

# Research on Mathematical Methods of Basic Laws of Education

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**Abstract** Since ancient times, education is a kind of social practice of "the educating people and the cultivating talents", its basic aim is to cultivate useful people for society, there its own objective regularity. This paper applies mathematical function to the study of basic laws of education, "The basic law curve of life growth education" is put forward for the first time, in the paper also to give a comprehensive description and functional analysis of the basic law curve of life growth education. According to the function analysis of "the basic law curve of life growth education", it can provide useful reference for setting the emphases of education in different growth stages of life.

**Keywords:** basic law of education, educating people and cultivating talents, moral character education, culture professional education, mathematical method research

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## 1. Introduction

In modern society, the competition of talents is very fierce. Therefore, people attach great importance to education. Around us, people almost every day to see children without stop to have classes, without stop to do homework, without stop to have learning, from morning to night. However, to see from the family education, school education and adolescent growth education effect, the total feeling is not satisfactory, but also feels the lack of something. Children can't feel the joy of their childhoods, parents feel to administrate children more and more difficult, teachers feel to teach students more and more difficult, enterprises and society feel young people's sense of responsibility more and more worse, the older generation of scientists feel talents less and less. Many parents do not know how to educate child, many teachers don't know how to teach. This almost has become a common phenomenon in modern society, and everyone seems to be confused about modern education. Why is modern education so? Is there a clear, image, and even visible education law and education direction?

Over the years, the author has been thinking about the same problem, also has read a lot of educational books and research literature, always wanted to try to understand, or even want to find the basic laws of education. But, very disappointed, did not find a clear answer. Therefore, the author wants to study the basic laws of education. With the help of the author 's opportunity to work in colleges for many years, through the consideration of this subject, want to give people a preliminary reference answer, this is also a topic that the author of this paper is willing to discuss together with researchers who are concerned about education.

## 2. Research Summary on Basic Laws of Education

From ancient times to the present, "education" is always an old and new topic. The definition of education in the academic field is more and more diverse, opinions differ. In Chinese, education consists of two words of "teaching and cultivating", our ancients in "Shuowen Jiezi" said, the two words of "education" were explained "teaching, people follow the example of their superiors", "cultivating, so that the child for good". With the modern language can be simply interpreted as the teacher how to teach students how to learn", "the aim is to make the students' moral character correct". In western countries, the word of "education" was derived from the Latin word educate, the meaning was "lead" or "export". The meaning to say that by means of a certain means, something that was hidden inside the body and mind was triggered. No matter how defined, in the long history of the development of human, education is always a kind of objective existence, it is a kind of social practice activity of "educating people and cultivating talents".

In recent years, many educational scholars have made unremitting research on the law of education. For example, "What are the laws of education" [1], "Where to find the law of education" [2], "New exploration on the classification of law of education" [3], "Basic laws of education and its application in higher education research and practice" [4], Analysis of "internal and external law of education"[5], etc., In these papers, the researchers gave a different description for the law of education.

The author of 《pedagogy》 said: "The law of education is the essential link between the various factors within the

educational system, between the education and the other things, and the inevitable trend of the development and change of education." [6] In this book, the author although told us, education is a regular pattern, but what is the essential connection of the regular pattern, what is the trend, did not give a clear answer. That is to say, the law of education is a concept that can only be passed by, no sense, is a hazy concept. Another author criticized the direct, linear, and simple cognition for the law of education in the literature of "the complexity and nonlinearity of education", emphasized that the law of education is a kind of chaotic order, which is the unity of order and disorder, necessity and contingency, certainty and random generation. The author said "the law of education is not an absolute necessity and not an affirmatory law, but reflected the law in the complex nonlinear mix of countless contingency and a certain elasticity, inevitability, it is an evolutionary process law, is a relatively stable link and trend." [7] The author of this research was to tell us, the law of education is considerable complexity and uncertainty, seemed to be telling us that the law of education is a law that does not have a descriptive of mathematics. The author of this paper thought that the literature [7] which could have revealed the complexity of the education process was worthy of recognition, but if to mix it together that the basic law of education with the specific behavior and change in the process of education, that's a little complicated to the educational law, this will cause people to have a sense of reverence for the law of education, even to have so far behind that one can only see the dust of the rider ahead.

