

School-factory will die. What's on?

(Education during the change of civilizations)

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Why is the traditional school arranged just so and not in another way? Why is just this system of teaching so claimed and firm?

Nature is not sparing of variety. We all are so various – even those of us who live close by. There are plenty of races, nations, and religions in the world. Then why is the public school all over the civilized world arranged in the same way? The rare exclusions, such as “authors’ schools” only confirm this uniformity. For all their appeal they don’t spread so wide to compete with the traditional education.

Why is the school just such?

The 18th century has brought an unprecedented movement to Europe. Everything was being broken: secular traditions of governmental arrangement, family foundations and moral principles, ways of travelling, of getting and serving food – tremendous masses of people were changing the way of their life. The 18th century has brought a mercury thermometer and a lightning rod, smallpox inoculation and electric experiments, discovered the probability theory and differential calculus. The ancient dreams of flying have come true – Mongolfiers flew up with the help of a balloon with hot air in it. But the main thing was the inventing of a steam engine invented by James Watt.

Genie did not get out from a bottle – he came from a boiler with hot water. But he had got the main property of the fairy-tale creature – his power. ‘Take the steam engines out off Britain – and you’ll destroy its wealth and abolish its power’- said S. Carnot¹, whose name one can read in the modern school text-books too.

There the demiurge’s work had begun. Genie had got an army: thousands of bright minds and millions of hands. Some people were inventing, others were selling, applying, using. The new demiurge was cunning. Having invented the steam engine, he spread it into all the possible branches of activity. Having thought out a factory – the collective form of labour, he didn’t put a modest air, too.

Factory – that was another name of the genie. Factory is the symbol of the industrial age. Even the most traditional farmers’ work acquired the properties and rhythm of the factory labour. The mechanical devices, produced by factories, raised the efficiency of agricultural labour very sharply. As a result, a lot of hands at the farms became free. These hands have moved to the quickly growing towns and came to the factories at last. Just in 30 years after the Watt’s invention the number of industrial and trade workers became greater than that of the farmers.

After the farming, the commerce began to look like factory. If before that a customer was buying the goods just from their owner, now the specially rented salesmen (the same workers, essentially) appeared. The salesmen were selling the goods according to the fixed rules and prices; they were working ‘from whistle to whistle’ as if it were factory. But the changes in the social sphere did not stop.

‘The inventors in the social sphere, who considered that the plant or the factory was the most progressive and efficient economic organization, tried to introduce their principle in other organizations too. So *schools* (italicised by A. Guin), hospitals, prisons, governmental institutions

and other organizations have many features of the factory, with its division of labour, with its hierarchy and total facelessnessⁱⁱ.

So, school. The only reason can't explain its birth. But there is a common base, the original cause and at the same time the background, against which the birth and the evolution of the public school were taking place. It's that school, that is the origin of the modern traditional school. That school was generated by industrialization.

The school appeared to resolve the social contradiction: the factory-owners had to rent people, who were brought up in the pre-industrial age (for there were no other workers), but they didn't want to do that, for 'the people, who had gone through the period of pubescence and were working in agriculture or some trade before, can't be turned into useful industrial workers'ⁱⁱⁱ.

The industrialization made new demands to workers. Literacy began to spread among the common townfolk of the third estate. Thus, by the end of the 18th century 47% of men and 26% of women in France were literate.⁴ The educational problems began to trouble the society seriously. The best minds were fighting in this walk of life. Voltaire was frankly against the education of the 'mob'. Diderot was speaking for the school, free of charge and available to all the levels of people. The brilliant works of humanistic philosophers were describing the school-dream, school-festival.

But the course of events was predetermined. The fruit of a lemon-tree is a lemon, so the industrial society produced a school-factory⁵. Its goals were clear: to teach people to listen and to remember, to act according to an instruction, to carry out the orders obediently, to accord one's own actions with that of the collective. To teach reading and counting, to teach punctuality and accuracy in doing the monotonous job. Children became the raw material, which had to be treated according to a certain technology, in order to obtain 'Homo industrialis'.

