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**G1-OP-12****An empirical example of implementing school-based gifted education in grade 8 mathematics class for learning the Pythagoras theorem****Chok Yin CHUI<sup>1</sup>**, Chi Hang WONG<sup>1</sup>, Lai Kwan CHAN<sup>2\*</sup>, Yuen San CHU<sup>2</sup>, and Hei Tung CHEUNG<sup>2</sup><sup>1</sup>Carmel Secondary School, Hong Kong<sup>2</sup>Jockey Club "Giftedness Into Flourishing Talents" Project, Faculty of Education, The Chinese University of Hong Kong, Hong Kong

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**ABSTRACT:**

Gifted education in Hong Kong aims to provide students, in particular, those highly able/gifted, with opportunities to receive quality education in a flexible and versatile teaching and learning environment. The HKSAR government has laid out a 3-tier implementation framework for gifted education provisions since 2000 (Education Department, 2000). The framework depicted Level 1 provision as a school-based whole-class approach with enriched curriculum to develop students' high-order thinking skills, creativity, and personal-social competence, and to modify subject contents to meet the learning needs of high ability students in regular classrooms by implementing differentiated teaching. Such whole-class teaching was found to benefit both teachers and students in other regions (e.g., Stevenson & Lee, 1995; Good & Groues, 1977). However, in the absence of adequate empirical evidence of how such practice can be done and be helpful to students, this study seeks to fill the gap and explore how to infuse elements of gifted education into regular classrooms, and how to cater for learner diversity from the perspective of multiple intelligences theory and improve students' manifold performance with differentiated teaching.

The empirical example was conducted in an 80-minute mathematics lesson on the topic of "Pythagoras Theorem" in a secondary school. With the professional support from the **Jockey Club "Giftedness Into Flourishing Talents" Project** (Project GIFT) which is a 3-year initiative organized by the **Program for the Gifted and Talented** at The Chinese University of Hong Kong and funded by The Hong Kong Jockey Club Charities Trust, the learning contents, activities and assessment with a set of worksheets were carefully designed based on the characteristics and needs of students. 32 mixed ability Grade 8 students attended the lesson. Differentiated teaching with modified curriculum contents (the differentiation of curriculum), instruction (the use of appropriate pedagogical practices including grouping strategies and varied resources) and assessment (the use of appropriate methods of assessment for learning) was introduced to the class.

Specifically, at the beginning of the lesson, a learning activity of creating a perpendicular with only a measuring tool was conducted, which sought to evoke student thinking and discussions, thus affording them a scenario to appreciate the beauty of mathematics. Two students who were good at presentation and interpersonal skills were assigned to introduce Pythagoras Theorem with proper mathematics glossary and language, and to guide the classmates to prove Pythagoras Theorem by using Origami. Students were engaged in working out their proof using Origami while teachers attended to students in need of individual support. Students were then divided into eight groups of homogenous mathematical ability. Worksheets on a collection of proofs of Pythagoras Theorem arranged in order of difficulty were developed and distributed to students according to their ability range. Students took the challenge, completed the differentiated worksheets and presented their proofs to group members. To enhance exchange and collaboration, students were then re-grouped into heterogeneous ability grouping, and students were required to share their work with new groupmates, so that students could get know of more alternative proofs of Pythagoras Theorem. The lesson was wound up by showing a video clip



presenting Pythagoras Theorem with a historical account and various versions of proof. As an extension of learning, another worksheet detailing and presenting the Gougu Theorem “勾股定理”, an equivalent version of Pythagoras Theorem in the ancient Chinese mathematics, was developed and distributed to help students scaffold their self-learning.

During the lesson, class teacher observed and monitored the entire learning process, provided appropriate support to individual students, and evaluated the effectiveness of the designed contents, activities and worksheets on student learning. Other teachers in the school and school development officers of Project GIFT also participated as observers. A check-list of “evidence of learning” was developed for observers to record and review the teaching and learning process, as well as student learning outcomes.

Class observation indicated that school-based whole-class gifted education with differentiated teaching, including differentiation of learning contents and differentiation of instruction with various grouping strategies, could enhance students’ engagement in learning to a substantial extent. The active participation of students in the learning process such as presenting the proofs to the whole class, and sharing their work with other groupmates contributed positively to enhancing their interpersonal and intrapersonal skills, such as self-confidence, collaborative learning skills, communication skills and personal-social competence. In addition, adopting Origami in learning Pythagoras Theorem was not only a convenient way of recognizing students’ different intelligences, but also an effective means to facilitate students’ practicing these skills. The questions and worksheets also provided students with opportunities to develop their high-order thinking and creative problem-solving skills. Moreover, learner diversity was attended to by different grouping strategies, extra-worksheet exercises and appropriate support from the class teacher.

While noting that school-based whole-class gifted education is not widely or commonly implemented in Hong Kong, the collaborative lesson planning, tryout teaching, research & evaluation, and professional dialogue between school teachers and school development officers and research investigators brought forth by Project GIFT contributed to shaping up decent empirical evidences that shed light on viable protocols of incorporating elements of gifted education in regular classrooms. Observations confirmed that an appropriate battery of differentiated curriculum contents, flexible and appropriate grouping strategies, and differentiated assignment/assessment designed in the light of student learning needs and development was relevant to identifying students’ talents and catering for learner diversity. It also supported the provision and development of Level 1 gifted education service in schools.

**KEYWORDS:**

Differentiation; Hong Kong; Jockey Club “Giftedness Into Flourishing Talents” Project; mathematics education; school-based gifted education



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