The Relationship between Self-Perception of Math Ability and Math Performance

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Citation
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What is a Mathematician?

Methods

The data collection consisted of a survey as well as a review of current math grades and homework. A total of 21 students participated in the study, 11 from Accelerated Algebra II and 10 from Geometry.

Student were asked to rate their math ability on a scale of 1 (low) to 10 (high) in four areas: how they rated themselves, how their parents would rate them, how their teachers would rate them and how their peers would rate them. These scores were averaged and students with an average score of 7 or above were placed in the High math self-perception group. Students with a score below 7 were placed in the Low math self-perception group.

Math performance was measured by looking at the students current grades at the time the survey was taken. Students with an grade of 77% or above were rated as high math achievement, while students with a grade lower than 77% were rated as low math achievement.

Introduction

“What I’m not a math person”

What goes into a person seeing themselves as a “math person” or “not a math person” is complex and goes beyond the grades they get in math class. Historically, the relationship between math self-perception and performance has been discussed in the context of “math anxiety” and “math self-concept”. Both of these terms describe the self-perception of math ability.

Traditionally, people with math anxiety have a low perception of their own ability, which can lead to poor performance. This poor performance is then seen as proof that they lack ability and becomes a self-fulfilling prophecy. This repeating cycle of poor performance and increased anxiety can last a lifetime and can be passed on to future generations.

Previous research has shown a number of influences on math self-perception, including the attitudes of parents (Rytkönen et. al. - 2007), teachers (Geist, 2010), and peers (Jackson & Canada, 1995).

In this study, I hope to better see this same correlation and also look at how students see the role of math in their lives today and in the future.

Figure 1: The survey used in this study

Figure 2: Math Self-Perception vs. Math Performance and the four groups that were defined in this study.

Figure 3: Word cloud of the responses to the question: “What is a mathematician?”. Students generally felt that a mathematician is someone who is very talented in math, who enjoys doing math, and uses math on a daily basis. Math is the major part of their job and they use math to solve problems or advance technology.

Figure 4: This is how students think others see them. Contrary to other studies, students rated their parents and friends perception of their math ability higher than their own. Students generally thought teachers perception of their math ability matched their own.

Figure 5: Even though most students know people who use math in the “real world”, most students answered that they did not know any mathematicians. And while most students see themselves using math when they finish high school, only one student reluctantly identified himself as a mathematician.

Findings

• Most students fell into either the LL or HH groups. Both of these groups indicate a strong link between how a student sees their math ability and their math performance.
• Math misconceptions and gaps in math learning need to be identified and corrected so students can reduce their math anxiety and strengthen their self-perception of math ability.
• When asked to define a mathematician, many students used phrases such as “uses math”, “knows math”, “enjoys math”, and “an expert in math”. The last two are the things that I feel keep math students from describing themselves as mathematicians.
• Math education needs to be interesting. Math curriculum needs to change to more project/discovery based learning where students are actively doing math rather than watching or practicing math.
• The definition of a mathematician needs to change. I would define a mathematician as “someone who uses math to explore the world around them.” This is a broad enough definition that allows students to identify themselves as mathematicians.

Group | Definition | Description
--- | --- | ---
HH | High Math Self-Perception, High Math Performance | Students see themselves as being good at math and their math grades reflect this.
HL | High Math Self-Perception, Low Math Performance | Students see themselves as being good at math but their current grades don’t reflect this.
LL | Low Math Self-Perception, High Math Performance | Students do not see themselves as being good at math but have good grades.
LL | Low Math Self-Perception, Low Math Performance | Students don’t see themselves as being good at math and their grades reflect this.

Self Perception vs. Perception of Others

| Definition | Perception of Others |
--- | ---
Self | Parent | Teacher | Peers |
HH | 17 | 4 | 4 | 1 |
HL | 17 | 7 | 14 | 1 |
LL | Yes | No | |
HH | |

The Role of Mathematics in Students Lives

- I feel math and I am finished with school
- I know I use math in the "real world"
- Under a mathematician
- I am a mathematician

Figure 6: This is how students think others see them. Contrary to other studies, students rated their parents and friends perception of their math ability higher than their own. Students generally thought teachers perception of their math ability matched their own.