

Identification of Mathematically gifted children from a Modified Multiple Intelligences Theory: A Hong Kong Story

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When talking about intelligence, we always can relate it with the intelligence quotient test (IQ test). Indeed, one of the major purposes of engaging in an IQ test is to distinguish the intellectual ability and educational needs of a child. In Hong Kong, we would call a person to be “gifted” if his/her IQ test score is over 130. On the other hand, it has been observed that gifted children are not always the high achievers in schools. It was realized that the intelligence quotient cannot be a single factor to identify giftedness/ talents and it has been a disputable issue for identification of gifted children.

In sight of this, Professor Howard Gardner has proposed the Multiple Intelligences (MI) Theory, defining the eight areas of innate intelligences, and this impacts the whole academia and psychological experts. Roughly speaking the IQ test assess the linguistics and logical-arithmetical ability of a child, which in my mathematical knowledge, will misinterpret the “pattern recognition” ability of mathematically gifted children. As a mathematics educator, I am enthusiastic about this area. Based on Gardner’s work and the need for better identification of mathematically gifted children, I have further modified the MI Theory as follows:

Redefining the following areas of giftedness which modified from MI Theory:

Memory G_1 is crucial in the modified MI Theory as it is used to receive, store old information and analyse new

Let $G = \{G_1, G_2, G_3 \dots\}$ be the set of possible areas of giftedness categorized as:

- G_1 = Memory (working memory capacity)
- G_2 = Learning/ Processing Ability
- G_3 = Pattern Recognition Ability (High Dimension Visualization/ Abstract Realization)
- G_4 = Sensitivity Ability
- G_5 = Structural/ Linguistic Ability
- G_6 = Structural/ Musical Ability
- G_7 = Bodily-Kinaesthetic Ability

data. In my observation Memory G_1 must be high enough to be gifted in respective discipline. In other words, high in G_1 is a necessary condition for being a gifted child.

Since mathematics is a discipline which emphasizes quantity,

structure, space and variation, the pattern recognition ability, that is high dimension visualization and abstract realization ability, is essential for being a mathematically gifted child. In other words, a child will be called “mathematically gifted” if he/she is

High in G_1 + Exceptional High in G_3

(Details can be found from a project report on Gifted Quotient Test for Identification of Gifted and Talented Children, MA4530 Project, Department of Mathematics, City University of Hong Kong, 2021.)

A Hong Kong Story:

For identification of mathematically gifted children using the modified MI theory, we had designed a new mathematics test paper on pattern recognition including logic, arithmetic, and working memory abilities and a questionnaire (about 54 Yes/No factual questions) for parents on the daily living behaviours of their children. These identification tests had been performed in several primary schools of Hong Kong and mainland China. The following is a brief report on the recent identification test given to a total of 60 students selected into an advanced talent education programs for gifted students in Hong Kong (A Gifted Education Fund No. GEF2019-4 firstly established by the Education Bureau on gifted education). The 60 students were selected with 18 students from the Hong Kong Academy for Gifted Education (HKAGE) and the rest from school nominations.

The scores obtained from the mathematics test paper and parents’ questionnaire are as follows:

