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The Incentive Effect in College Mathematics Teaching

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Abstract: when introducing derivatives, we can say that tangents define the history of development, from ancient Greece to Fermat, Newton, from static to dynamic, from global to local, and so on. When we talk about derivatives, we can talk about Newton's flow number method, which experienced a perfect course of more than 200 years of hard work.

Keywords: effect mathematics; teaching college

1. Introduction

In the process of teaching college mathematics, teachers not only should enable students to learn ledge ,develop skills and capabilities in all aspects as well, but also encourage students to understand the importance of learning mathematics, inspire students' self-confidence and their sense of beauty and interest, stimulate students' consciousness of learning and their awareness and ability to use mathematical theory to solve practical problems, and encourage them to cultivate rigorous thinking habits, etc. Here are a few examples to illustrate the role of student motivation in the college mathematics teaching.

2. Inspire Students to Understand the Importance of Learning Mathematics

When teaching the limit of series, teachers introduce the fractal theory briefly (take Koch snowflake as an example). Set the length of the regular triangle to be 1, the perimeter is equal to a_1. Triangulate each side and use the middle edge as the outer edge to make a regular triangle, remove the middle edge (as the second image shows), whose perimeter is a_2, it's easy to know that $a_2 = \frac{4}{3}a_1$.

The second figure is equally divided into three equal parts. Implement the same operation to the third figure (as shown in the third image) whose perimeter is a_3, it's easy to know that $a_3 = \frac{4}{3}a_2 = (\frac{4}{3})^2 a_1$.

Repeatedly, the perimeter of the n_{-th} graph is $a_n = \left(\frac{4}{3}\right)^{n-1} a_1$.

The perimeter of each graph consists of a series, try to take the limit of the series $\lim_{n\to\infty}\left(\frac{4}{3}\right)^{n-1} a_1$.

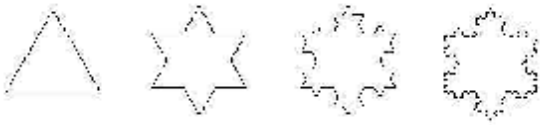
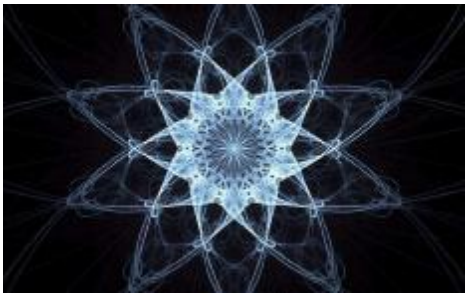
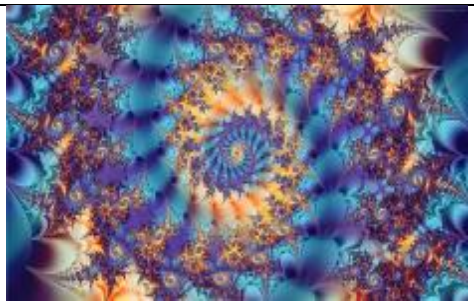


Figure 1. Perimeter of each graph consists of a series

It is easy to know that when n tends to infinity, the perimeter of the graph is infinite, but its area is finite (because the area of the graph will not exceed the area of the circumcircle). Students have not seen such graph so they will be interested in them. Actually, a graph that has self-similarity like this form and structure is called fractal. The theory that studies this geometric problem is called fractal geometry. The patterns that are designed by fractal geometry are pretty and beautiful (see the following pictures). At the same time, the theory is widely applied in architectural design. Some master architects have designed many classic works based on fractal theory. This example teaches students if they want to be masters, they should study mathematics well.





