their own transition experiences from secondary school to college.

Key Findings

Key findings of CMP 2008 include:

- Only 65% of students achieved “good grades” (A, B or C) in first-semester mathematics in college, while 35% received grades of D or F or withdrew from the course, placing them at risk of not completing their chosen program.
- Only 62% of recent Ontario graduates (ROGs) (students under the age of 23 on December 31, 2007 *and* who graduated from an Ontario secondary school) achieved good grades in their first semester, compared with 71% of older students or those from outside Ontario.
- Males outnumber females in first-semester mathematics by almost 2 to 1, however, females are more successful than males for both ROGs and non-ROGs.
- Achievement statistics in college mathematics are comparable to those of college English.
- Choices of secondary school mathematics courses and achievement in the chosen courses have a major impact on first-semester college mathematics achievement. For example:
 - Over 70% of students with Grades 9 and 10 Academic Mathematics achieved good grades in college mathematics but fewer than 50% of those with Grades 9 and 10 Applied Mathematics did so;
 - Nearly 50% of students taking the most common sequence of college preparation mathematics courses (Mathematics for Personal Finance at Grade 11 and Mathematics for College and Apprenticeship at Grade 12) were found to be “at risk” when they reached the college level mathematics. In technology programs, this rose to more than 50%;
 - 75% of students with high achievement (more than 80%) in Mathematics for College and Apprenticeship achieved good grades in college mathematics;
 - Only 3.6% of students took Mathematics for College Technology in Grade 12 but 63.6% of these achieved good grades in college mathematics;
 - Course selection for Grade 11 mathematics was at least as important as that for Grade 12.

** A good grade is defined as A, B, or C, indicating a greater potential for success in college programs that include mathematics.*

Conclusions from the Regional Forums

Findings from the data analysis is deliberated with stakeholders through 4 regional forums in which college and school representatives discuss ways of increasing student success and help form the recommendations in the report. Students also participated in each forum, recounting their own transition experiences from secondary school to college.

From these deliberations, CMP 08 concluded that,

- student success in first semester college mathematics needs to improve and that all stakeholders - students, parents, schools, teachers, colleges, faculty, and the Ministry of Education and the Ministry of Training, Colleges and Universities - can help achieve that goal;
- students and faculty agreed that students' becoming accountable for their own learning and demonstrating appropriate skills and attitudes is key to their success in college and beyond. These learning skills include behaviours and attitudes such as independent work, teamwork, organization, work habits/homework and initiative. Yet in school, such "Learning Skills" are often perceived as less important than the achievement of the formal expectations of the curriculum and do not receive formal grades.

CMP 2008 Recommendations

Recommendations include:

- Students, parents, secondary schools and colleges should place more emphasis on the value of learning skills by discussing them and ensuring they are well developed before college.
- The need to increase opportunities for dialogue among secondary school and college teachers and faculty, to share experiences and understand the difference in teaching and learning environments in secondary, college and university classrooms.
- The impact of secondary school mathematics course selection on college academic success should be considered, in particular, colleges and secondary school guidance staff should clarify which courses best prepare students for their future plans; secondary schools should ensure student access to the necessary courses to be prepared for their future plans; and the Ministry of Education should consider revising and simplifying structure of the mathematics courses in the Ontario curriculum.

Current Directions – CMP 2009

CMP 2009 is underway and it is now a province-wide study which includes all English-language and French-language district school boards and all colleges in Ontario. It will be the first time that the records of graduates of the revised mathematics curriculum (published in 2007) will be available for study.

Appendix B

CMP 2008 Research Questions

The research questions of the CMP 2008 addressed and further developed the same four areas of interest used in CMP 2007: information about the participants; distribution of marks in first semester college math; relationship between college achievement and secondary school mathematics background; and relationship between a student's first semester math achievement and the secondary school from which he/she came.

The questions were:

A. PARTICIPATION

- A1. What are the numbers of students in our sample, by college, gender, and program cluster?
- A2. What are the numbers of students under the age of 23 (December 31, 2007) and who are recent graduates of Ontario secondary schools (ROGs) by college, gender, and program cluster?
- A3. What are the numbers of students (ROGs and non-ROGS) enrolled in all math courses, in college-level math courses, and in preparatory math courses (course type), by college, gender and program cluster?

B. COLLEGE MATHEMATICS ACHIEVEMENT

Note 1: These apply to all students taking mathematics courses (as shown in A3)

- B1. What is the mathematics grade distribution for ROGs and non-ROGs, by course type, college, gender, and program cluster?
- B2. What are the % of students achieving a "good passing grade" (A, B, C) for ROGs and non-ROGs by course type, college, gender, and program cluster?
- B3. What is the % of students "at risk" (D, F, and W) for ROGs and non-ROGs, by course type, college, gender, and program cluster?
- B4. How do students' college English marks (A, B, C, D, F, W) compare with their college mathematics marks (good grades, at risk)?

C. SECONDARY SCHOOL MATHEMATICS BACKGROUNDS

Note 1: These apply to ROGs taking mathematics only (as shown in A3)

- C1. What are the numbers of students taking each secondary school mathematics pathway and what % of those taking each pathway achieve good grades or are at risk in college?
- C2. For students following a pathway culminating in MCT4C, MAP4C, or a 12U course, how do students' Grade 12 math marks (50-60, 60-70, 70-80, over 80) compare with their college math marks (good grades, at risk)?

D. COLLEGE ACHIEVEMENT BY SCHOOL BOARD AND SCHOOL

Note 1: These apply to ROGs taking mathematics only (as shown in A3)

- D1. What are the % of students with a "good passing grade" (A, B, C) and "at risk" (D, F and W) from each of the partner school boards in the project?
- D2. What are the % of students enrolled in college-level courses and preparatory courses from each of the partner school boards in the project?
- D3. What are the % of students with a "good passing grade" (A, B, C) and "at risk" (D, F and W) from secondary schools in each of the partner school boards in the project?