While the production grows more complicated, the volume of necessary education becomes greater. Children begin to go to school in a younger age; the school day and the school year become longer. Arithmetic and natural sciences take more and more place in the school education. In the 19th and 20th centuries the school became more complicated, the advances of science and the changes of culture, technology and everyday life have had an effect on it. But nevertheless the school remained mainly the school-factory.

However, some people's intentions did not always coincide with the motion of all the society. There were teachers, resisting the educational conveyor, in any historical age⁶. The most gifted children were falling out of the stream, too⁷. The lack of correspondence between the school program and educational technology, from one hand, and the demands of gifted people, from the other, resulted in the myths about the stupidity of the classical scientists (such as C. Darwin, B. Pascal, A. Einstein etc.) in school.

The more complicated the cultural environment is, the more loopholes appears for gifted students and prominent teachers, and the more chances they have to avoid the 'general equalization'. It's expected, for the industrial society both working hands, and managers, engineers, scientists. And the attempts to solve this problem at the early stages of industrialization by teaching only the children of higher estates failed.

Nowdays the school-factory is alive yet, but it is in a great fever. This fact really has a cause. We'll analyse the cause in detail. For that let us clear up three stages of the civilization.⁸

Stage 1 – pre-industrial: till the beginning of the 18th century. In this stage the child's ideology is formed mainly under his family influence. The child is in his family practically all the time, so no influence from outside can appear. The majority of common people never go further then the nearest village during all their life.

Stage 2 –industrial: relatively three last centuries. Great numbers of people move to towns, where the density of population is much greater. The post for common population appears.⁹ Railways and steamers make the world visible, if not frankly little. Telegraph, radio, TV... Now the information can come from anywhere in any short time (to tell the truth, mainly in one direction – from the ruling elite to the common people). The main role in forming the ideology passes from the family to the government. The state radio and TV can interpret the events and

affect the citizens' opinions in any way. One can't oppose anything so efficient to it, because nursery schools and schools are state institutions too.

Stage 3 – informational: from nowadays and on – now it's difficult to understand, how long. Information becomes the most important, profitable and mass goods – for the first time in the history. There appear informational technologies that allow great masses of people to communicate, to see one another, to argue and to affect each other, being at the opposite sides of the planet. In theory, soon there will appear personal TV channels – as many, as you like, even one channel per each person living on the Earth. Everybody will be able to make films and TV broadcasts or speak to the whole world over Internet – only the listeners will be needed. In this cosmos (or chaos) of information it will be more difficult to affect the ideology of a growing person. And it is said both about the state mass media and about school. Teachers in Russia have already noticed that it became more difficult to control children's opinions and disposition, especially in cities, where the informational space has grown much wider since the Soviet Union collapsed.

We are entering the new stage of civilization – the world is changing by leaps and bounds. So, the fever of the school is expected. Here is the curious fact: poor level of the American school students in mathematics and natural sciences 'is a serious menace to the USA's position in the world society'. That's said in the report prepared by the officials of the Knowledge Checking Centre in Princeton University.¹⁰

However, one can gather as many troubled politicians' and scientists' quotations, as he likes. It's more difficult to find the quotations that show the satisfaction with education in any civilized country.

New tasks for education

15 or so years ago I was lecturing in the town of N-sk. A grey industrial town. Mud, rubbish, sunflower seeds everywhere. An old school building, the paint on its walls has peeled off. The WC smell is felt in any place of the school. The most ardent dispute among the primary school teachers was caused by the problem of calligraphy.

'It develops culture and neatness!' – they exclaimed.

'Look through the window'- I answered.

I can agree that calligraphy is useful to a certain extent. Or, at least, it was useful, when the main task of primary school was to teach children mere diligence, to teach by any ways. To tell the truth, that time has already passed. But the inertia of thinking and the educational traditions and stereotypes have remained.