Xiamen University professor Mao-yuan Pan is a famous contemporary educator in our country, last century, 80s, for the first time, he clearly put forward two basic laws of the external and internal relations of education in a school principal's study class at Hunan University, in which the external law of education is "the law of the relationship between education and social development", and the internal law is "the law of the relationship between education and human development". [8] He thought that society is a big system, education is a subsystem of the large system, but this subsystem will be subject to constraints by various elements in the other subsystems of society, and education subsystem also can produce function to other subsystem of society. This is the basic content of the external law. In the internal law of education, he believed that the main contains three aspects of the relationship, First, is the relationship between the physical and mental development and personality characteristics of educational requirements and educational objects; second, is the relationship between the various components of the overall development of human, in the process of education, it is necessary to promote the harmonious development of the educated in the moral, intellectual, physical and aesthetic aspects; third, is various elements relations of the educator (teachers), the educational objects (students) and the education influence (education carrier and its application mode, method) in the education (Teaching) process. The two laws of internal and external relations of education were put forward by professor Maoyuan Pan has been aroused widespread concern within the modern educational circles, also has had a positive impact on. From professor Pan's two laws,

we seem to see a clear outline of the laws of education, and the author of this paper pays more attention to professor Pan's description of the internal law of education.

Education is a kind of social practice activity of "educating people and cultivating talents", generally speaking, each person in the growth phase will be more or less to accept the family, school and society, different education. For example: reading primary school, junior high school and high school, etc. It is like this in our country, the same in western countries, too. From this point of view, education is no national boundaries. Since it is so, the basic laws of education should have some common characteristics, it is both in line with China's educational activities, but also to adapt to foreign educational activities. In this fact to extend, we can bring the external law of education proposed by professor MaoYuan Pan to the special circumstances of the basic laws of education, which is attributed to this factor of "the impact of education" in internal law of education. In this way, we can raise the internal relationship law of education which was put forward by Professor MaoYuan Pan as the basic law of education. And on this basis, we can make further generalization and refinement of the three relations in the laws of education proposed by Professor MaoYuan Pan, with the relationship between the physical and mental development and personality characteristics of the educational object and the harmonious development of morality, intelligence, body and esthetics summed up as "moral character education", and with the relationship the elements of educator, educational object and education influence in the process of education summed up as "culture professional education" together. At this point, we can bring the basic tasks of education into two categories, first, is "moral character education", two is "cultural professional (skills) education".

The social system of China and western countries is different, the requirements of ideological consciousness for citizens may also be different. Although so, Chinese citizens have to accept the education of moral character as a young age, and the citizens of western countries have to accept the education of moral character as a young age, too, just there may be some differences in the requirements of education. Chinese citizens to accept the education of professional (skills) from a young age, the citizens of western countries have also to accept the education of professional (skills) as a young age. Thus it can be seen, although the system of the eastern and the western countries is different, but, the task of education is the same. Therefore, we can summarize the basic law of education as the teaching process of the two major tasks of education. This law of education is not only in line with China's educational practice, but also in line with the educational practice of the western countries. This is the universal basic law of education. This is the social basis of the basic law of education proposed by the author.

