Foundational Quantitative Skills Support

Proposal submitted by
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Summary

The new SFU Graduation Requirements, to be implemented in Fall 2006, require that every student take at least 6 credits of courses that foster quantitative/analytical (Q) abilities. With the introduction of the Q requirements, the University is anticipating a significant increase in the need for learning support for students taking Q courses. Implementation of the Q requirement will necessitate the creation or identification of a flexible assessment tool to determine students' preparedness for Q courses, as well as the development of appropriate Foundational Quantitative Skills courses for those who are not sufficiently prepared to take the Q courses of their choice.

The Department of Mathematics is in a unique position to address these needs, due to our many years of experience helping a variety of students to improve their mathematical skills, including students with poor mathematics backgrounds, math anxieties, and other problems. We believe we have the knowledge and experience to tackle the challenge of developing the kind of services that these students will need.

We propose to:

- Design a flexible Mathematics Assessment Test. The test will measure students' preparedness to take a variety of Q courses;
- Design a sequence of Foundational Quantitative Skills (FQS) courses. These courses will address the needs of students who intend to take a variety of SFU Q courses, but who lack the basic skills set by the new entrance requirements;
- Create the Q Support Centre. This centre will support two existing courses, MATH 100, MATH 190 and the new Foundational Quantitative Skills courses. It will also provide advice to students regarding the assessment test. If required, the Centre may also serve as a drop-in centre for students taking a variety of “Q for the Humanities” courses. The centre will be associated with the future Student Learning Centre in whatever form that entity eventually develops.

I. Historical background

1. Workshops in the Mathematics Department

The Mathematics Department has been running student learning centres, which we call "workshops", for well over twenty years. These workshops are highly regarded across Canada, and many universities and colleges are now following our example. We currently have three workshops, each targeting the needs of a
particular group of students.

The first, created by the then Department of Mathematics and Statistics, was the Statistics Laboratory, which opened in 1972. It was called a laboratory since it functioned in somewhat the same way as a science laboratory: it was equipped with a set of calculating devices – early calculators – which students could use as they would any other lab equipment. At the same time, students were able to get one-on-one help with their problems.

The first non-statistics lab opened in 1977/78. This was prompted by both the success of the Statistics Lab in helping students and the department's dissatisfaction with the tutorial system for introductory mathematics courses. Two other labs soon followed, and, in the late eighties, were renamed "workshops" to better reflect their role in supporting students. When Statistics separated in 2001, the Statistics Workshop went to the new department, and Mathematics retained the other three.

Our workshops provide support for students enrolled in many of our larger lower-division mathematics courses. They are coordinated by faculty members who have accumulated wide knowledge and experience. Each workshop has specific courses assigned to it.

The Algebra Workshop supports MATH 100 (Precalculus), MATH 190 (Principles of Mathematics for Teachers), MACM 201 (Discrete Mathematics II), MATH 232 (Linear Algebra), and a credit–free course called Basic Algebra.

The Calculus Workshop is responsible for MATH 151 (Calculus I), MATH 152 (Calculus II) and MATH 251 (Calculus III).

The Applied Calculus Workshop deals with the two applied streams: Calculus for the Life Sciences (MATH 154/155) and Calculus for Business and the Social Sciences (MATH 157/158).

All our workshops are set up as drop-in centres for students in the courses assigned to them, although they occasionally help students from other courses across campus. They are open long hours, allowing students to work for as much, or as little, time as they need. Students can get individual help from TAs, as well as work in groups with other students. Collaborative work is encouraged by the physical layout of the rooms, which, in addition to more private tables on the perimeter, includes large round or rectangular tables, which seat 8 or 10 students. Over all, each workshop can seat 45 - 60 students.

The workshops allow all students to get the help they need. Students with weaker skills or who are shyer find the environment much less intimidating than tutorials. At the same time, top students drop in and have their questions answered in a timely way. By contrast, the tutorial system for large classes
works best for average students, with weaker and less confident students often being too intimidated to ask questions or even attend, and the best students not being challenged enough.

