# Quality Enhancement Grant Scheme

| **Final Evaluation Report** | **Project No. :** 25/QEGS/09-10 |
|---|---|

## Part A

**Project Title** : Math Portal

**Name of Grantee :** Hong Kong Community College

**Project Period** : From September 2010 (*month/year*) to August 2012 (*month/year*)

## Part B

Please use separate A4-size sheets to provide an evaluation of the Project with regard to the following aspects:

1. Project activities contributing to the attainment of Project objectives, extent of attainment of the objectives, evidence or indicators attesting to the attainment of the objectives, and if applicable, reasons for not able to achieve the objectives.
2. Impact or benefits of the Project to the participants, the target institution(s) or the sector.
3. Cost-effectiveness of the Project against clear indicators, e.g. utilization of available resources, unit cost per beneficiaries, sustainability of Project activities/impacts, applicability of Project outcomes/deliverables to other institutions, or alternative approaches for equivalent benefits at less cost, etc.
4. Outcomes and deliverables of the Project.

Signature: _____ Organization Chop: THE HONG KONG POLYTECHNIC UNIVERSITY HONG KONG COMMUNITY COLLEGE

Name of Authorized Person: Dr. Simon Leung

Name of Grantee Organization: PolyU HKCC

Position of Authorized Person: Director

Date: 29 November 2012

# A Final Evaluation Report on QEGS Project – Math Portal

## Project Code: 25/QEGS/09-10

## 1. Project Overview and Objective

A sum of HK$1,423,000 was granted to Hong Kong Community College for the purpose of carrying out the captioned QEGS project from 1 September 2010 to 31 August 2012. The overall objective of the project was to provide students with additional support in learning mathematics and statistics as well as to improve their numerate literacy and, ultimately, to enhance their learning effectiveness and to improve the quality of graduates in terms of quantitative and analytical skills. This report provides a summary of the project outcomes and deliverables and presents a self-evaluation of the project effectiveness.

## 2. Project Activities

The project has completed all of the following planned activities across all four phases of the project during the reporting period, contributing to the successful attainment of all project objectives:

- Math Learning Center
- Remedial Courses
- Self-directed Learning Software

### (a) Math Learning Center

Math Learning Centers (MLCs) have been set up at both the Hung Hom Bay campus and the West Kowloon campus to provide students with an additional channel to seek help for mathematics-related problems. During term time from Monday to Friday from 14:00 to 18:30, either one of the two MLCs was open for students enrolled in the following mathematics / statistics subjects.

- Quantitative Methods for Business
- Elementary Statistics
- Mathematics
- Introduction to Calculus and Linear Algebra
- Business Statistics

Since the establishment of the MLCs in semester 1, 2010/11, over 1,000 students have been benefited from the support services provided by the MLCs.

| | Number of beneficiaries |
|---|---|
| Semester 1, 2010/11 | 157 |
| Semester 2, 2010/11 | 213 |
| Semester 1, 2011/12 | 490 |
| Semester 2, 2011/12 | 164 |

***Evaluation***

Sets of questionnaires were developed and used to collect students' feedback on the support services provided by the MLCs and for the revision of the existing services. Positive comments from students were received. As shown in the following table, an average score of 8.69 (on a 10-point scale with 10 equals to the most effective) was obtained for the question about the effectiveness of the services provided by the MLCs in facilitating students' learning.

| | Average score on the effectiveness of services provided by the MLCs (on a 10-pt scale) |
|---|---|
| Semester 1, 2010/11 | 8.48 |
| Semester 2, 2010/11 | 8.77 |
| Semester 1, 2011/12 | 8.75 |
| Semester 2, 2011/12 | 8.57 |

While positive comments were received from students who have used the MLCs, the utilisation rate, in terms of the number of visits, was a bit low. Thus, the project team developed and administered a questionnaire to all students enrolled in the subjects concerned to collect their views on the services as well as the reasons for not using the MLCs. Students were requested to tick all options whenever appropriate. The options are listed as follows:

*R1: I am able to cope with the subject materials. Thus, I do not need this kind of help.*
*R2: I can seek assistance from my lecturers/friends whenever I need.*
*R3: The lectures and tutorials are adequate for me.*
*R4: I am not available during the opening days and hours.*
*R5: I am not aware of the services of MLC.*
*R6: The learning assistant is not capable of solving my problems*

Responses are shown in the following table which shows that most students indicated that they were able to seek assistance from their lecturers and/or friends when needed.

