Liberal Arts Math Through Theater

Emma LaPlace
Teachers College, Columbia University

Keywords: liberal arts, theater, interdisciplinary approach

Liberal arts mathematics courses, a crucial topic in mathematics education research, are typically designed to fulfill an academic requirement for non-STEM majors. They often focus on "real-world" mathematical applications (Penn LPS, 2024), and unlike traditional undergraduate mathematics courses that deeply explore one subject, liberal arts mathematics classes tend to highlight a variety of mathematical topics (George, 2010). Existing literature about liberal arts mathematics courses claim that these classes should highlight the "usefulness" of mathematics for those not pursuing a career in a STEM-related field (Strasser, 2011; Teixeira, 2023), and focus on the fact that "typically, students in these classes are not math enthusiasts" (Teixeira, 2023, p. 106). However, perhaps with a more intentional approach, focusing instead on the beauty of mathematics rather than the utility, these students could engage with rich mathematics in a more meaningful way.

I propose a liberal arts mathematics course that focuses on mathematics in theatrical works (liberal arts mathematics through theater, or LAMTT). Theater has the "capacity to adjoin and to assimilate every other art [the written word, music, dance, costumes, sets, etc.]" (Gertsberger, 2009, p. 70), so it is the most comprehensive medium with which to engage liberal arts students. This would be particularly appropriate for students majoring in a humanities discipline, because "meeting students at the intersection of where their interests lie along with significant mathematics allows educators to better communicate with their pupils" (Meadows & Caniglia, 2021, p. 183). The Database of Mathematical Fiction, curated and maintained by Dr. Alex Kasman is "widely recognized" as a reliable research tool in mathematical fiction, and contains a list of 71 theatrical works highlighting mathematics (Kasman, n.d.; Swallow, 2006).

I have analyzed these 71 theatrical works according to the intersection of "significant mathematics" and "student interest," as indicated by Meadows and Caniglia (2021). A variety of rich mathematical topics can be found in these theatrical works, such as: sequences, partitions, and The Functional Equation of the Riemann Zeta Function in Simon McBurney's *A Disappearing Number*; and Euclidean and fractal geometry, chaos theory, and Fermat's Last Theorem in Tom Stoppard's *Arcadia*. On the Database of Mathematical Fiction, the plays are labeled by their mathematical content (i.e. Probability/Statistics, Mathematical Physics, etc.). The 71 theatrical works also touch on interest areas that may engage liberal arts students, such as mental health in David Auburn's *Proof* and history and Lord Byron's poetry in *Arcadia*, and India and its diasporas in *A Disappearing Number.* I created a table that shows the intersection between mathematical content areas and common liberal arts content areas (i.e. *Arcadia* may fall under *(Chaos/Fractals, History)*). This analysis will be displayed in further detail on my poster, and can be used as a tool for undergraduate mathematics educators to create a LAMTT syllabus.

Ruth, a character in *A Disappearing Number,* says it best with her line: "It may be very hard to define mathematical beauty but that is true of beauty of any kind. We may not know quite what we mean by a beautiful poem, but that does not prevent us from recognising one when we read it" (McBurney, 2007, p. 42). In examining an artistic medium such as theater that both connects with student interests and focuses on the beauty rather than the utility of mathematics, liberal arts students may feel a deeper appreciation for the mathematics that they study and learn.

References

Auburn, D. (2001). *Proof*. Farrar, Straus, and Giroux.

George, M. (2010). The Origins of Liberal Arts Mathematics. *PRIMUS, 20*(8), 684–697. https://doi.org/10.1080/10511970902839377

Gertsberger, H. (2009). Mathematics learning and aesthetic production. *ZDM Mathematics Education*, *41*, 61-73.

Haddon, M. (2013). *The curious incident of the dog in the night-time*. Metheum Drama.

Kasman, A. (n.d). Mathematical fiction. https://kasmana.people.cofc.edu/MATHFICT/

McBurney, S. & Complicite. (2007). *A disappearing number*. Oberon Modern Plays.

Meadows, M., & Caniglia, J. (2021). Incorporating popular media to engage students. *Mathematics Teacher, 114*(3), 174-186.

Penn LPS. (April 30, 2024). *The liberal arts math revolution: How math is more than just numbers*. https://lpsonline.sas.upenn.edu/features/liberal-arts-math-revolution-how-math-more-just-numbers

Stoppard, T. (1993). *Arcadia*. Faber & Faber.

Strasser, N. (2011). Innovative math for liberal arts majors. *Contemporary Issues in Education Research, 4*(5). 9-12.

Swallow, J. (2006). Reality conditions (book review). *American Mathematical Society,* 761-763.

Teixeira, K. (2023). Improving success and retention of liberal arts students in a large math class. *International Journal on Studies in Education, 5*(2), 106-119. https://doi.org/10.46328/ijonse.104