To our teachers' credit, such disputes grow weaker and weaker, calligraphy has fewer and fewer adherents, because the psychologist have discovered that a good handwriting is more the result of one's character than the result of lessons, and because the writing people in the whole world had replaced pens for keyboards.

The problem of calligraphy is very particular. I show it to you as an example.

Here is another example, a brighter one.

'Is literacy the purpose of education? If so, than what does the word 'literacy' mean? The skill of reading and writing? A well-known anthropologist Edmund Leach asserts in his daring article written for the Prognostic Centre in Edinburgh, that reading is easier and more useful than writing; and generally it's no use for one to have writing skills. The technical means that recognize speech clear vast space to us'.¹¹

Even a few years ago I would consider these words to be fantastic, and now I am dictating this article to my computer.

The 'clever' technical equipment is developing quickly. The life perception is changing. Sometimes it's enough to meet a person or a book or simply stop, look around and think. Let's not be afraid of thinking, even if the conclusions will turn to be unusual.

What problems does the modern school teach to solve? And what problems does the life raise before the young people? We see even without analysing that these problems are of different kinds.

To teach reading and writing, to acquaint with the principles of sciences is an evident purpose of the school. To teach submitting oneself to the senior's will, to obey the rules and instructions – this purpose is not mentioned aloud, but it is not less significant to the modern school. Probably, it's even more significant. School's attitude to the discipline violation is much more sensitive, then that to the student's poor progress in studying, even if it is the violation of the rules that are out of date. School allows the change in the substance of education, than breaking of the traditional method of teaching.

I am not going to assert that this purpose is wrong. I think that the accents must be changed, that some other discipline is needed. The school is so keen on the factory discipline that it did not notice the change of social needs. Now only 10% of the population of the developed countries works in the mass line production. But the necessity in people who are able to make decisions themselves, of initiative and ingenious ones is constantly increasing. I say that the mass school is not working purposefully on the development of these quite necessary features. In other words, the school tries to ignore a new central task for itself: teaching children to live in a dynamic, quickly changing world. It's hard to live, and it will be harder, to those, who have not learned to make their choice.

Does one have much mind to get married? Formerly there was not much to choose, and a young man did not make that choice himself.¹² Due to today's density of the population and the development of the media the choice is endless. Some people are choosing in such a way all the life.

...He and she have got acquainted over Internet; they were in correspondence for some time, then they met each other and got married. That's only one of the possible scripts. All the borders are washed away. Different countries, languages, nations, and races – nothing stops the choice. It is so already, and it will be so – the further, the more.

Now it has become a real opened problem¹³. To choose the profession and the place of studying, to change the place of residence or find a new job, even simply to buy something – everything becomes an opened problem, because a wide space of choice has appeared. It's necessary to learn how to live in this space. And one has a choice even here.

One may shut one's eyes and ears hysterically and give oneself to the mercy of anybody who wants to have power over him. One may give somebody a right to choose for him. A psychiatrist H.A. Sackdeo from the New Jersey Medical School, having talked to the people who had survived after the mass suicide in Georgetown, drew a conclusion: 'People have so many opportunities to choose, that they can't make decisions efficiently. They want somebody to make a decision, and they would follow it'.¹⁴

And one may learn (and teach, if we are speaking about school) to live in this space, to accept new realities to orient oneself and study quickly, to make the decisions on one's own.

There is one more nuance, as large, as happiness: if one does not cope with the problems that are falling upon him constantly, his character grows worse. It's well known: he, who sows the character, will reap a fate. If you want to see good, successful and happy children, teach them in a correct way, in correspondence with their real needs and social realities. By the way, in such a case children don't make any resistance to studying (common mass school feels such a resistance now).

How to turn the education to a proper direction? That's really a question! I offer you a few principles from a book: 'Technique of teaching'.¹⁵ These principles are like a bridge from the present into the future. They can be realized in the today's school, are already realized in the best schools and will be actual, though realized in other technical ways, in future.