### **3. Mathematical Method Research on the Basic Law of Education**

#### **(1) The establishment of the curve graph of life growth education**

To study and reveal the basic law of education is to better run education, to guide and develop education,

better to serve the educated person, to improve the ideological and educational quality of the educated person. Everyone knows, education is closely related to the process of a person's growth, if we only define the basic tasks and basic laws of education, it is obviously not enough, it does not reflect a person's educational goals and priorities in the process of growing up, of course, it is not accurate to work out the development plan to guide the education work. Therefore, we need more complete and accurate describing the law of the development and change of education in the process of life growth. Based on this point, the author introduces the concept of mathematical function to the basic law of education, to combine mathematical functions with the basic laws of education that is to combine the basic law of education with the growth of life, from a mathematical point of view to describe and to reveal the basic development law of education.

Figure 1 is the curve graph of the basic law of life growth education first proposed by the author, mainly use the three function curve in the rectangular coordinate system to describe the basic law of life growth education.

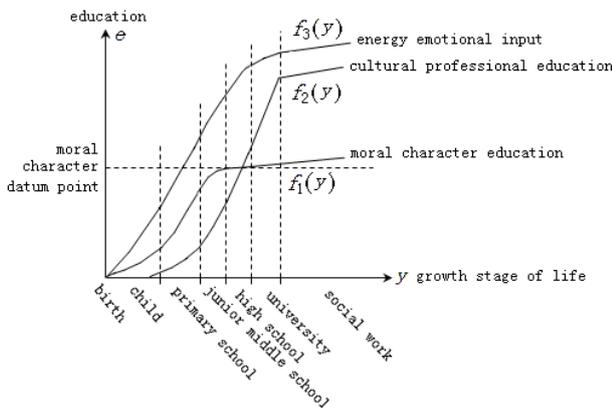


Figure 1. The curve graph of the basic law of life growth education

In Figure 1, the horizontal coordinates Y represents the growth stage of life, the vertical coordinates E represents the education knowledge accepted in the growth phase of life; the curve  $f_1(y)$  described is the "moral character education" accepted in the growth phase of life, also represents the image perception ability of life; the curve  $f_2(y)$  described is the "cultural professional education" accepted in the growth phase of life, also represents the logical thinking ability of life; the curve  $f_3(y)$  described is the "energy emotional input" spent in the process of receiving education of life, also represents the limit of the energy and emotion of life.

**(2) the function analysis of the curve graph of the basic law of life growth education**

From Figure 1 we can see that there are two important growth stages in life, first, is the period educated from birth to college during, second, is the stage of social practice after graduating from university. The period educated is subdivided into 7 years of early childhood education stage, 6 years of primary school education stage, 3 years of junior middle school education stage, 3 years of high school education stage and 4 years of college education stage.

Can be seen from Figure 1, the process educated of life is not a simple linear development process, but, is the

development process mutually matched by the three function curve  $f_1(y)$ ,  $f_2(y)$  and  $f_3(y)$ . From the birth to the growth stage of second year of junior high school, the trend of curve  $f_1(y)$  is rising faster, especially the upward momentum is more fierce from primary school to the stage of second year of junior high school; After the second years of junior high school, the trend of curve  $f_1(y)$  tends to be gentle gradually. The change process of curve  $f_1(y)$  shows: the strength of "moral character education" accepted of a person from birth to the stage of second years of junior high school is more and more big, but, the strength of "moral character education" accepted after the stage of second year of junior high school is more and more weak, this also shows, after the stage of second years of junior high school, a person's moral character already has a very good foundation, even has had a basic shape.

Similarly can be seen from Figure 1, from people's birth to about 5 years old, curve  $f_2(y)$  is almost 0, the growth stage from the beginning of 5 years to first year of junior high school, the trend rising of curve  $f_2(y)$  is relatively slow, after the first year of junior high school, the trend of curve  $f_2(y)$  is rising rapidly, steep, momentum is more fierce, especially during the university period, the trend of curve  $f_2(y)$  shows an explosive rise. However, after graduating from college (starting work), the trend of curve  $f_2(y)$  tends to be gentle quickly. The change process of curve  $f_2(y)$  shows: the strength of "cultural professional education" accepted of a person from birth to the stage of the first year of junior high school is relatively weak, from the first year of junior high school to third year of senior high school phase, the strength of "cultural professional education" accepted is more and more strong. After graduating from college, the strength of "cultural professional education" accepted shows explosive growth. But after graduating from college, the strength of "cultural professional education" accepted is quickly weak, also shows that after participating in social work, the opportunity to accept the "cultural professional education" is becoming less and less.

