

Piloting Curriculum Compacting in Hong Kong: Experience Sharing in Teaching Primary Students DNA Concepts as Replacement Activities

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Abstract

Teaching primary students concepts of DNA seems very difficult but the result can be different if the target audience are scientifically gifted students. By using the school-based curriculum jointly developed by frontline teachers and the curriculum officers of the Education Bureau supplemented with interesting experiments, the piloted compacted curriculum was tailored to meet the needs of the gifted students with the addition of students' curiosity and teachers' continuous reflection. The first attempt of implementation of curriculum compacting in the formal school curriculum of Primary 4 General Studies was found very successful as viewed from students, teachers, school administrators and even parents. This paper reports on the experience sharing on the curriculum planning and implementation of this first attempt of the curriculum compacting in the formal primary school curriculum in Hong Kong with its focus in scientific investigation. The different phases of the compacting process starting from understanding the definition of curriculum compacting to the provision of the replacement activities focussing on the teaching of DNA concepts and practices at elementary level were shown. The paper also includes the experience sharing of the frontline teachers and the curriculum officers on teaching primary students DNA with the school-based curriculum adapted from abroad.

Keywords: Curriculum compacting, DNA concepts, School-based gifted curriculum, Gifted education.

1. INTRODUCTION

To primary students, the term "DNA" is a brand new word to them as that can never been found in any of their textbooks in science or technology. Today in Hong Kong,

however, with the advance in science and technology, nearly all walks of life are related with biotechnology. News of genetically mutated food, cloning and DNA are found everywhere in the TV, newspaper, magazines and even fictions. Hence, it is the responsibility of the government to widen the perspectives of the primary school students in learning biotechnology at cell or gene level. The main reasons are to keep them abreast of the recent development of the biotechnology and to prepare them for our future scientists. Of course, there would be problems in actual implementation of the curriculum such as the difficulty in proving the existence of the DNA because of its minuteness, the sufficiency of apparatus and materials in supporting the experiments in primary school and lastly the teachers' efficacy in teaching such topics.

Research demonstrated that many gifted students due to lack of differentiated curriculum and instruction were found to spend lots of time in school doing work they have mastered. Moreover, some bright students have to relearn the materials they have already known. Curriculum compacting belongs to one of the service delivery components of the schoolwide enrichment model proposed by Renzulli and Reis (2003, p. 187). It streamlines the regular curriculum to meet the learning needs of the gifted students or students with high ability to enable time for more challenging and interesting work (Reis and Renzulli, 2005, p.5). Though most research demonstrates that compacting which has been field tested in U.S.A. since 1975 can dramatically reduce redundancy and challenge gifted students to new

height of excellence (Reis et al., 1993), it has not been tried out in any school in Hong Kong yet.

1.1 Background of study

The Gifted Education Section of the Education and Manpower Bureau (EMB) is responsible for advising the schools of public sector on the provision of gifted education. In 2004, the Gifted Education Section under Curriculum Development Institute of EMB launched a seed project to invite both primary and secondary schools to join the project in running some gifted nurturing programmes for their students identified to be gifted. The project aimed at developing some school-based gifted programme with the joint effort of the frontline teachers and curriculum development officers from EMB. One of the schools in Tin Shui Wai was invited to pilot the curriculum compacting in General Studies for a class of Primary 4 students with the focus of scientific investigation. This was a new curriculum initiative in Hong Kong as nearly all the member schools were running pull-out enrichment programmes as a kick-start of gifted education provision at that time.

During the implementation stage, the most difficult task found by the colleagues was in searching for suitable topics for the replacement activity after the formal curriculum was compacted. With the help from British Council, EMB obtained the approval from Dr. Assinder of University of Wales, Bangor, to adapt and translate her booklet on DNA workshop for Grade 2-6 students (Assinder, 1998). Both curriculum developers and teachers

worked together for designing the school-based curriculum and finally came up with 6 lesson plans for the replacement activities of the curriculum compacting.

1.2 Aim of study

Through the experience sharing of how a school-based gifted curriculum was developed and implemented in a school, and through the continuous reflection of the teachers involved and the co-operation between the EMB curriculum officers and frontline teachers, the practices and experience of introducing the new curriculum initiative into the formal curriculum could be conceptualized. With both contextual factors and difficulties encountered, the valuable experience was hoped to be disseminated to teachers of other schools. The butterfly effect was to influence other enthusiastic teachers to cater for the needs of the students scientifically gifted.

