

Biographical Study of Srinivasa Ramanujan

Based on the biographical book *The Man Who Knew Infinity: A Life of the Genius Ramanujan* by Robert Kanigel

Project by Sarah Magno

Srinivasa Ramanujan

- He was born in Erode, India on December 22, 1887
- He died in Kumbakonam, India on April 26, 1920
- He was known as a genius and a gifted mathematician
- From Chapter 1, “Gifted Education,” of the textbook, Ramanujan would be classified as having high “logical-mathematical intelligence, which includes inductive and deductive reasoning and computing.” (Davis et al., 2011, p. 23)
- Many of the theorems he developed are still being used today in areas such as computer science, space travel, and cryptology (Kanigel, 2016, p. 347)
- Much of his work was completed with his mentor and friend G.H. Hardy in England
- He grew up in a poor, religious family
- He was a sickly child who suffered from many ailments throughout his life, leading to his early death in 1920 from tuberculosis
- His mother was a homemaker who earned a modest salary performing in religious ceremonies in town
- His father was a clerk who did not earn much and was largely absent from his life
- He had two brothers who survived into adulthood, as well as two brothers and a sister who died in infancy
- His family arranged his marriage in 1909 to Janaki, a young, teenage Indian girl
- He was placed in advanced math classes throughout his schooling and excelled in them; however, he showed no interest or motivation for other subjects and failed them
- He graduated from secondary school, but he did not earn a college degree
- This phenomenon contradicts the typical notion of giftedness that we discussed in Class Discussion #1, where many of my classmates believed that all gifted students show a strong “work ethic,” are “motivated,” and “determined.” (Class Discussion #1) Ramanujan’s story emphasizes the importance of helping gifted students who are underachievers.

Talent Markers

- As a child, he and his mother would play a game called Goats and Tigers
- It was a game similar to checkers that “demanded logic, strategy, and fierce, chesslike concentration.” (Kanigel, 2016, p. 18)
- This game helped Ramanujan build his intuition and strengthened his logical thinking abilities, which are important skills that supported his future successes
- He developed a strong bond with his mother, and this was a positive influence from his home life
- This was an early sign of Ramanujan’s giftedness, as he displayed one of the recurrent characteristics of students who are gifted, according to Table 2.1 from Chapter 2, “Characteristics of Gifted Students,” in that he used “high-level thinking skills and efficient strategies.” (Davis et al., 2011, p. 33)
- At this young age, his talents were apparent, since “compared with the average child, the thinking processes of the gifted child are quick and logical.” (Davis et al., 2011, p. 35)

Talent Markers

- When he was sixteen, he read the book *A Synopsis of Elementary Results in Pure and Applied Mathematics* by G. S. Carr.
- This book was challenging for Ramanujan, as many of the mathematical results were not clearly stated or explained
- “For in baldly stating its results it almost dared you to jump in and prove them for yourself. To Ramanujan, each theorem was its own little research project.” (Kanigel, 2016, p. 44)
- Carr’s book was one factor that led to his interest in math, and the skills he learned from solving problems in the book helped him later in life
- This highlights Ramanujan’s “high concentration” and “independent, self-directed” nature, which are recurrent characteristics of gifted learners. (Davis et al., 2011, p. 34)

Talent Markers

- While in his math classes, his professors recognized his giftedness and often gave him supplemental material to work on
- “One math professor, P. V. Seshu Iyer... encourag[ed] him to tackle problems appearing in mathematics journals like the London *Mathematical Gazette*.” (Kanigel, 2016, p. 47)
- This influence from school fueled Ramanujan’s passion to continue learning and working on mathematics
- Here, we see that Ramanujan needed and enjoyed “learning tasks that are unstructured and flexible, rather than the highly structured tasks needed by less-able students.” (Davis et al., 2011, p. 39)
- This is a common trait of gifted students, and it is clear that Ramanujan’s learning style was a sign of his giftedness