Figure 1: Boxplot for Performance on Mathematics Test Paper

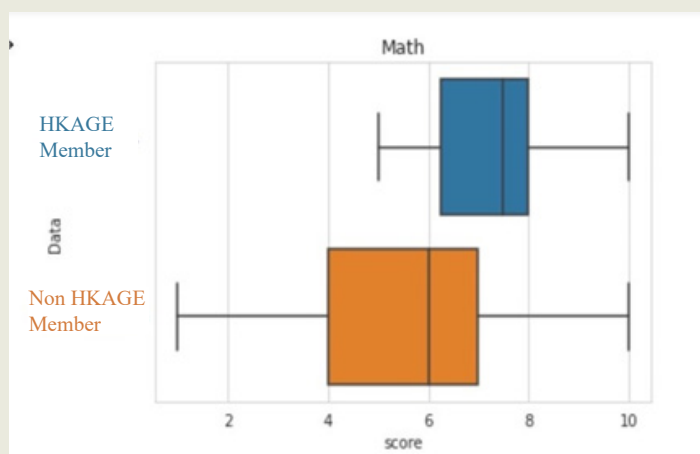
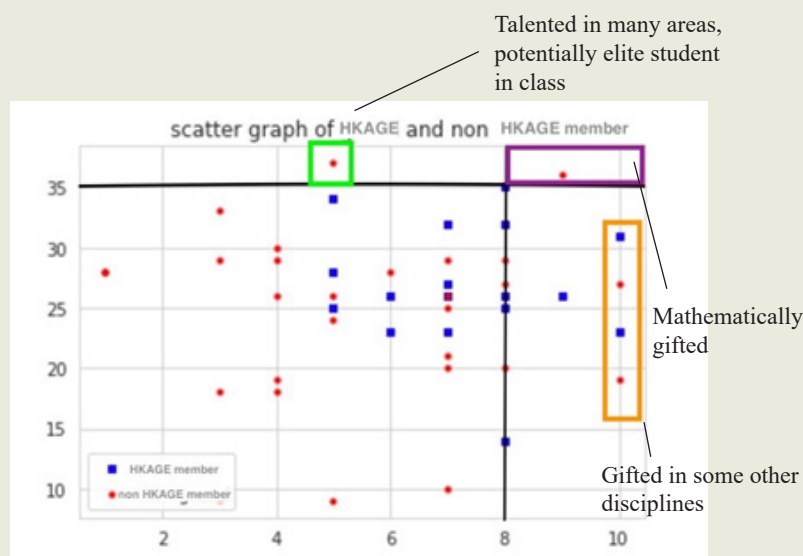
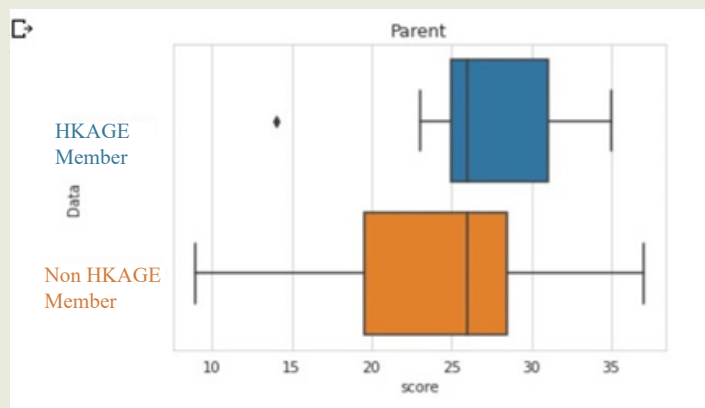


Figure 2: Boxplot for Parents' Questionnaire Score



The above result shows that mathematically gifted children have better performance on pattern recognition and logical thinking, apart from arithmetic ability. Moreover, the higher parents' score for the HKAGE member indicates that some of the behaviours (communication ability with peers, sensitivity to changes in the environment, insistence and orderliness, etc) reflected from the responses on the parents' questionnaire are related to mathematical giftedness.

Moreover, when we look into individual's performance, we find that some students who scored highest in both parents' score and math score are not a member of HKAGE. This shows that this new test can identify mathematically gifted children who failed to be recognised as gifted children by the HKAGE due to probably the insufficiency of IQ test in identifying mathematically gifted children.

In conclusion, the modified IQ theory has been applied to identify successfully mathematically gifted children in their developmental stage. We hope that their parents and teachers can provide a more comprehensive support and guidance to further improve the gifted education in Hong Kong.

References

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In conclusion, the modified IQ theory has been applied to identify successfully mathematically gifted children in their developmental stage. We hope that their parents and teachers can provide a more comprehensive support and guidance to further improve the gifted education in Hong Kong.



Professor Benny Hon has been awarded the Top 2% most highly cited scientists prepared by Prof. John Ioannidis and his team in Stanford University. His major research interests include meshless computation using radial basis functions for solving various types of real physical problems such as inverse heat conduction; medical image reconstruction; and financial options pricing. His educational research involves the identification and nurturing of mathematically gifted children. He had designed and offered several special gifted education programmes (MathCamp for gifted children 2001-02; Summer Workshop on art of mathematics at the La Salle College 2006-07; Talent, Aspiration, and Excellence programme for Hong Kong Academy for Gifted Education (HKAGE) students 2017-18; and Advanced Talent Education Programmes for Gifted Students in Hong Kong 2020-21. He is now serving as adviser for Hong Kong Gifted Education Teachers' Association, Hong Kong Association for Parents of Gifted Children, and the HKSAR Education Bureau-Gifted Section.