2. METHODOLOGY

2.1 Participants

The target audience was taken from a class of Primary 4 with a total of 37. They were found to have high scores in General Studies. Some of them had passed a selection test. All of them received recommendation from their subject teachers. There were altogether 15 boys and 19 girls with their ages ranging from 10 to 12.

2.2 Research method

Once the school decided to pilot the new curriculum initiative, all teachers involved had to undergo a session of staff development on concept and practices of curriculum compacting organized by the curriculum development officers from EMB. They held meetings to compact the formal curriculum on a unit of the P.4 General Studies. When the school-based curriculum was streamlined, they needed to develop the lesson plans for the replacement activities. When the implementation was commenced, class visits and lesson observation were conducted by the curriculum development officers and other teachers. All lessons were videotaped for later analysis and discussion. Both students and teachers are required to write their learning log and reflection log respectively. When the whole programme was completed, interviews were conducted to collect opinions from the headteacher, the teacher-in-charge and some of the students. Parents were later invited too.

2.3 Research instruments

To identify the students who have already mastered the contents and outcomes of a unit or segment of instruction that was about to be taught, scores on previous tests, completed assignments and classroom participation were one of the ways. This school used pre-tests on the assessment of basic skills. Before learning any topic, students were needed to write a pre-test so that their prior knowledge and strength in that topic was made known to the teachers. After each individual class, students were assessed of their learning outcomes by using different tools. Same procedures were used in assessing the effectiveness of the replacement

activities too. In addition, the teaching progress plan, the individual lesson plan, students' worksheets, and the students' report cards would be produced for documentary analysis. Researchers would then assess the effectiveness of the programme by analyzing these documents and evidence.

3. RESULTS AND DISCUSSIONS

The content shared by the teachers involved in the curriculum compacting included the process of curriculum development, reflection from the teacher-in-charge, the support rendered by the curriculum development officers, and the contextual factors leading to the success of this curriculum initiative.

3.1 Curriculum development

The present provisions to meet the learning needs of the gifted students can be summarized into 3 categories, ability grouping, curriculum compacting and tier-assignments. The aim of adopting curriculum compacting in the formal curriculum is to design differentiated curriculum to meet the needs of the gifted students. The strategy is to make some adaptation in the formal curriculum for the students with high ability, reduce the contents which have already been mastered by them and arrange some replacement activities for them in the time saved through compacting. The replacement activities can either be acceleration or enrichment in function. Some schools would use this time for students to

undertake their individualized education plan (IEP) while others would make use of the time for exciting learning experiences, or the opportunity to work with a mentor, peer tutoring or to rotate through a series of self-selected mini-courses. Acceleration might include the use of materials for the next chronological grade level textbook, or the completion of even more advanced work (Renzulli and Reis, 2003, p. 193).

3.1.1 Implementation

Because of limited resources and manpower, the school piloting the curriculum compacting began the new initiative in a class of P.4 students gifted in science who were bright but easily got bored in the traditional way of teaching. A new approach in teaching may be suitable for them in learning DNA. Teachers had to develop their school-based curriculum in order to shorten the teaching period from 20 to 14. Students had to take up the untouched content by self-learning such as reading and browsing through internet. Pre-tests and end-of-unit assessments were prepared by teachers to diagnose the students' initial standards and ensure their learning effectiveness respectively.

3.1.2 Replacement Activity

Replacement activity, which filled up the time made available for the compacted curriculum, was chosen to be acceleration in function. Teachers of this school determined to guide the students to investigate about DNA which would not even touched by the secondary school leavers in their curriculum. They started to adapt and translate the DNA learning

programme developed by Dr. Assinder. The school-based curriculum included a course plan for 6 teaching periods with the purpose of acquainting the students with the basic idea of DNA and its related structures. The students were planned to know the basic structure of a cell, use the microscope to observe the onion cells, construct a double helix of a DNA by the 4 bases and make funny cartoons faces by using different parts of hair, eyes, mouths and noses.

3.2 Reflection from teacher-in-charge

Through the reflection log of the teacher-in-charge, the result of piloting the curriculum compacting in her school was highly recognized and her colleagues. With the advocate of the working theory from the researchers of gifted education, the teachers of this school confirmed that the pilot scheme of the new curriculum initiative proved again the need of school-basification of gifted nurturing curriculum. They admitted that they needed consultation from experts outside school, they also needed resources and empowerment to implement the initiatives. From practising the new teaching approach and strategies, all teachers involved had benefitted in guiding students in all investigation activities which in turn promoted the teacher-student relationship and enhanced students' inquiry techniques. Using appropriate feedback in either written or oral form could enhance teachers' pedagogical techniques. On the other hand, students' positive response and continuous support from parents encouraged them to move forward despite the heavy workload of preparing the lessons. She confirmed that only through setting clear goals with students,

using humorous activities and giving encouragement to students, the effectiveness of learning and teaching DNA would be enhanced.

