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## Claim of Policy

### I. Introduction

- A. (Opening Device) How many people here were taught to memorize their math facts? Memorizing mathematical topics has been the norm in classrooms for many decades. Recently, however, memorization is being discouraged and some teachers are emphasizing on more flexible thinking in math for the benefit of future generations. As a math instructor for Mathnasium, a math learning center, I have personally seen the side effects of memorization on students of all ages.
- B. (Thesis Statement) Today, I will present why memorization in math should be avoided and offer some alternatives for teaching math to children.
- C. (Preview of Main points) Specifically, I will address that the child's use of memorization is inefficient when compared to their use of number sense and math concepts.

### II. Body

A. **Problem:** To begin, memorization of mathematical ideas is ineffective.

- 1. Loss of conceptual understanding
  - a. Memorizing multiplication example
    - i. Fact memorization: is > means
    - ii. Vertical form: constrains student to multiply only those numbers
  - b. Loss in interest of concept
    - i. David Ginsburg, a math teacher and an instructional coach, says "...once students have memorized and practiced procedures that they do not understand, they have less motivation to understand their meaning or the reasoning behind them".

- 2. **2 Sided Appeal:** Some of you may believe that memorization isn't a real problem. Many of you probably have memorized your multiplication facts in your childhood.

**Rebuttal:** In actuality, America has been lagging behind other countries in math for a long time.

- a. America isn't the best in math
  - i. (Emotional Appeal: Fear) According to the OECD (The Organisation for Economic Co-operation and Development), in the 2015 PISA (**Programme for International Student Assessment**) results, the United

- states is ranked between the 38<sup>th</sup> to 41<sup>st</sup> ranks when compared to other countries.
- ii. Do we want this to continue in our preceding generations?
- b. Recent proof that memorization doesn't affect scores
    - i. In a study published by the *School Science and Mathematics Journal*, it is mentioned that "...there was no evidence that mandated automaticity drills, even when accompanied by higher automaticity rates, positively impact scores on the computation section of the ITBS".

**Transition: If memorization can't help improve test scores, what can?**

**B. Solution:** I believe that reinforcing number sense and teaching a mix of conceptual and procedural math could help improve our results.

### **1. Number sense definition**

#### **a. Breaking apart numbers**

- i. **Visualization of vertical form**
- ii. Creative

#### **b. Succeeding students have number sense**

- i. JO Boaler, a professor in mathematics education, at Stanford University says, "...when students were given a problem such as 21-6, the high-achieving students made the problem easier by changing it to 20-5, but the low-achieving students counted backward,...which is difficult to do and prone to error."

### **2. Integrate concepts into procedures**

#### **a. Helps with answer checking**

- i. **Concepts can reinforce or refute the reasoning behind answers**
- ii. **28 near 30, so answer should be less than 240**

#### **b. Are tied iteratively to procedures**

- i. In a study published by the Journal of Education Psychology, they infer that "...a child's conceptual knowledge ...may guide them to choose correct procedures more often and incorrect procedures less often..."

## **III. Conclusion**

- A. (Summary) To sum it up, memorization is detrimental to students, and to solve this, students should learn number sense and math concepts**
- B. (Closing Device) In this way, our future generation will have less of a burden memorizing and be more inspired by the creativity of math. Considering this, the next time you see a child struggling in math, try teaching them number sense and the concepts underlying the problem. This way we can see our future generations play with numbers as they grow and prosper in math.**

#### IV. Reference List

Boaler, J. (2019). Developing Mathematical Mindsets: The Need to Interact with Numbers Flexibly and Conceptually. *American Educator*, 42(4), 28–33. Retrieved from <https://search-ebscohost-com.ezproxy.losrios.edu/login.aspx?direct=true&db=eric&AN=EJ1200568&site=eds-live&scope=site>

Validation: The American Educator is a journal run by the American Federation of Teachers, a union of professionals committed to improving education across America.

Ginsburg, D. (2015, October 16). Doing Math vs. Understanding Math. Retrieved October 21, 2019, from [http://blogs.edweek.org/teachers/coach\\_gs\\_teaching\\_tips/2015/03/doing\\_math\\_vs\\_understanding\\_math.html](http://blogs.edweek.org/teachers/coach_gs_teaching_tips/2015/03/doing_math_vs_understanding_math.html).

Validation: David Ginsberg is a math coach and professional instructor coach with 20 years of experience in the classroom.

McGee, D., Brewer, M., Hodgson, T., Richardson, P., Gonulates, F., & Weinell, R. (2017). A Districtwide Study of Automaticity When Included in Concept-Based Elementary School Mathematics Instruction. *School Science & Mathematics*, 117(6), 259–268. <https://doi-org.ezproxy.losrios.edu/10.1111/ssm.12233>

Validation: School Science and Mathematics is a journal dedicated to publishing articles about issues regarding science and math in school.

OECD (2016), PISA 2015 Results (Volume I): Excellence and Equity in Education, PISA, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264266490-en>

Validation: The Organisation for Economic Co-operation and Development is an international organization dedicated to improving the standards of living across the globe.

Rittle-Johnson, B., Siegler, R. S., & Alibali, M. W. (2001). Developing conceptual understanding and procedural skill in mathematics: An iterative process. *Journal of Educational Psychology*, 93(2), 346–362. doi: 10.1037//0022-0663.93.2.346, from [https://www.researchgate.net/publication/289767207\\_Developing\\_conceptual\\_understanding\\_and\\_procedural\\_skill\\_in\\_mathematics\\_An\\_iterative\\_process](https://www.researchgate.net/publication/289767207_Developing_conceptual_understanding_and_procedural_skill_in_mathematics_An_iterative_process)

Validation: Journal of Education Psychology specializes in publishing articles associated with psychological research pertaining to education.