

# GeoGebra Courses for STEM

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## Sharing of a student member

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Hello, I am LEUNG Tsun Hei, a student member of the Hong Kong Academy for Gifted Education (HKAGE). I am very honoured to share with you all my learning experience here.

From January to April 2016, I participated in two GeoGebra courses co-organised by the HKAGE and the GeoGebra Institute of Hong Kong. I decided to join these courses because I found that GeoGebra is very powerful and novel. I had tried GeoGebra before when I participated in another course in 2015, and so I would like to learn more about it.

The application of GeoGebra makes complicated and tedious Mathematics problems vibrant and interesting. Mathematics courses often involve complicated Mathematical formulas that are hard to memorise. In the world of GeoGebra, however, difficult problems can be visualised with dynamic figures. Use "Sections of 3D Shapes" as an example, people with poor spatial sense like me find it difficult to visualise the shapes of the sections of a 3D figure. With the "plane view" function of GeoGebra, I can visualise the section easily and solve the problem.

The most fascinating thing about GeoGebra is its powerful built-in functions that cover different dimensions, such as plane shapes, 3D shapes, reflectional symmetry etc. It is truly intriguing and one would never get tired of it.

In his 2015 Policy Address the Chief Executive put forward the recommendation to promote Science, Technology, Engineering and Mathematics (STEM) education. The free dynamic mathematics software GeoGebra (Geometry + Algebra) integrates mathematics, technology and coding in one package that supports construction, modelling and investigation. It is an ideal tool for STEM education.

Since 2014, the GeoGebra Institute of Hong Kong and the Hong Kong Academy for Gifted Education (HKAGE) have co-organised summer GeoGebra courses for secondary student members of the HKAGE. In 2016 we offer regular GeoGebra courses of elementary, intermediate and advanced levels for primary and secondary student members of the HKAGE. In the courses, students make use of the software GeoGebra to conduct various hands-on activities on geometric and algebraic constructions, designs, inquiries and problem-solving (Figures 1 to 6) that enrich their understanding in mathematics, foster their creativity and problem-solving skills, and nurture their science and mathematics literacy so as to facilitate STEM as well as STEAM (A: Art) education.



Figure 1 : (elementary)

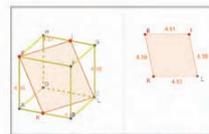


Figure 2 : (elementary and intermediate)



Figure 3 : (intermediate)

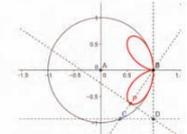


Figure 4 : (advanced)

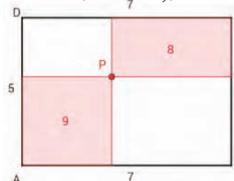


Figure 5 : (elementary inquiry task)

What are the positions of P at which the two rectangles have equal areas?

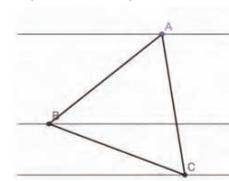


Figure 6 : (advanced inquiry task)

How to construct an equilateral triangle on three parallel lines?

To equip students with the programming skills, we have included tasks of tessellation and curve stitching using algebraic commands (Figure 7) at the courses, in which programming-related capabilities such as algebraic and logical thinking could be cultivated through the process of analysis, coding and testing in the tasks.

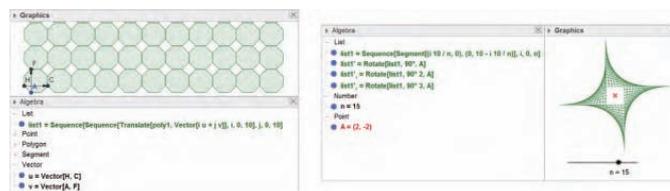


Figure 7 : Coding Tasks (tessellation and curve stitching)

The GeoGebra courses are very well-received by student members. They participated actively in the courses, and some of them applied what they learnt to create new figures (Figure 8) and to investigate new loci (Figure 9). After these years of practices, we consider that GeoGebra can effectively inspire students' thinking and creativity, and to enhance their abilities of inquiry and problem solving. We hope that the construction and inquiry activities with GeoGebra could be more popular in the primary and secondary classes to facilitate the STEM education.

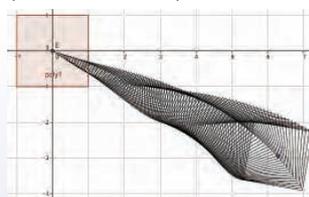


Figure 8 : The work of student member Jeff Chau

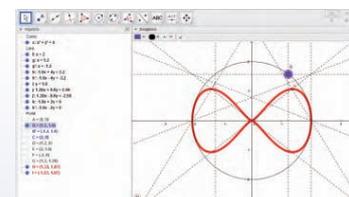


Figure 9 : The work of student member Lai Chun Yui