| | | No. of respondents | R1 | R2 | R3 | R4 | R5 | R6 |
|---|---|---|---|---|---|---|---|---|
| Semester 1, 2010/11 | Total | 1781 | 228 | 447 | 372 | 821 | 413 | 40 |
| | % | 100% | 12.80% | 25.10% | 20.89% | 46.10% | 23.19% | 2.25% |
| Semester 2, 2010/11 | Total | 852 | 175 | 343 | 220 | 220 | 173 | 13 |
| | % | 100% | 20.54% | 40.26% | 25.82% | 25.82% | 20.31% | 1.53% |
| Semester 1, 2011/12 | Total | 1,825 | 387 | 648 | 373 | 438 | 348 | 23 |
| | % | 100% | 21.21% | 35.51% | 20.44% | 24.00% | 19.07% | 1.26% |
| Semester 2, 2011/12 | Total | 919 | 230 | 375 | 253 | 188 | 208 | 23 |
| | % | 100% | 25.03% | 40.81% | 27.53% | 20.46% | 22.63% | 2.50% |

**(b) Remedial Courses**

***Delivery of Remedial Courses***

An entry test was administered to all stage-1 sub-degree students of HKCC before the commencement of the first semester of their studies to measure their mathematics ability. Appropriate remedial courses were arranged for students with lower levels of numeracy.

| Remedial course | Campus | Number of classes | Number of beneficiaries |
|---|---|---|---|
| **Semester 1, 2011/12** | | | |
| Elementary Algebra | WK | 39 | 804 |
| Basic Statistics | HHB | 13 | 295 |
| Pre-Calculus | HHB | 18 | 280 |
| **Semester 2, 2011/12** | | | |
| Basic Statistics | WK | 46 | 760 |
| Basic Statistics | HHB | 23 | 331 |
| | **Total** | **139** | **2,470** |

***Development of Course Materials***

The following materials were developed for the remedial courses, each set of materials contains (i) notes together with examples, (ii) preliminary exercises, and (iii) drilling exercises.

| Module | Elementary Algebra | Pre-Calculus | Basic Statistics |
|---|---|---|---|
| 1 | • Approximation and Errors<br>• Exponential and Logarithmic Functions | • Trigonometric Function I | • Organisation and Representation of Data |
| 2 | • Simultaneous Linear Equations in Two Unknowns | • Trigonometric Function II | • Measures of Central Tendency and Dispersion |
| 3 | • Linear Inequalities | • Partial Fraction and Series | • Permutation |
| 4 | • Linear and Quadratic Graphs | • Differentiation I | • Combination |
| 5 | • Formulas and Basic Algebraic Identities | • Differentiation II | • Probability I |
| 6 | • Laws of Indices and Scientific Notation | • Complex Number | • Probability II |
| 7 | • Variations | • Quadratic equations in one unknown | • Conditional probability and Bayes' theorem |
| 8 | • Inequalities and linear programming | • More about polynomials | • Discrete random variables, Probability distribution, expectation and variance |
| 9 | • More about graphs of functions | • More about equations | • Binomial, Geometric and Poisson Distributions |
| 10 | • Basic properties of circles | • Arithmetic and geometric sequences and their summations | • Normal Distribution |
| 11 | • Locus | • Mathematics Induction | • Sampling distribution |
| 12 | • Equations of straight lines and circles | • Binomial Theorem and Induction to the number e | • Point and Confidence interval for a population mean and proportion |
| 13 | • Determinants | | |
| 14 | • Concept, operations and properties of matrices | | |
| 15 | • Solving systems of linear equations | | |
| 16 | • Introduction to vectors | | |
| 17 | • Scalar product and vector product | | |
| 18 | • Applications of vectors | | |

For each set of materials of remedial courses and test banks, after the writer had developed the materials/test banks, it was then send to a reviewer (an experienced lecturer) for review. All comments received were relayed to the writer and he/she was required to make amendment according to the comments or give justification for not doing so. Schedule for submission and sample of reviewer's comment on materials for remedial courses and test banks are attached in the appendices.

***Evaluation***

Students were required to sit for progress tests during classes. Students' performance in the entry test and the progress tests is summarised in the following table.

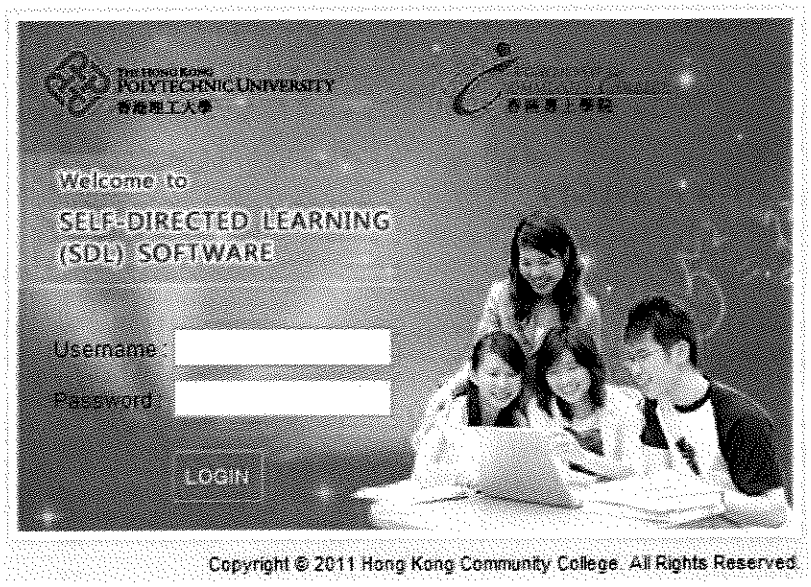
| Remedial course | Average score (out of 100) | |
|---|---|---|
| | Entry test | Progress test |
| Elementary Algebra | 43 | 66 |
| Basic Statistics | 48 | 75 |
| Pre-Calculus | 42 | 60 |