3.3 Reflection from curriculum officers

It has been the duty of the officers of the Gifted Education Section to encourage the member schools to initiate some curriculum provisions for the students gifted or having higher ability in certain discipline. Once commitment was made by the school, the curriculum development officers should offer all kinds of support ranging from providing staff development on the definition, rationale and starting procedure of curriculum compacting to holding evaluation meetings with all teachers involved upon completion of the whole programme. From the reflection logs of the curriculum development officers, the try-out of the new curriculum initiative was a success and had benefited all teachers and students of the participating school. Teachers were reported to gain new experience in streamlining a given unit or segment of instruction in the formal curriculum of General Studies. They appreciated the partnership between the curriculum officers and them during different stages of planning, implementation and evaluation. During implementation, the curriculum officers were able to learn the difficulties encountered when the curriculum design was being interpreted in the classrooms which really helped them to improve the quality of the future implementation. Upon completion of the programme, the teachers were given valuable opinions during the evaluation meetings. After conceptualization of the valuable experience gathered, the case

can be disseminated to headteachers and teachers of other schools planning to provide differentiated curriculum to their students in need.

3.4 Contextual factors

The success of the pilot implementation of the curriculum compacting in the formal curriculum of P.4 General Studies can be attributed to the co-ordination and the collaborations of several parties which included the administrative support from the school authority, the partnership between the teachers and the curriculum development officers of EMB, the perseverance of students and the parents' support from behind the screen. Factors leading to the success of the try-out of the new curriculum initiatives summarized by the researchers were as follows:

3.4.1 Mission held by the headmistress on providing gifted education to students

The headmistress of the participating school was so insightful that she joined the seed project of the EMB three years ago in promising to provide the gifted students appropriate and differentiated curriculum. Mathematics and Science education were their two starting key learning areas.

3.4.2 Continuous support from school in administration and management work

Before piloting the curriculum compacting, the school had planned to stream the P.4 students according to their ability especially in science. On the other hand, the teaching periods of the teachers involved were allocated so that they could have time to have the

collaborative lesson preparation time. Lastly, the school also put aside one special room in the schedule for this class of students to perform their experiments and activities there.

3.4.3 Commitment and involvement of the teachers

All participating teachers must have the basic gifted education training. In addition, they had to attend some teaching training in the implementation of curriculum compacting. Moreover, they must collaborate closely with each other and be ready to spend extra time in planning and preparing the lessons and the replacement activities. The most important thing was to have more time in practising the reflection so that the quality of the teaching would be improved. Their commitment, therefore, must be several times more than those counterparts teaching mainstream classes.

3.4.4 Parent volunteers were recruited as a kind of teaching resources and manpower

The school had built up a well-structured mechanism in liaison with the parents. Some parents always came to school to be the volunteers in helping the teachers in preparing the practical work for teaching. They really shared a lot of the teaching workload of the teacher and played a very important role in the piloting of the curriculum initiative.

3.4.5 The professional support from Education and Manpower Bureau

The curriculum officers were important in providing professional support to this school especially in offering the consultation services and manpower in the design of the curriculum and providing resources in the replacement activities. Being an observer in the

class visit, the officer could help the school to evaluate the provision so that teachers can disseminate their valuable experience in running such a programme in some seminars and teacher workshops.

4. CONCLUSION AND IMPLICATION

The quality of the school-based curriculum developed through the effort of collaboration between the frontline teachers and the curriculum development officers, the experience shared by the frontline teachers in various seminars and sharing sessions and the consent given by the parents and students altogether proved that the ideas and the practices of introducing DNA concepts into the formal curriculum was a great success. Of course, there was still much room for improvement. First, the whole programme did not strictly follow the procedures of the curriculum compacting proposed by Renzulli and Reis (2003) as there was no compactor designed for recording the prior knowledge and learning profile of each student (p. 194). It was also beyond the ability of the teachers involved to diagnose and record the learning profile of the students as they were short of time in dealing with all the teaching and non-teaching duties in the school. Anyway, this was the first attempt in Hong Kong to try out the curriculum compacting in the science investigation in primary school. We are still looking for more schools trying out the same provision in gifted education so that their experience can be conceptualized for future dissemination. Of course, the Gifted Education Section will

continue to encourage other member schools to pilot other provisions such as IEP and tier-assignment so that the learning needs of more gifted students or students with high ability in certain discipline can be met in the future.

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