Our workshops go beyond simply providing support for learning mathematics content. We put a lot of emphasis on helping students to learn study skills that are needed to study mathematics. These include quantitative reasoning and problem solving skills, reading mathematical textbooks, and studying for exams. Our experience (and a lot of research done elsewhere) suggests these skills are best learned within the context of meaningful activities and problems in mathematics.

We also help students in overcoming math anxiety. This is another example of something which can be done successfully only in the context of learning mathematics. Gaining a mastery of a field one believed is beyond reach is an extraordinary confidence-boosting experience, and many of our students are positively joyful that, after years of struggle, they feel confident about math.

2. Supporting students with weaker mathematics backgrounds

For over twenty years, the Algebra Workshop (formerly the Basic Math Workshop) has constituted a learning centre for our Precalculus course MATH 100 (which may be redesigned and reclassified as one of the Foundational Quantitative Skills courses), and for MATH 190, Principles of Mathematics for Teachers, which presents mathematics to a predominately non-science-oriented audience. That course has more than a few students who are quite fearful of mathematics. In addition, this workshop offers a non-credit Basic Algebra course.

Basic Algebra is a self-paced preparatory course for students with inadequate mathematics backgrounds. It is taught as a self-study course with instructor support. It has two streams: one designed as preparation for a precalculus course, and thus for students who intend to take further university mathematics courses, and the other for students who intend to take only MATH 190, or possibly an introductory statistics course. Regardless of the stream, one of the goals of the course is to help students build confidence and learn proper study skills. Both the course and the support system have been designed with this in mind. For example, students have the opportunity to rewrite all their tests (except for the final exam) as many times as they need without penalty in order to master each concept.

The TAs for the Algebra Workshop are carefully chosen and closely supervised with regard to not only their mathematics knowledge, but also their ability to work with students for whom mathematics does not come easily. TAs are either graduate or exceptional undergraduate students in Mathematics, or graduate students in Mathematics Education.
In the past, there have also been various discussion groups and workshops on overcoming math anxiety organized through the workshop.

3. Mathematics support for non–science programs

Our department has had useful experience teaching mathematics to students with weak backgrounds, some of whom have very little faith in their ability to understand quantitative theories.

MATH 190, Principles of Mathematics for Teachers, and Basic Algebra both address the needs of students from outside the core science programs. Basic Algebra has been discussed above.

MATH 190 is very important because the knowledge of mathematics possessed by elementary school teachers and their attitudes towards mathematics have great impact on the children they teach. Many studies indicate that, for the majority of people, attitudes towards mathematics are formed before they finish elementary school. This course, like Basic Algebra, is designed not only to teach students what they need to know in terms of subject matter, but also to give them an appreciation for mathematics and mathematical thinking, and to build confidence in their ability to learn it. For these reasons, MATH 190 is an excellent template for Q courses for humanities students.

Since 1995, the Department has been involved with the Liberal and Business Studies program offered through the SFU Harbour Centre campus. We have designed a mathematics course for this program, MATH 198, Introduction to Quantitative Reasoning (formerly called Practical Mathematics), and a preparatory workshop created for students who need to upgrade their background before taking MATH 198. MATH 198 is another example of a course that can serve as a successful model for a Q for humanities course, both because of its content and because it excels in addressing the needs of students with a broad spectrum of backgrounds and attitudes towards mathematics. Many of these students tell us afterwards that they “got math” for the first time in their lives.

Recently, because of our fruitful cooperation with the Liberal and Business Studies program, we were asked to design and teach a mathematics review course for the SFU Public Policy Program.
II. Proposal: FQS Support Structures

1. The Mathematics Assessment Test

The new SFU Graduation Requirements specify that (pages 8 – 9, Revised Recommendations of the Undergraduate Curriculum Implementation Task Force):

“... We recommend that, beginning in 2006-3, all applicants be required to demonstrate their competence in quantitative skills as a part of the admissions process by obtaining a grade of 60% (C) or higher in a course equivalent to Principles of Math 11 (or Applications of Math 12), or in a course equivalent to Principles of Math 12 (whichever is required for admission to their specific Faculty and/or Program).

