

**Title of Proposal** Investigative Curriculum for Ontario Grade 12**Contact information***The one person and place to
Communicate with the applicant(s).*

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Summary *Less than 100 words* **Total amount requested in this competition** \$ _____

For 10 years I have been working with the Ontario Ministry, the Fields Math Education Forum, CMESG, and many teachers, developing investigative and modeling problems for the Grade 12 curriculum. This year I have posted an investigative "text-book" for the new Ontario Advanced Functions course and I propose to do the same for the Calculus course. There are 32 teachers from 30 schools throughout Ontario using the material now and I'm sure the list will grow. It consists of problems of the type we, and the Ministry, and many teachers "want" in the curriculum, but is in short supply. I am applying for funds to hire undergrad students to assist me in developing this resource and providing on-line help to teacher participants, and to hold meetings at the Fields Inst once or twice a year for the teachers to gather and talk about their work.

Applicants*Put any specific information on the relevant experience or expertise of an applicant in "Other".*

Name(s)	Peter Taylor		
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Position	Professor and Head		
Employer	Queen's University		
Address	Kingston ON K7L 3N6		

CMS member number	003846		
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Current Grants	NSERC Discovery 32K/yr		
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For 10 years I have been working with the Ontario Ministry, the Fields Math Education Forum, CMESG, and many teachers, developing investigative and modeling problems for the Grade 12 curriculum. Indeed, in Ontario, the Grade 12 curriculum has undergone many recent changes and over the past 18 months, Walter Whiteley and I have been working closely with the Ministry folks and a group of teachers and math coordinators to try to get a curriculum that is workable for teachers and students but meets the ministry (and OAME) objectives for more process components and mathematical modeling.

The policy documents for two revised courses appeared last spring and these courses are already underway. New textbooks are not yet out and in general the old ones are being adapted, but many teachers have asked for more and better resource material. OAME has responded with a set of on-line units (for which I was one of the “fact-checkers”). I have also responded with an on-line curriculum for the new Advanced Functions course and over the next 12 months I intend to do the same thing for the Calculus and Vectors course. There are currently 30 teachers, mostly in the Toronto area and Eastern Ontario, using this material and the list is growing weekly as the site gets better known. Teachers already tell me that the material is challenging, but of significant value and is an excellent complement to the OAME resources. Even when the new text-books appear (or perhaps because of that!) there will be a significant need for the resources I am producing.

The point is that these resources are different in an essential way from other “conventional” resources, as they are structured differently and emerge from a different philosophy of education. In a word they are more sophisticated and more like “whole works of art” than are the more technically oriented examples typically delivered to high school students. Plainly put, the problems I am developing are the kind of problems mathematicians enjoy. Are such examples too “hard” for our students? Well, “hardness” is partly a question of what you do with it, of the nature of the demands you place on the student. Certainly in art and literature the student is given works which are at a higher level of difficulty and sophistication, but the required level of understanding and technical mastery is set to be appropriate for the level of the student. Technical mastery is essential of course, but enough of this can be done in the context of sophisticated problems. And our future scientists and leaders deserve to encounter such examples in high school. [Indeed, our teachers deserve these examples too.] Details and curriculum units can be obtained from the project web-site at:

http://www.mast.queensu.ca/~peter/grade_12.htm

More needs to be done with these resources: more problems, especially of a technical nature, more solutions, revisions of the existing classroom notes (“black masters”) and on-going web support. The web support is a big factor as I find teachers emailing me with questions about the material and comments about what their students did and how should they respond. I will be setting the web-site up so that they can send questions and comments to one another too, and thereby contribute to the development of the resource. For all of this I will need help and I plan to use a couple of our undergraduate Con-Ed Math students as assistants, for preparing technical exercises and solutions and for web-support. This will be an excellent learning experience for these students. The material so far has been for the existing Advanced Functions course. Considerable future work is planned for the Calculus&Vectors course.

I also want to be able to host a meeting each year at the fields Inst of participating teachers. Half of these will be near Toronto but others will require travel money. And I want to give them all lunch.

Budget

Description	Revenue		
Norman Miller Fellowship Fund	1000	1000	
Queen's Faculty of Arts and Science	1000	1000	
CMS Endowment Grant requested	2000	2000	
Total Revenue \$	4000	4000	
Expenses			
Undergraduate salaries (130 hours at \$20/h)	2600	2600	
Travel money for 25 teachers (with carpooling)	1000	1000	
Lunch for 40 teachers	400	400	
Total Expenses \$	4000	4000	

Other

Funding, partners, revenue potential, information on applicants such as publications or awards, at most 20 lines.

Experience. I have considerable experience working with high school students and teachers, having run biweekly high school math enrichment sessions at Queen's for 30 years, and taught two semesters of high school, at LCVI in 1986 and at KCVI in 1998 with my PhD student Nathalie Sinclair. I was a writer for the policy document of the new 1998 curriculum at the Fields institute, a text-book author with Pearson Education in 1999-2001, and have worked closely with the Ontario Ministry of Education for the past 4 years developing curriculum. I present at the OAME annual meeting each year and give or sell (at cost) a number of workbooks of problems to the teachers there. Much of this work in the early 90's was funded by Imperial Oil. I am an active member of the Fields Math Education Forum and of CMESG. I was a regular lecturer at ICME 2000 in Tokyo, and am currently the Canadian Representative to ICMI the International Commission for Mathematics Instruction. I am co-organizer of the CMS Math Ed Forum to be held in Vancouver 2009. I am a 3-M Fellow and last year was the winner of the CMS Pouliot Award for Math Education. Enough of that!

Budget. There are two components. The first is undergrad salaries for preparation of solutions and "on-line" support for teacher queries/discussions. The second is funding for the teachers involved (at least some of them) to meet once or twice a year. This is a huge factor for teachers, especially in out-lying areas and there is almost no funding around for them to do that. As I will hold these meetings at the Fields Inst. and half my teachers are (and will likely be) in the Toronto area, this funding will only be needed for those who are 3-4 hours drive. And I'd like to give everyone a lunch.

Other support. I am applying to the Fields for \$1000 for travel/refreshment support so that I can have a meeting this Fall of the 30 teachers that are part of this year's project. My request to the CMS Endowment Grant covers the two year period starting May 2008. I am applying to Queen's for support: to the Faculty of Arts and Science for \$1000 per year and to the Norman Miller Fellowship Fund for \$1000 per year. I am fairly confident I will get both grants if they are matched by a CMS Endowment Grant.

Project start date: May 1 2008

Project finish date: April 30 2010