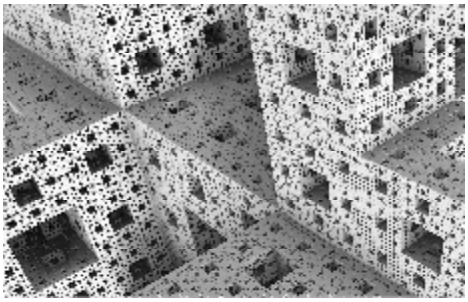


Figure 2. Study mathematics well

3. Inspire Students to Establish and Cultivate their Confidence Stripling

For example, when talking about sets or probability statistics, teachers can talk about fuzzy math. The phenomenon in the objective world can be divided into certainty and uncertainty. In addition to the random phenomenon, there are a fuzzy uncertain phenomenon. For example, let A be a set which the elements are stripling, we can say 20 years old people belongs to A, but how about 30 years old, 40 years old? For classical set theory, the element either belongs to or does not belong to A, this phenomenon belongs to binary logic. However, it is not suitable for fuzzy sets. Because the extension of fuzzy set concept is not clear, it is difficult to determine the relationship between an object and a set. It cannot be expressed simply by belonging to or not belonging to, but expressed by the degree of membership, which belongs to the multi-valued logic. The values of the degree of membership included in [0,1]. Obviously,0.5 is the most blurred. Membership degree is obtained by membership function. For example, the founder of the mathematics Zedd gives the fuzzy set membership function is:

$$Y(x)=\begin{cases}1 & 0\le x\le 25\\ \left[1+\left(\frac{x-25}{5}\right)^2\right]^{-1} & 25<x<200\end{cases}.$$

It's easy to know $Y(45)=0.059$,that is, the degree of the 45-year-old belongs to young people is 5.9%. (Do not consider the roughness of the function and the limitations of the historical).

Similarly, outstanding students is also a fuzzy set. Excluding the quantitative indicators given by the school for a certain purpose, it is difficult to decide who is better among students. In fact, every student is the best, this idea can cultivate and build their self-confidence, inspire students' aesthetic consciousness and taste as well.

4. Inspiring Students' Aesthetic Consciousness and Interest

If we are learning infinite series, we must talk about Euler's formula $e^{ix}=\cos x+i\sin x.$

$e^{ip}+1=0$ is known as the most beautiful equation in mathematics when $x=p$. Where is the beauty? In fact, "$0,1,p,i,e$" were the five most important constants in mathematics, and the basic three operations are "addition、 multiplication and power", and then "equal" is the most central concept. These key elements in mathematic finally get together after experiencing a long and bumpy fate by "Calculus", Mathematicians called the Euler's formula as "a formula created by God".

5. Inspire Students' Learning Initiative and Consciousness.

For example, when talking about the full probability formula and Bayesian formula, you can give an example as following: there are 3 majors in a certain college named as architecture, urban planning and landscape architecture. The proportion of the number of students is 50%, 30% and 20%, respectively. The rate of failed the university mathematics exam is 2%, 3% and 4%, respectively. Now select one students randomly, who was found to fail the exam, then try to figure out which of the students was most likely to be the student?

This example can motivate the conscientiousness of learning and make students study hard to avoid failing exam actively.

6. Encourage Students to use Mathematics Theory to Solve Practical Problems of Interest and Ability.

For example, when teaching the Bernoulli's model, teachers can give an example : the Architecture and Urban Planning College and the civil engineering Col-

lege hold a table tennis match. The former is slightly stronger. Each player has a winning rate of 0.6. The two parties negotiate and confront each other.

(1)、3 members for each team ;

(2)、5 members for each team ;

(3)、7 members for each team.

Try to figure out which way is more beneficial to the Architecture and Urban Planning College?

Another example is the independence of the incident. For example, if A and B make a gamble and two wins in three games. Assume A is known to have won the first game first and the gamble is terminated accidentally, try to figure out how is it reasonable for A and B to allocate gambling money? (Assuming that each game is independent, the winners have the same probability of winning or losing, etc.)

7. Encourage Students to Cultivate Rigorous Thinking Habits

For example, when introducing derivatives, we can say that tangents define the history of development, from ancient Greece to Fermat, Newton, from static to dynamic, from global to local, and so on. When we talk about derivatives, we can talk about Newton's flow number method, which experienced a perfect course of more than 200 years of hard work. And set cultivate students' rigorous thinking habits as a purpose.

8. Acknowledgment

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