Rate of Memorization the School Mathematics Using A Difference Equation Model

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Abstract

This Research is designed towards the validity of the Difference equation model for describing the rate at which one memorizes on a simple level and short term. The equation in question is \( \Delta u(n) = K(1 - u(n)) , n \geq 0 \). This model will be analyzed and solved first. Then, testing on high school student will confirm whether or not the model is useful for determining the rate of memorizing and retention on a short term basis.

Key words: Difference Equation, Memorization, Mathematics, Modelling, Design, Tool

AMS Classification: 97M70

Introduction

The analysis of this difference equations model, a brief explanation of the subject at hand is appropriate. Due to the complexity of the children mind and its ability to store memory, the information received from short term studies are limited. Also it should be explained that mostly speculation exists as to the workings of the ability for children to remember.

The memory works on two levels.

- Short-term memory defines which allows for precise recall of events for a few seconds or minutes after their occurrence,
- Long-term memory defines which is a bit more complex and will not be delved into in this paper, we will be primarily looking at short term memorization rates.
- There are many explanations as to the way the children memory works; however the assumption in this paper is that the model describes the rate of memory on a short term and simple level
**Analysis of The model**

K is the parameter,

\[ u(n) = \text{fraction of list learned at the interval } n \geq 0 \]

\[ u(n) = 0 \text{ knowing none of the list} \]

\[ u(n) = 1 \text{ knowing the entire list} \]

\[ (1 - u(n)) \text{ says that the entire learned is substracted by fraction of the list learned} \]

The solution the Difference Equation gives a discrete function of the amount of the list learned with respect to the interval. We are assuming that the rate of learning is proportional to the amount left to be learned.

\[ \Delta u(n) = K(1 - u(n)), \quad n \geq 0 \]

The solution of the Difference Equation

\[ u(n) = 1 - (1 - K)^n \]

The parameter K is different for different individuals, an example of the solving technique for K is shown below. Say for example that after one minute the subject learns 15% of the list. Plugging these values into the solved Difference equations gives us an approximate value for K. plugging this K value into the equation we get \( u(n) = 1 - (1 - (0.16252))^n \)

**Methodology**

The Researcher adopt the following methodology to strengthening the children memory to memorizing mathematical formulas and word problems (The Link Method, The Story Method, The Loci Method, The Peg System, Draw a Mind Map)

**Tool**

- One tool consisted of mathematical formulas;
- Another tool list consisted of 10 basic word problems

**Design**

The students are divided into two groups one is experimental group and another is control group.

- The Experimental students were tested being in word problem, was familiar with the material yet taken some time to reconstruct the list in order.
- The Control Group students were tested who had never seen material before and actually learned the list.
quicker than the Experiment group student.

**Experimentation Analysis**

The real data was compiled by testing individuals with a list of mathematical formulas and a list of word problem. The list was studied at one minute intervals and the subjects were then required to reconstruct the list from memory. This process was repeated until the list was learned in its entirety. The experiments in this research were interesting.

Figure 2 show that the Control group and accompanying curves. This Control group was not familiar with the information on the word problems; it shows an extremely high rate of retention. The curve shows a good approximation of the rate for this student memory.

Figure 2A show that the Experimental group and accompanying curves. This experimental group was familiar
with the information on the word problems.

Figure 3 show that the Control group and accompanying curves. This Control group was not familiar with the information on the mathematical formulas.

Figure 3A show that the Experimental group was familiar with the information on the mathematical formulas.

**Conclusion**

The results of the graphs from the experiment are skewed. The Researcher of this paper has experience with experimentation. The student are tested have extremely high retention rates. There is an assumption through the graphs presented here that the student memory works on a high level. The model is simple and student mind is extremely complex, the model works better than one might imagine at first glance. This difference equation model can be described with discrete function is $\Delta u(n) = K \left(1 - u(n)\right)$, $n \geq 0$ is a better model for describing on a short term basis. Finally the practical application of this model, one could determine how long it would take to learn a long list of mathematical formulas or any type of learning.

**Reference**