Talent Markers

- Within his community, he met the local college's senior math professor, P. Singaravelu Mudaliar.
- Although Ramanujan did not attend college, he worked with Mudaliar, a fellow community member, on math problems
- “Together, the two of them would tackle problems appearing in mathematics journals. If Ramanujan couldn't crack one of them, he'd give it to Singaravelu to work on overnight; invariably the professor couldn't solve it, either.” (Kanigel, 2016, p. 53)
- Although this partnership did not last long, it was one of the few mentors he had in India who recognized his mathematical gifts
- He also befriended an elderly woman in his neighborhood who provided emotional support, as she “took [him] under her wing, often inviting him in for midday snacks.” (Kanigel, 2016, p. 76)
- These relationships that Ramanujan formed with the adults in his community demonstrate his active nature, in that he enjoyed “shar[ing] information, direct[ing], lead[ing], offer[ing] to help, and eager to be involved,” which is a recurrent characteristic of gifted students. (Davis et al., 2011, p. 33)

First Recommendation

- **One programming strategy I would add to Ramanujan's personalized learning plan would be forms of therapy, counseling, and emotional support.**
- **He suffered from peer pressure and competitiveness**
 - When he scored lower on a math test than his friend, he “refused to speak to him” and “ran home crying to his mother.” (Kanigel, 2016, p. 50)
- **He was constantly seeking recognition from others**
 - He had a “thirst for public acknowledgment of his gifts” and had “pain when denied it.” (Kanigel, 2016, p. 52)
- **He was “sensitive and stubborn” (Kanigel, 2016, p. 13) and did not possess “flexibility.” (Kanigel, 2016, p. 289)**
- **According to the Characteristics Module 2 Part 2 Video Lecture, “sensitivity may isolate [gifted boys] from age peers.” (Characteristics Module 2 Part 2 Video)**
- **As a result, he was bullied by classmates when he worked at Cambridge**
 - “Ramanujan’s shyness was read as unfriendliness, and students sometimes taunted him.” (Kanigel, 2016, p. 230)
- **He suffered from depression (Kanigel, 2016, p. 291) and almost committed suicide (Kanigel, 2016, p. 294)**

Benefits of the First Recommendation

- **This strategy would benefit Ramanujan, as counselors are trained professionals that can help resolve various emotional issues**
- **For example, in Chapter 17, “Understanding and Counseling Gifted Students,” counselors can explain how “excellence should be expected, not perfectionism, and counselors can discuss these differences with students.” (Davis et al., 2011, p. 457)**
 - **When Ramanujan reacted to receiving a lower test grade than his friend, “from [his] more fixed mindset perspective, [his] intelligence had been up for judgment, and [he] failed.” (Dweck, 2014)**
 - **Therapy sessions revolving around this issue could help Ramanujan lessen his feelings of competitiveness when others outperform him, and promote the development of a growth mindset, showing that one does not need to constantly brag about their accomplishments to others**
- **Additionally, therapists can assist with depression and suicidal thoughts, and “challenge the idea that suicide is an honorable solution to one’s problems (as it is a foolish, permanent solution to a temporary problem).” (Davis et al., 2011, p. 466)**
 - **A counselor would provide Ramanujan with someone to talk to about his emotions and explain the dangers of suicide**
- **Working with a counselor could help boost Ramanujan’s self-esteem and develop a positive self-concept, while providing advice on how to make friends and avoid bullies**

Second Recommendation

- Another curriculum strategy I would include in Ramanujan's education plan is the use of subject-skipping.
- Although it was stated that Ramanujan utilized grade-skipping, since he “entered Town High's first form at the age of ten, corresponding to about an American seventh grade,” (Kanigel, 2016, p. 26) I would recommend that subject-skipping (accelerating only in mathematics) should be used instead.
- He was in higher-level classes for all his subjects, but “except for math, he did poorly in all his subjects... often scoring less than 10 percent on exams.” (Kanigel, 2016, p. 54)
- Ramanujan's intense dislike for subjects other than math and lack of support, combined with the fact that he was in advanced classes for all other subjects, led to his failures.