Applicants who obtain math scores in the 60% - 69% range may be admitted, but will be required either to register directly in a Foundational Quantitative Skills (FQS) course or to take a diagnostic quantitative skills test within their first semester. The diagnostic test will contain modules equipped to assess the quantitative abilities needed for all types of Q courses. Admitted students who choose to take the diagnostic test and who score 70% or higher on the appropriate module will be eligible to register in an appropriate Q course (that is, a Q course with prerequisite skills assessed by the module). Those who score below 70% will be required to register in an appropriate Foundational Quantitative Skills course within their first 30 credits and to obtain a grade of C or better within their first 45 credit units before being eligible to register in a Q course. …”

The Department of Mathematics has been offering a Mathematics Assessment Test to SFU students for over twenty years. The present test has two modules. One of them tests students’ readiness for courses like Math 100, 190 or introductory Statistics courses, for which BC Principles of Math 11 (or equivalent) is a prerequisite. The second tests students’ readiness for first year Calculus courses. Both were designed in the early 1980’s and revised ten years later. This test is a good starting point for creating a diagnostic tool, able to measure students’ preparedness to take a variety of Q courses. However, it is not suitable in its present form for such use, for three reasons. First, it is overdue for a major revision required to address changes in the BC high school mathematics curriculum. Second, it is only a paper and pencil test, and each module exists in one version only, which limits its use. (An on-line test, which can give an instant feedback to students, would be more resource efficient.) Finally, since our test was originally designed for different purposes, it does not provide enough flexibility to test students’ preparedness for the Q for humanities courses.

An assessment tool able to address the needs of the new Q requirements will have to be created in conjunction with the new Foundational Quantitative Skills
courses, and in consultation with people who will be designing and teaching new Q for humanities courses. Therefore, the process will consist of three stages:

- Consultations with people who have been, and will be, designing and teaching new Q for humanities’ courses, regarding their expectations of students’ background.

- Research on existing mathematics assessment tests, offered at some BC colleges, as well as at some Canadian and US universities.

- Design of the test, which will take into account expectations of faculty teaching Q courses, and which will address the entrance requirements recommended by the Task Force and passed by Senate.

The consultation stage needs to involve people from other departments. A small Advisory Committee should be created for this purpose, which could include representatives from the Department of Statistics and Actuarial Sciences, the Department of Philosophy, and from the Faculty of Education. In addition, several members of that Faculty have valuable expertise that can be useful for designing the test. We expect that this committee will be created and start working in November 2004.

The second stage is already well under way. While it is very unlikely that a test already exists which would be suitable for our needs, it is useful to develop as much expertise in the area as possible. Therefore, we have been investigating assessment tests offered by universities and colleges in Canada and US, and some commercial firms, like the Accuplacer. However, these tests are mostly designed as tools in assessing students’ preparation for Calculus and, in some cases, also Precalculus courses.

We have been involved in discussions on math assessment with people from BC colleges since April 2004 and, in some cases, even earlier, through our involvement with the BCCUPM, and personal contacts with faculty from Douglas, Langara, Capilano, Fraser Valley and Camosun colleges. One of the venues for these consultations has been our annual Changing the Culture conference at the SFU Harbour Centre - a joint project of the SFU Department of Mathematics and the Pacific Institute for the Mathematical Sciences (see www.pims.math.ca/ctc). At this year’s conference, which took place on April 23rd, 2004, we have organized workshops focusing on students’ preparation for various levels of mathematics courses, and on the assessment. Subsequently, we have been surveying BCCUPM members whether they offer any assessment test, and on their experiences with the effectiveness of such instruments.