A set of questionnaires developed for collecting students' feedback on the remedial courses was administered in lesson 4 or 5 of the courses, the post-teaching reports from the lecturers on the remedial courses were received, and at least one class conducted by each visiting lecturer was visited.

In general, positive comments on the remedial courses were received from the students and the lecturers. In particular, for the question about the effectiveness of the courses in helping students to learn mathematics / statistics, an average score of 7.7 (on a 10-point scale with 10 equals to the most effective) was obtained. In the post-teaching reports, lecturers reported that the students were attentive and well-disciplined, and they found the materials developed for the courses useful. To further strengthen student's mathematics ability, lecturers suggested that more topics should be covered in the remedial courses.

**(c) Self-directed Learning Software**

The self-directed learning software was developed, and can be accessed at http://www.hkcc-polyu.edu.hk/mathportal/.




After logging in to the system, students may select the topics that they would like to practise. There are over 10,000 questions categorised under different topics for student practice. Students may also review the key concepts of the topics or take a look at the worked examples.

***Evaluation***

A set of questionnaires was developed for collecting students' feedback on the self-directed learning software. Students were invited to fill in the questionnaires after using the software. In general, students found the software user-friendly and commented that the self-practice exercises could help them review and consolidate the concepts and techniques needed in mathematics / statistics courses.

59 students has used the software and returned the completed questionnaire. Out of which, 43 students indicated that they would like to use the software again. For questions about the effectiveness of the software in helping students to learn mathematics / statistics, an average score of 6.4 (on a 10-point scale with 10 equals to the most effective) was obtained. Technical comments, e.g. suggestions on SEARCH function, and non-technical comments, e.g. want to have more exercises on a particular topic, were related to the software vendor and the project assistant, respectively, for follow up.

## 3. Impact or Benefit of the Project

This project benefited around 2,500 sub-degree students. In this project, students who were enrolled in the five mathematics/statistics subjects concerned were welcome to visit the MCLs and seek assistance from the helpers. Also, students who were identified to be weaker in Mathematics were eligible to enjoy the remedial courses. Base on the quantitative and qualitative feedback collected from the students and lecturers, the project could enhance the mathematics competence of the student participants.

With the grant funded by QEGS, an MLC has been set up at each campus. Upon the completion of the project, the College has sustained the operation of the MLCs and continued to provide assistance to students in need.

## 4. Cost Effectiveness of the Project

| Budget Items | Approved Budget | Actual Expense | Balance |
|---|---|---|---|
| Manpower | $1,209,925.00 | $1,196,555.20 | $13,369.80 |
| Equipment / Facilities | $50,000.00 | $43,255.00 | $6,745.00 |
| Services | $80,000.00 | $88,000.00 | $(8,000.00) |
| General Expenses | $75,575.00 | $73,941.45 | $1,633.55 |
| Others (Auditor's Remuneration) | $7,500.00 | $7,500.00 | $0 |

The project is considered to be cost-effective as it has made good use of the available resources. The total cost for the project is $1,423,000, and around 2,500 students have participated in different activities, other than the entry test. The cost per beneficiary is around $407.

The self-directed learning software and the materials developed for the remedial courses were specially designed to cover those topics and skills which most students with limited mathematics background found challenging. They are good references for HKCC students who need additional help in mathematics.

## 5. Project Outcomes and Deliverables

All project activities for Phases 1 to 4 stipulated in the agreement had been completed, including:

| Milestone(s) and Deliverables Attained | |
|---|---|
| (1) Implementation of the Math Learning Center | ✓ |
| (2) Administration of the entry test | ✓ |
| (3) Development of teaching and learning materials for the remedial courses | ✓ |
| (4) Implementation of Remedial course (Elementary Algebra) | ✓ |
| (5) Implementation of Remedial course (Basic Statistics) | ✓ |
| (6) Implementation of Remedial course (Pre-calculus) | ✓ |
| (7) Development of the self-directed learning software | ✓ |