Perspectives in the Use of Primary Sources in Undergraduate Mathematics Education: A Triangulation of Author, Instructor, and Student

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We report on a case study of two different university mathematics classes (both Linear Algebra courses) that implemented the same primary source project (PSP) as part of the Transforming Instruction in Undergraduate Mathematics via Primary Historical Sources (TRIUMPHS) project. One class was taught by the author of the PSP; the other was taught by an instructor at a second university. Data were collected from students in both courses via pre- and post-surveys with Likert items and open-ended items designed to assess their mathematical attitudes and perceived gains. Instructors completed a PSP implementation report and pre-/post-course surveys. In our poster presentation, we provide a triangulation of the data from the perspectives of the author as an instructor, a non-author instructor of a same course (Linear Algebra), and the students.

Mathematics faculty and educational researchers are increasingly recognizing the value of the history of mathematics as a support to student learning. The expanding body of literature in this area includes recent special issues of *Science & Education* and *Problems, Resources and Issues in Undergraduate Mathematics Education* (*PRIMUS*), both of which include direct calls for the use of primary historical sources in teaching mathematics. For many instructors, the current lack of classroom-ready materials poses an obstacle to the incorporation of history into the classroom. As noted by Jankvist (2009), "the 'urgent task' of developing critical implements for using history in the teaching and learning of mathematics" (p. 256) is also essential for further research on the benefits and effectiveness of using the history of mathematics to teach. The collection of PSPs being developed by TRIUMPHS addresses these related concerns.

The TRIUMPHS PSP "Solving a System of Linear Equations using Ancient Chinese Methods" (Flagg, 2017) was first implemented in fall 2017. Survey response data were collected from 11 students in the author's course and 7 in the non-author's course. The pre-course survey included items to determine students' beliefs about mathematics, prior experience with primary source materials, views about mathematics learning and general demographic information. The post-PSP survey contained questions intended to capture students' perceived gains in skills specifically related to linear algebra, general mathematical skills such as reading and writing about mathematics, and attitudes and confidence in mathematics. Other post-PSP survey questions asked about the interaction of students with peers, the instructor, and the primary source material inside and outside of class. Finally, several open-ended questions asked students to reflect upon their experience with the PSP, including their perception of benefits and obstacles of learning mathematics using primary sources, and their attitudes towards using primary sources in a linear algebra course. Implementation reports and pre-/post-course surveys were collected from both instructors, and an instructional guide containing implementation recommendations for instructors was provided by the PSP author.

We will discuss the successes from each implementation from the student and instructor perspectives, the ways in which the two course populations reported similar student gains, and the ways in which students' reported benefits and obstacles for learning with primary source materials can inform future implementations in the TRIUMPHS project.

References

Flagg, M. (2017). *Solving a system of linear equations using ancient Chinese methods.* Retrieved from https://digitalcommons.ursinus.edu/triumphs_linear/1/

Jankvist, U. T. (2009). A categorization of the "whys" and "hows" of using history in mathematics education. *Educational Studies in Mathematics, 71*(3), 235–261.