The final, design stage, will use the expertise gained in the Department of Mathematics through years of offering the existing Mathematics Assessment Test, as well as that gathered through the first two stages of the process. The
diagnostic test both needs to assess students’ preparation to take introductory Q courses and to determine the level of FQS course they will require. In addition, it should result in a test designed for on-line administration. We have already begun researching the tools available for on-line administration of the test. One of the most promising electronic delivery systems for this purpose is LON-CAPA, which has been used by the SFU Physics and Chemistry Departments for many years. In our department, Dr. Veselin Jungic used it in Math 242 in the Spring 2004 and is using it Math 157 in the Fall 2004. Note that, because LON-CAPA is already being used at SFU, extending its use to the Assessment Test may prove to be the most cost-effective solution. Another interesting possible tool is Maple TA by Maplesoft.

2. Foundational Quantitative Skills (FQS) courses

The Task Force Recommendations (see previous section) imply that appropriate FQS courses will exist at SFU by the Fall of 2006. The Department of Mathematics has the expertise to develop such courses.

As is the case for the Q Assessment Test, existing courses will provide a starting point for the design of new FQS courses. Our MATH 100, with minor changes, will continue to be our most advanced FQS course, suitable for students who want to take courses for which BC Principles of Mathematics 12 is a prerequisite, and who have sufficient algebraic skills (as witnessed, for example, by an adequate grade from BC Principles of Mathematics 11). However, this course is too advanced for the majority of students who will be taking Q for humanities courses.

The existing Basic Algebra course addresses the needs of students with weak mathematics skills. However, like the existing assessment test, it is not ready for the needs of the new SFU curriculum. It needs updating and extensive revision. We propose to redesign it as a FQS course in a way which will make it a suitable preparation not only for MATH 100 and MATH 190 (Mathematics For Elementary School Teachers), but also for future Q for humanities courses. Therefore the design process must include a review of existing introductory Q courses and consultation with those who are proposing and teaching other Q for humanities courses. This review may suggest the creation of more than one course, to better meet the needs of students.

The review stage will also include investigating whether similar courses do already exist in BC colleges, or are being designed there. We have been already receiving inquiries from colleges interested in transferability of their existing or future courses into our Foundational courses.

Before describing the proposed format of future FQS courses, it is worth recalling the goals of these courses, and the needs of the students taking them. The
most obvious goal is to give the students the knowledge and the skills they need to succeed in the Q courses of their choice. However, for the majority of these students, the traditional teaching methods they experienced in schools failed to give them these skills. To succeed, these students will have to learn new study habits: to actively engage in the learning process and to focus on a deeper understanding of the concepts, and better problem solving skills. In short, the goal of our FQS courses should be to give students tools to succeed in the Q courses they intend to take.

Future FQS courses will have flexible curricula, so as to provide a good preparation for a variety of Q courses, and to respond to the needs of our students. The courses will consist of several modules. For students not immediately allowed to take Q courses, the Assessment Test will determine the module the student needs to start at, and the courses the student intends to take will determine which modules, and how many, will be appropriate. The FQS course instructor will advise students on their customized course curriculum, and will approve the choice of the modules for them. The flexibility of such a structure will allow students to continue taking additional modules if the need arises.

Flexible curricula need flexible delivery. Basic Algebra, which has always been offered as a self-paced, supervised study course, has given us useful insights into the advantages and disadvantages of this mode of delivery. This suggests a combination of approaches, with regular, weekly lectures and structured small group study periods, with the option of flexible, self-paced program of study.

The format of class activities most suitable for the needs of our FQS courses is that of the Active Learning Model, exemplified by the Studio Physics courses, which have been introduced at several US universities. This method requires smaller classes – in our case, sections of 50 students may work reasonably well – and teaching through a combination of lecturing and in-class small group activities supervised by the course instructor. This will require more contact hours – preferably 6 hours a week. Half of these hours could be interactions with the course instructor, and half with a TA.

SFU has a policy of welcoming mature students in addition to those not long out of high school. Many mature students have appropriate credentials on paper but do not remember enough math to be successful in the Q courses they want to take. Experience shows that the majority of students lose most of their math skills within five years of taking their last course. Therefore, mature students require a thorough review of the concepts as much as the students just finishing high school who have grades insufficient to admit them into the Q courses of their choice.