Benefits of the Second Recommendation

- **Subject-skipping, as opposed to grade-skipping, offers advantages for students who struggle with subjects outside their area of expertise.**
- **According to Chapter 5, titled “Acceleration,” “[Students] may need support or accommodation in their area of weakness to accomplish accelerated work in their area of strength.” (Davis et al., 2011, p. 135)**
- **Ramanujan could be placed in advanced level math classes, while remaining in age-appropriate or lower-level classes for other subjects.**
- **This would give him the support he needs to learn subjects other than math at a slower pace.**

Third Recommendation

- A third programming strategy I would make in Ramanujan's educational plan is incorporating positive parental involvement.
- It is important that parents are supporters of their children's education, and that they are aware of their children's progress and setbacks.
- According to Ramanujan's biography, there were many instances where Ramanujan's mother "stormed into the principal's office and protested." (Kanigel, 2016, p. 19 and 47)
- Although it is not possible to completely eliminate negative reactions like those listed above, parents of gifted children should have a beneficial relationship with their children's school community and be taught appropriate parenting techniques to best support their children.
- This would help support gifted and talented identification measures, as it "promot[es] collaboration with administrators and the public." (Davis et al., 2011, p. 82)

Benefits of the Third Recommendation

- Ramanujan's school could have evening counseling sessions with parents to provide tips for parenting gifted children.
- Ramanujan suffered negative emotional consequences from feelings of peer pressure and competitiveness, and "these problems can complicate children's lives; they also can be informative to parents who are aware of the potential meaning of such symptoms." (Davis et al., 2011, p. 421)
- Being skilled in detecting signs and symptoms can play a key role in creating positive relationships between mother and son, and families and school professionals.
- According to a study where gifted adults were asked about life satisfaction, they highlighted the importance of bonding with their families, and they "recommended cultivating and treasuring relationships with family members." (Perrone-McGovern, 2009, p. 829)
- Therefore, support and guidance that Ramanujan's mother can receive from his school will be helpful in strengthening their bond.

Fourth Recommendation

- A fourth programming strategy that I would add to Ramanujan's personalized learning plan is the use of mentorships.
- Ramanujan's main mentor towards the end of his life was G.H. Hardy, an accomplished mathematician and professor who worked at Cambridge University in England.
- Ramanujan traveled to England to work with Hardy for many years, where Hardy taught him new areas of mathematics, and "was in many ways, the best and truest friend Ramanujan ever had. He was considerate, loyal, and kind to him." (Kanigel, 2016, p. 253)
- However, Ramanujan did not meet Hardy until later in his life, and as Kanigel wondered, "Would [Ramanujan] have achieved more had he found mentors early on?" (Kanigel, 2016, p. 357)
- Although Ramanujan did have some supporters, such as P. Singaravelu Mudaliar, this relationship was not as strong as the mentorship he had with Hardy.
- As a result, more opportunities to work with mentors during Ramanujan's childhood in India would likely help him achieve more later in life

Benefits of the Fourth Recommendation

- **Some individuals that would be good mentors for Ramanujan include those who are “matched in ethnicity, gender, social class, background, and values.” (Davis et al., 2011, p. 164)**
- **This was one aspect that Ramanujan did not have in his mentorship with Hardy, and as Hardy once stated himself, “Ramanujan was an Indian, and I suppose that it is always a little difficult for an Englishman and an Indian to understand one another properly.” (Kanigel, 2016, p. 278)**
- **Another quality that would be important in a mentor for Ramanujan would be “social and emotional support and advocacy beyond what is normally found in typical instructor-student relations.” (Davis et al., 2011, p. 164)**
- **One example of a mentor could be a math teacher at a local secondary school in India that Ramanujan could work with for extended periods of time, as a supplement to his secondary school work**

Fifth Recommendation

- The last instructional strategy I would implement in Ramanujan's individualized learning plan is an interdisciplinary curriculum.
- To help Ramanujan become successful in all aspects of life, it is important to address his underachievement in subjects other than math.
- An interdisciplinary curriculum would incorporate mathematics into other Ramanujan's other subjects, such as physiology and history.
- As Kanigel stated, "Ramanujan exhibited a prima donna-like self-importance that left him unwilling to study what he had no wish to study, or to work for any reason but to support his mathematics." (Kanigel, 2016, p. 82)
- Ramanujan was experiencing "boredom, apathy, and frustration" toward school, and this is common for some gifted students to feel, especially regarding subjects they are not interested in (Davis et al., 2011, p. 38).
- This is similar to the ideas presented in Class Discussion #2B, where classmate Jessica N. and I were discussing gifted students who may be unmotivated and are considered underachievers. (Class Discussion #2B)