We can also see from Figure 1, from birth to second year of senior high school phase, by comparing two curves of educational knowledge of  $f_1(y)$  and  $f_2(y)$  will be found,  $f_1(y) > f_2(y)$ , and after that it is  $f_1(y) < f_2(y)$ , in the point of second year of senior high school (specific will vary, and there will be a small change),  $f_1(y) = f_2(y)$ . This result tells us, the second year of senior high school is the intersection of "moral character education" and "cultural professional education" that is also the datum point of "moral character education". This law tells us, prior to this, we should put the emphasis of education task on the "moral character education" for the students; after that should put the emphasis of education task on the "cultural professional education" for the students.

The  $f_3(y)$  function curve shows in the Figure 1, the stage from birth to the university of life is to accept education and to pay the stage of the energy and emotional, there is no big fluctuation in the whole process, which is close to the linear relationship. That is to say, the energy and emotion paid in the process of reading and learning is comparative adaptation with the growth of the age. And after from the university to participate in the work the energy and emotions paid to accept education of life

becomes much more gentle, this also shows that people's mind becomes mature, peaceful, calm a lot.

**(3) The development relationship analysis between the curve graph of the basic law of life growth education and human's thinking ability**

"The curve graph of the basic law of life growth education" why shows such a form, this is closely related to the law of development and change of the physiological, psychological and logical thinking ability in the process of the growth of life.

A scholar have done a special research for the characteristics of the development of children's thinking" in a book of "child psychology", they passed the some examples of intuitive action thinking, concrete image thinking and abstract logical thinking completed by children, summed up the three golden stages of the development of children's thinking:

The first stage: 0~3 years old --- the intuitive action thinking is being developed, the concrete image thinking has just sprout;

The second stage: 3 ~ 7 years old --- the specific image thinking is being developed rapidly, the abstract logical thinking has just sprout;

The third stage: 7 ~ 15 years old --- to develop abstract logical thinking. [9]

And the percentage of the task completed in the three thinking ways of different age of children was carried out test statistics, as shown in the following table.

**Table 1. Percent statistics of the task completed in the three thinking ways of different ages of children**

Way of thinking \ Age	Intuitive action	Concrete image	Abstract logic
3 ~ 4	55.0	17.5	0
4 ~ 5	85.0	53.8	0
5 ~ 6	87.5	56.4	15.0
6 ~ 7	96.3	72.0	22.0

As can be seen from the above Table 1, the judgment ability of life in early childhood is mainly the judgment ability of intuition and image, and the ability to judge abstract logic is much weaker, basically just budding. That is to say, children's image thinking ability is much stronger than the ability of logical thinking. From the author's "life growth education basic law curve" can also be seen, a person from birth to the second year of senior high school growth stage,  $f_1(y) > f_2(y)$ , that is, his perceptual ability is clearly greater than the ability to think. From this point speaking, the test results are consistent with "the basic law curve of life growth education".