One of the advantages of the future FQS courses over the Basic Algebra course will be their status as credit courses (additive credit). At present, Basic Algebra
is a credit-free course. This affects the enrollment, since the course cannot be counted when applying for student loans. The new courses will be much more attractive to students.

3. The Q Support Centre

We propose to create a new Workshop within the Department of Mathematics: a Q Support Centre. This Centre will be charged with the following responsibilities:

- Overseeing administration of the new Q Assessment Test.
- Providing advice to students both prior to and after taking the Test.
- Providing advice to students interested in Q courses regarding the choice of courses best suited to their interests, and the level of preparation required for specific courses.
- Supporting the learning of students enrolled in FQS courses, including MATH 100 (Precalculus).
- Providing support for MATH 190 and possibly other Q for humanities courses.
- Organizing workshops on overcoming math anxiety, and on math study skills.

The Centre will be run similarly to the existing mathematics workshops. It will be coordinated by faculty members (lecturers), experienced in working with students who have varied mathematical backgrounds. The faculty members will also teach FQS courses, provide advice to students, and organize, possibly in cooperation with faculty from the Department of Psychology, the Faculty of Education, and the Health and Counseling Services, math study skills workshops and math anxiety workshops. They will also design and conduct TA training program, to prepare TAs for work with the students taking the Assessment Test and FQS courses.

The training required for working in the Centre will include developing good listening skills and ability to assess students’ needs. It will also teach TAs how to guide students through stages of problem solving, without just telling them how to do a problem.

The Centre will be staffed by specially trained TAs, who, in addition to good knowledge of mathematics and experience with the educational aspects of mathematics, will have good communication skills, patience, willingness and ability to help students who have weak mathematics background and/or math
anxiety. As is the case for other workshops in the Department, the TAs will be graduate students from Mathematics or Mathematics Education, or senior undergraduates who have shown superior performance in mathematical courses, as well as good communication skills and teaching abilities. Graduate students from other departments, who are interested in teaching and learning mathematics, may also be good candidates for TAs in the Centre.

Note that adding Math 190 to the Centre was dictated in part by the desire to use potential TA resources more efficiently. Graduate students in Mathematics Education have been working as TAs for this course in the past. And, the background and skills required for working with Math 190 students are very similar to those needed for work with students taking FQS courses.

Programs offering existing Q courses generally address their support needs using their own resources. Some of the developers and instructors of the future Q courses may, however, be interested in providing their students the opportunity to benefit from the expertise and support of the Department of Mathematics, by linking them with the Q Support Centre. Courses, which may fit well within the Centre, are two new Education courses, EDUC 211 and 212, recently approved as Q courses.

Proper support for such courses can be provided only if the courses are formally assigned to the Centre in the same manner as mathematics courses are presently assigned to math workshops, with a similar level of financial support. Such assignment is at the discretion of the department/faculty mounting the course in question.

We expect that our new Centre will be linked with the new Student Learning Centre being discussed (amongst other options) by the Student Learning Services Task Force. We hope that, if such a Learning Centre will be created, it will, in addition to supporting students' learning, provide a forum for the exchange of ideas, experience, and knowledge between individuals involved in the support of student learning, especially learning connected to the implementation of the new undergraduate curriculum.

III. Required Funding

The funding required for the proposal falls into three categories:

1. Space and equipment costs
2. Developmental costs
3. Continuing costs

1. Space and equipment costs.
The new Q Support Centre will require a new space, preferably close to other math workshops. This space should either be close to the Mathematics Department, for example on the 4000 level of AQ, where two of our workshops are located, or possibly in proximity to other Learning Centres, that may be created as a result of recommendations of the Student Learning Task Force. However, it is worth noting that the AQ 4000 level space itself may be an excellent venue for a future Student Learning Centre, because of its unique location and the present usage of some of its rooms.

