

A Mathematics Project Experience

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This is not a formal report but a personal teaching experience which my friends have invited me to share. It was a trial of incorporating mathematics project work in the secondary year one curriculum six years ago. Hereupon, I will write my story in retrospect.

It began...

As I first joint the teaching profession, I believed that the most important objective was to help students passing examinations with good results. This brought no apparent harm but it was certainly not a healthy objective. (*Readers are reminded that over examination-oriented teaching will bring more harm than good.*) As I got along with more friends in the profession and was influenced by their aspirationⁱ, my view of mathematics education gradually changed.

I was then teaching in a famous secondary school which enjoyed the prestige of having students of high calibre. I found that the mathematics curriculumⁱⁱ had provided nothing to help students learning the beauty and richness of the subject and very often deprived students of the opportunity of developing this aspect because of its highly examination-oriented nature. Feeling greatly frustrated, I wanted to try something innovativeⁱⁱⁱ and I persuaded the principal and panel chairman to allow me to incorporate project work in my secondary year one teaching. Fortunately, my request got their support on the condition that the usual teaching syllabus would be completed.

What I did..

After the permission granted, I needed to do the planning by myself. I had to answer a few questions myself.

What did I want to do?

How would my students benefit from this?

How could the work be assessed?

I had always dreamed of an ideal mathematics learning situation where students would explore different mathematical jobs such as solving real problems, playing games, discussing their ideas and searching for more by reading on their own. I decided to ask my students to do project because project work appeared to have embraced all these. Since this was a new attempt, I had no idea how to cause least disturbance to normal teaching. Eventually, I decided to put project work into the two-week block before Christmas in the whole year plan so that the original teaching syllabus could be completed without difficulty. I asked students to work in groups of four or five. They were free to choose their own topic. During that couple of weeks, they could work in groups during all the mathematics lessons. After the Christmas vacation, each group would have to produce a written report and give a ten-minute oral presentation in either English or Chinese^{iv}. Assessment of the project work would be counted as 10% of their first term score. To help the students to start, I gave them some suggestions of project titles supplemented with a few pages of reference. These titles were: fun with numbers, polyominoes, polyiamonds, fun with matches, noughts and crosses, magic squares and other arrangements, cryptarithms and alphametics, marker board puzzles, puzzles, mathematical models, flexagons, string cutting and related number patterns. Furthermore, they were free to suggest something on their own.

With all these ideas, I then began my venture.

Project was not a new idea in the school but mathematics project was an additional new item. Immediately after the explanation of the idea to the class, I received complaints that it was the "tenth" project in that academic year. Many students really preferred paper and pencil exercises which made life simpler. This further confirmed my feeling of the need of alternative

assessment. Too many choices also created difficulty. Many students took some time before they could decide on a certain topic. My role in the two weeks was a facilitator whose job was by means easy. With eight to ten groups of students working together, their noise was tremendous. I nearly made a fool of myself by having discipline problem in a school which was always proud of self discipline. Besides, an average of less than 5 minutes for each group in each lesson was really inadequate. Severe time constraint and inadequate communication skills made the oral presentation so difficult that the result was nearly disastrous.

Despite the above mentioned, it worked. My students produced projects some of which I still remember. Below are a few interesting items.

- There was a very detailed solution of a board game which was more than eight pages in length.
- A group put themselves into cartoon persons who travelled through Egypt and told stories of early mathematics.
- A group of students who gave a solution to the Tower of Hanoi insisted that their solution was valid though not the most efficient during their presentation.
- A group produced all sorts of polyhedrons and complained that the grade given was too low to give proper recognition of their effort.
- A group gave an enlightening illustration of the game of "drawing ghost legs" (畫鬼腳) and produced a new modified format for the game.
- A group decided a bingo with a batch of mathematics questions.
- There were two projects on magic squares of different approaches. One begun by telling the legend of "he tu" and the other emphasized the challenge of difficult puzzles.

It was a joyful experience to read their creative work but marking was a hard job. My marking was quite subjective and I gave many B's thus received complaints about not giving more A's.

To conclude...

This is not an original trial and by no means a success. Some problems like choice of suitable topics, justified assessment, poor communication skills and inadequate planning need to be further explored and solutions should be sorted. Nonetheless, it is a precious experience. It makes me feel more deeply the inadequacy of traditional examination-

oriented teaching and that there are so much more about the subject that we should *share and learn* with our students. Mathematics teaching and learning should definitely be more than a knowledge delivery business.

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- i I owe my deepest gratitude to my fellow-teachers like Mr. Fung Tak Wah, Mr. Cheung Pak Hong, Dr. Wong Ngai Ying and my teacher-friends like Dr. Siu Man Keung and Dr. Matthew Linton.
 - ii By "curriculum" I refer to the syllabus, the textbooks, assessment and teaching. Though teachers are supposed to have freedom in their teaching and methods of delivery, there are too many limitations to be mentioned here.
 - iii This idea is no longer innovative now. Interested readers may consult recent NCTM publications.
 - iv English is the official medium of the school. Special permission was then obtained from the principal to allow project homework to be done in Chinese. This adjustment allowed students coming from Chinese primary schools to feel adequate in expressing their ideas but mixed code was strictly forbidden in their written work.