## History and Pedagogy of Mathematics: A Research Trip to Hong Kong
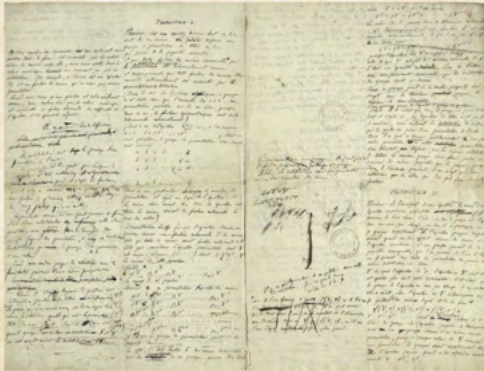
Earlier this year, I initiated a research project titled "History as a Pedagogical Tool for Advancing Students' Affective Development in Mathematics Classrooms: A Comparison between England and Hong Kong," which is related to my PhD studies at Middlesex University. In an attempt to examine the efficacy of incorporating historical content into mathematics education, experiments are planned with the participation of secondary school teachers and students in both England and Hong Kong. In July 2024, I took part in the Enrichment Programme for Young Mathematics Talents (EPYMT) as a guest lecturer, marking the first phase of my empirical investigation. This event is an outreach programme for secondary school students with mathematical potential, organised by the Department of Mathematics at the Chinese University of Hong Kong, and it enables them to experience some advanced mathematics topics. In the course "Towards Modern Algebra," I introduced the birth of abstract algebra from a historical perspective, focusing on the development of the theory of equations.
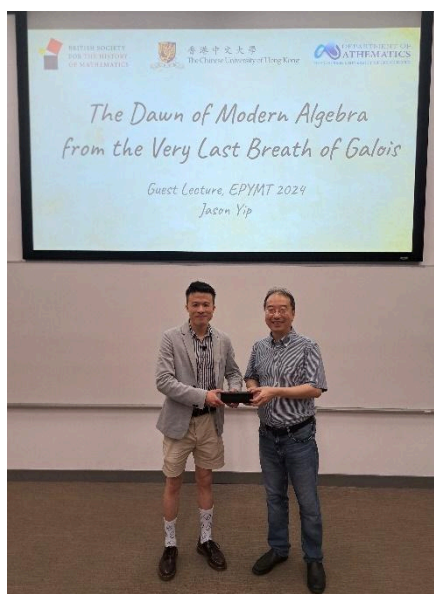
The history of mathematics is mathematics itself, which is an important message I aimed to convey in class. Therefore, I adopted the pedagogical frameworks suggested by Fauvel, van Maanen, and Jankvist. This endeavour involved the use of classical problems, famous literary works, and the historical development behind mathematical concepts. Additionally, biographies and anecdotes of mathematicians served as illuminating examples. In practice, I divided my lecture slides into three main parts. To begin with, I discussed some of the earliest methods for solving quadratic equations, covering the Babylonian algorithmic approach, the straightedge and compass constructions of ancient Greece, the Chinese abacus, and the works of Brahmagupta and al-Khwarizmi. In this way, students were able to witness the transformation of algebra from rhetorical to syncopated forms.

In the second section, I introduced some important events and discoveries in the Renaissance. For example, many mathematical notations that we are now familiar with came to light during this wave of cultural movements. Symbolic algebra provided mathematicians with a set of tools to exchange thoughts much more efficiently. I elaborated on this by giving a brief derivation of cubic and quartic formulae. Finally, we explored major breakthroughs in the theory of equations, such as symmetric functions, Lagrange's resolvents, and Galois theory. Since Galois was the protagonist of the entire lecture, I placed emphasis on his background story. To engage students more deeply in his life, I showed them his manuscript, helping them realise that even a great mathematician had a human side.

Galois' Letter to Auguste Chevalier

«Il y a quelque chose à compléter dans cette démonstration. Je n'ai pas le temps.»

"There is something to complete in this demonstration. I do not have the time."

(Manuscript de Galois, la Bibliothèque de l'Institut de France)

Given the limited time, I could only cover the essence of Galois theory with a brief example. At least an introduction to groups and fields was conducive to their comprehension. At the end of the lecture, I used questionnaires to gather feedback from the participants, so that I might gain some insights to answer my research questions. On the one hand, I want to determine whether there is a significant impact on students' motivation and attitude when using the history of mathematics. On the other hand, I aim to study the role of the historical approach in moral education, allowing pupils to see contemporary mathematical results as a collective effort from different cultures and civilisations.

It is expected that a paper will be written after the two phases of my experiments in Hong Kong and England, respectively. In the meantime, the unwavering support from the British Society for the History of Mathematics should not be forgotten. I hope my results will support other studies that advocate for the use of historical content in mathematics teaching and offer insights into the analysis of English and Chinese mathematics education from cultural and historical perspectives.