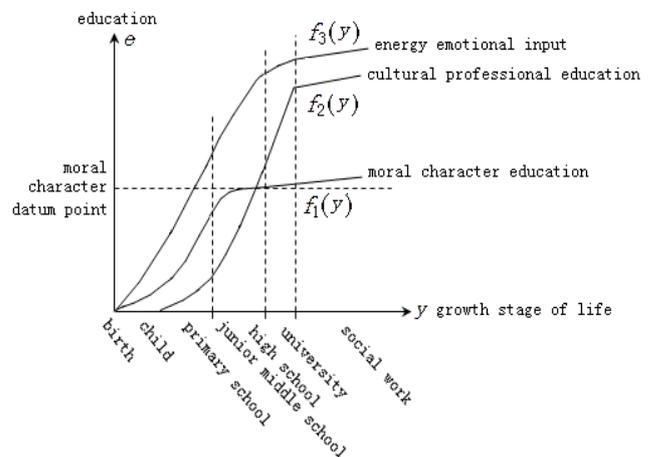
This test data and "the life growth education basic law curve" tells us, at this stage, a person's understanding of the outside world is mainly through image thinking to understand. Specifically, it is through the teaching by precept and example of their parents and the behavior influence of the surrounding characters to understand. Especially in this growth phase, the plasticity of people is the strongest. If to carry on a good moral character education to him, he would be a good talent for the good, otherwise, he will be as bad moral character foreshadowed. If at this stage, let a child living with a wolf, he naturally has the wolf's life habits, even in the future how to correct

again, his wolf is also very difficult to completely change. This shows that in this stage to strengthen the moral character education for people is particularly important. Similarly, at this stage, the logical thinking of people is more vaguely and more hazy. If at this stage to give him too early, too much, too complex cultural professional knowledge education, his understanding ability and accepting ability will be greatly reduce, and even produce resistance. Because the cultural professional knowledge mostly belongs to the category of logical thinking, if you do not have the ability of logical thinking, even rote learning to learn, can not really understand the true meaning of the knowledge.

After from the second year of senior high school, personal logical thinking ability is more and more strongly, to see the problem will not only look at the surface, but also from the deep level to analyze and judge. At this time, a person has grown into a teenager, his ability to accept cultural professional knowledge will be more and more strongly. So, from this period of time, should strengthen the education of the cultural professional knowledge to teenagers.

**4. Analysis of Educational Tasks in Different Sections of Basic Law of Education**

Professor MingYuan Gu who is one of the pioneers of modern education theory in Chinese deemed "the essence of education is to inherit the culture, to cultivate talents, education is for human development." [10] This is the review on the core of education spoken by the older generation of educators, is also the earnest expectation of the educational work. The author put forward "the curve graph of the basic law of life growth education" is to study the relationship between education and human growth, it is a image description to the development trend of education from the point of view of mathematics, although it can not cover and contain everything, but it points out a clear direction for the educational practice activity of the "educating people and cultivating talents". This curve graph divides the education of life into three sections, as shown in Figure 2.



**Figure 2. Partition of educational task**

The section from birth to primary school graduation is the section of the physiological and psychological growth education, in this section to strengthen the moral character education of children, especially family education is very important, parents' behavior is an important object of children's imitation, and school education is the extension and strengthening of children's moral character education, but also the focus of children's spiritual education.

Middle school to high school stage is the formation section of logical thinking, but also is the development section of germinating curiosity and creativity. In this section, parents should take children more to contact with nature, more go to Xinhua Bookstore to read some extra-curricular books and science fiction books, schools to organize more students to visit science and technology exhibition, etc., to lead and inspire children's curiosity and imagination.

The university is the accumulation section to learn cultural professional knowledge, in this section is mainly to strengthen the learning and accumulation of professional knowledge of science and culture, to lay a solid foundation for the upcoming social work.

## 5. Conclusion

From ancient times to the present, education is a kind of social practice activity of the "educating people and cultivating talents", the basic law of education is to carry on the process of "moral character education" and "cultural professional education" to people, the basic objective of education is to cultivate useful people for the society, and the aim is to train the high end science and technology talents for the society. The author first proposed the basic

law of education established by mathematical method, although not fully accurate description of all aspects of life education, but, to make education is no longer a vague conjecture and a sermon, and is a clearer direction and trend, it describes the focus and content of educational work in different stages of life, it can provide reference to carry out education work in different stages of life. Of course, the author also hope to expand more extensive exchanges, research and learning with the majority of educational researchers on the basic law of education.

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