The space for the future Q Support Centre will have to be equipped with tables and chairs to seat a minimum of 60 students, and 2 – 4 desks for TAs. It should have a separate room for supervised administration of the Assessment Test, equipped with 4 - 8 computer stations.

It is worthwhile to design such space in a way that will make it also suitable for teaching Studio-style FQS courses.

In addition, offices for the two lecturers who will be running the Centre, will be required.

2. Developmental costs.

The developmental stage of the project consists of the following tasks:

• Design of the Assessment Test

• Design of FQS courses

• Redesign of MATH 100 as an FQS course

• Organization and setup of the Q Support Centre

• Testing the setup prior to official implementation of the new curriculum by opening the Centre and offering new FQS courses in the Summer 2006.

Design of the Assessment Test and FQS courses will require a substantial amount of research and consultations with those who will be teaching future (and existing) Q for humanities courses, and with people teaching similar courses in BC colleges and other universities. The Assessment Test and the FQS courses need to be designed in parallel, so both are flexible enough for our needs. The courses will be considerably more complex than a regular course, to allow them to be adapted to the needs of individual students. This will require careful planning and a description of various possible paths through the course curriculum, as well as designing appropriate course materials. In addition, this
work needs to be set in such a way that our Math 100, after required modifications, will become part of the sequence of FQS courses for those students who need it.

Below is the breakdown of the expected costs during the development stage, and a timeline for their completion:

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>Timeline</th>
<th>Budget (in course units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math Assessment Tool</td>
<td>Creating an advisory committee of faculty members teaching Q courses</td>
<td>Nov 04</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Research into existing assessment tests and writing a report</td>
<td>April 04 - Feb 05</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Consultations on students’ needs, and the needs of instructors of Q courses</td>
<td>Nov 04 – Feb 05</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Development of local test, validating the test</td>
<td>Feb 05 - Jan 06</td>
<td>8 units</td>
</tr>
<tr>
<td>FQS Course Development</td>
<td>Creating an advisory committee of faculty members teaching Q courses</td>
<td>Nov 04</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Consultations on students’ needs, and the needs of instructors of Q courses</td>
<td>Nov 04 – Feb 05</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Redesign of MATH 100, development of new FQS, preparation of course materials</td>
<td>May 05 – April 06</td>
<td>4 units</td>
</tr>
<tr>
<td>Organization of FQ Support Centre</td>
<td>Preparing resources (course materials, TA manuals, advisory materials on Assessment Test, etc) for the Centre</td>
<td>Jan 06 – April 06</td>
<td>4 units</td>
</tr>
<tr>
<td></td>
<td>Developing TA training</td>
<td>Jan 06 – April 06</td>
<td></td>
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</tbody>
</table>
This work will have to be completed during the next two years, with the courses starting, and the Centre opening officially in September 2006. However, as noted above, the Centre should in fact open and the courses start in May 2006, to provide one semester testing period and an opportunity to implement a TA training program as part of the development stage. This will be possible only if space for the new Q Support Centre is ready in time.

These tasks listed above will require a minimum commitment of two full time, one year lecturer positions. For lecturer positions at the step 3 level, each will require $55,003, to a total of $110,006.

*The funding required for the development stage of the project, including coordinating the Q Support Centre and teaching FQS courses in 1064, is equivalent to two one year’s lecturer stipends, or $110,006.*

3. Continuing costs.

Starting September 1st, 2006, additional faculty resources will be required to teach newly created FQS courses, coordinating the new Q Support Centre, and advising students. These tasks are closely related, and therefore best performed by the same people.

The new introductory FQS courses will have to be offered continuously throughout the year, both as regular lecture courses, offered three times a year, and as a self-paced, supervised, independent study program. A combination of the two approaches may also be needed.

Coordinating the Centre will include overseeing administration of the Assessment Test, advising students taking the test, and organizing math study skills and math anxiety workshops. It will also include training, scheduling, and supervising TAs assigned to the Centre. In addition, it will include coordinating support for MATH 100 and MATH 190; however, this support is part of the existing departmental budget.