Benefits of the Fifth Recommendation

- **An interdisciplinary curriculum would help motivate Ramanujan to succeed in his other classes.**
- **For example, the history of mathematics, such as the lives of famous mathematicians and mathematical discoveries could be discussed in his history class.**
- **Additionally, in physiology class, not only would Ramanujan learn terms and definitions about human biology, but he could also perform calculations regarding chemical quantities and balancing equations.**
- **These supplements to the curriculum will help pique Ramanujan's interest in other subjects and encourage him to work harder in these classes**
- **According to the textbook, using an interdisciplinary curriculum has been shown to help gifted students who struggle in certain subjects, as it “allows the student to find connectedness between topics” and “provides for depth and complexity of thought.” (Davis et al., 2011, p. 200 and 414)**

What I Have Learned

- Ramanujan's story taught me about the importance of mentorship programs for gifted students.
- G.H. Hardy's mentorship with Ramanujan was inspiring and demonstrated many qualities of a beneficial working relationship.
- It is important that a good mentor doesn't "destroy [the mentee's] confidence" or "break the spell of [the mentee's] inspiration," in the words of Hardy. (Kanigel, 2016, p. 4)
- This relates to the lessons I learned from Chapter 6 in our textbook, where mentorship programs for gifted students lead to "increased self-confidence, responsibility, and purpose." (Davis et al., 2011, p. 164)
- This influenced me, because as an aspiring high school math teacher, I hope to teach gifted students and help them find mentors.
- By analyzing Ramanujan and Hardy's mentorship, as well as using the content I learned from class, I will be better prepared to identify the qualities of an effective partnership.

What I Have Learned

- It is important to nourish and support gifted students' creativity.
- Ramanujan reached the "Innovative Level" of creativity, where "originality and out-of-the-ordinary production or ideas are the hallmarks of this stage." (Davis et al., 2011, p. 206)
- It did not take long for Hardy to recognize Ramanujan's unique creative abilities in the field of mathematics. According to Hardy, "One gift [Ramanujan] has which no one can deny— profound and invincible originality." (Kanigel, 2016, p. 207)
- One example can be seen when Ramanujan experimented with prime numbers, which are whole numbers greater than 1 that have only themselves and 1 as factors.
- By listing many prime numbers in order, Ramanujan was able to discover a pattern in the appearance of prime numbers (Kanigel, 2016, p. 216).
- For many years before Ramanujan's discovery, mathematicians tried to develop accurate formulas to model this pattern, but with little success.
- Ramanujan's insight and creativity helped him create a formula that mathematicians use today as a method of finding the number of prime numbers less than a given number.

What I Have Learned

- Additionally, I learned about the significance of cultural diversity among gifted students.
- Ramanujan faced many difficulties when he was trying to fit in at Cambridge University, due to cultural differences in clothing, religion, and food. As stated in the Special Populations Lecture Video, these clashes in “cultural values” can negatively affect “culturally diverse gifted students.” (Special Populations Lecture Video)
- As a result, this led him to be rejected by his peers and dislike social gatherings
- This relates to the material I learned in Chapter 13, where it states that gifted multicultural education teachers need to possess “skills in addressing individual and cultural differences.” (Davis et al., 2011, p. 341)
- This influenced me, as I hope to create a welcoming and safe environment in my classroom that celebrates diversity, instead of intolerance of other cultures.

References

Characteristics Module 2 Part 2 Video Lecture

Class Discussion #1

Class Discussion #2B

Davis, G., Rimm, S., & Siegle, D. (2011) Education of the Gifted and Talented (7th ed.) Saddle River, NJ: Pearson.

Dweck, C. (2014). The Power of Believing That You Can Improve. TED Talks. Retrieved from https://www.ted.com/talks/carol_dweck_the_power_of_believing_that_you_can_improve?language=en

Kanigel, R. (2016). *The Man Who Knew Infinity: A Life of the Genius Ramanujan*. Washington Square Press.

Perrone-McGovern, K. M. (2009). Major Life Decisions of Gifted Adults in Relation to Overall Life Satisfaction. *Journal for the Education of the Gifted*. 34(6) 817-838.

Special Populations - Module 3 Video Lecture