In addition to teaching the FQS courses and coordinating the QS Centre, we intend to monitor the effectiveness of the Assessment Test and the FQS courses in preparing students for Q courses on a continuous basis, and, if required, adjust the test and/or FQS courses to address the needs of the Q courses better.

The Revised Recommendations of the Undergraduate Curriculum Implementation Task Force document estimate that there will be approximately 500 students taking FQS courses each year. Based on this estimate, below are the expected costs of running the Centre and teaching the required courses:
• Coordinating Assessment Test, including monitoring effectiveness of the Test, will be equivalent to teaching 1 course a year, or 1/8 of a lecturer's position.

• Advising students will be equivalent to teaching 1 course a year, or 1/8 of a lecturer's position.

• Teaching 500 students a year in groups of 50, monitoring the effectiveness of the FQS courses in preparing students for Q courses, and monitoring the needs of new Q courses regarding students’ preparation they require, translates into 10 courses a year, or 1 and 1/4 of a lecturer’s position.

• Supervising students working through self-paced, independent study programs is equivalent to 1 course a year, or 1/8 of a lecturer’s position.

• Organizing math study skills and math anxiety workshops – 1 course a year, or 1/8 of a lecturer’s position.

• Training, scheduling, and supervising TAs assigned to the Centre – 1 course a year, or 1/8 of a lecturer’s position.

• Interaction with faculty teaching Q for Humanities courses, including consultations on students’ preparation, effectiveness of the Assessment Test, and recommendations on improvements to FQS courses – 1 course a year, or 1/8 of a lecturer’s position.

The above list of tasks involved in the Q Foundational teaching adds up to two full lecturer positions. However, one of these should be at the Senior Lecturer level, to take on a leadership role for the Centre. In addition, the cost of the lecturer’s non-teaching semester (1 in 9), and a study leave (1 in 7 years) adds 30% to the cost of the positions, and the benefits add further 20%.

From the current salary scales, the cost of a Lecturer, step 3, is $55,003, and a Senior Lecturer, step 1, is $61, 973. The total of the two is 116,976. The benefits, non-teaching semester and study leave add 50% of this, to a total of $175,464.

Note that the list is not necessarily complete, as it does not account for any involvement with “Q for the Humanities” courses.

Since the cost of teaching and TA support for MATH 100 is not new, it is not part of this proposal.

Over all, teaching the new FQS courses and coordinating the Q Support Centre will require a minimum of two full time lecturers positions, one of
them at a Senior Lecturer’s level, starting September 1st, 2006. The cost of these two positions, including benefits and non-teaching semester and study leave coverage, will be $175,464.

It is worth noting that the innovative aspect of the project, the research and development involved, and the need to continuously reassess the work of the FQS courses, the assessment test, and the centre, will create an opportunity for interesting research in undergraduate mathematics education. This creates a potential research dimension to the Q Support Centre. To reap the most benefits from this, SFU may consider creating a faculty position associated with the Centre. While this would add another $55,000 plus benefits to the cost of the centre, this cost would in part be offset by the fact that this faculty member would undertake some of the teaching in the Centre, which would be equivalent at least to the cost of the two lecturers’ study leaves and non-teaching semesters. Such a position would bring to SFU graduate students whose interests would make them excellent TAs for the QS centre.

TA support required for the new FQS courses will depend on the enrollment in these courses. If the number of students enrolled in the FQS courses meets the expectations of the Undergraduate Curriculum Implementation Taskforce, which suggest 500 students a year, 25 – 30 base units of TA work will be required, or approximately $30,000 a year.

CONCLUSION. In order to set the above proposal in motion, we request approval for the appointment of two full-time lecturers from September 2005. The first year of these appointments will be devoted to the Development Phase. Starting from September 2006, the appointees will be responsible for the ongoing implementation of the project.

In addition, a creation of a faculty position in mathematics, dedicated to research in undergraduate mathematics education, should be considered.