Technique of teaching: principles

PRINCIPLE OF FREE CHOICE

In any teaching or ruling action, where it's possible, give the right of choice to a student. An important condition: the right of choice is always balanced by realized responsibility for the choice made.

That may be done within the limits of the modern educational system. Here are a few examples of the free choice. Victor Shatalov (a teacher of Mathematics) gives his students plenty of problems and the students choose themselves, which of the problems to solve. Sophia Lysenkova (a teacher of primary school) allows the children to choose what difficult words the teacher must write down on the blackboard. Ivan Volkov (the teacher of Handicrafts) gives his students only the topic, and they decide themselves what thing and of what material they will make...¹⁶

PRINCIPLE OF OPENNESS

Use opened problems in teaching; not only give the knowledge to your students, but also show them the limits of the knowledge; let your students meet the problems, the solution of which are lying beyond the bounds of the course being studied.

A student of secondary school (and even of the University) imagines the limits of his knowledge very vaguely, and the limits of the scientific knowledge as a whole are in the fog at all. Then where to take inquisitiveness, without which any teaching is no more than the training of executors!

In school the 'closed' problems (from point A to point B) are solved, and life gives you opened problems! And the students' interest and, as a result, our educational efforts, often fall into this gap between the closed school problems and the open problems of the life.

PRINCIPLE OF ACTIVITY

Students must master the knowledge, skills and habits mainly in the form of activity.

While the students' knowledge is checked in the form of a quick rendering in the tape-recorder regime, while studying and reviewing are realized in the form of learning by heart, school is working idle for 90% of time.

If a student wants his knowledge to be a tool and not a heap of old stuff at the backyards of his brains, he must work with it. What does it mean 'to work with the knowledge'? In common words that means: to use it, to look for the conditions and limits of its applicability, to transform, expand and amplify it, to find new connections and correlations, to consider in different models and contexts...

PRINCIPLE OF THE BACK COMMUNICATION

The process of teaching must be controlled with the developed system of feedback.

The more developed the system (technical, economic, social or educational) is, the more mechanisms of feedback it has. A pilot follows a set of parameters using the instruments during the flight: from the temperature overboard to the level of fuel in the tanks. A successful flight can't be imagined without it. Neither a successful lesson. Only a teacher follows other parameters during the lesson: Students' mood, their interest, level of understanding...

PRINCIPLE OF IDEALITY

Use the abilities, knowledge, and interest of the students themselves maximally in order to raise the results and reduce the energy spent in the educational process.

The greater the students' activity and self-organization is, the more ideal the teaching or ruling action is. If we accord the substance and forms of education with the students' interests competently, they will try to learn 'What's on?' THEMSELVES. If we accord the rate, rhythm and complexity of teaching with the students' capabilities, they will feel their success and will want to support it THEMSELVES. The principle supposes the active involvement of the students into the ruling of their collective, and they begin to teach each other THEMSELVES. The teacher does not get tired while efficiency of his work is very high! It was low ideality that caused the fact that many methods of teaching were rejected in spite of their use: they required from the teacher either much power or too rare features.

The principles of teaching themselves are declarative. They become tools in the certain methods and technologies. But even the best technique of teaching is only half the work. The other half is the substance of teaching. What to teach?

What to teach?

The education is based on the knowledge delivering, which often is out of date even before they are included into the school curriculum. How to catch up with science?

We have a paradox: we must teach the children to live in the world that we don't know yet – in the world of future. This paradox has appeared not long ago, when the technological and scientific paradigms began to change within one generation.¹⁷

The particularly specialized education does not satisfy the rate of life, too. The more particular the specialist is, the more difficult it is for him to learn again, to orient himself in the adjoining branches of knowledge. And the solving of the modern problems requires more and more system approach, skill of seeing far consequences. A problem, solved well, causes new opportunities, a badly solved one causes new troubles. And this concerns not only scientific or other professional activity, but the common life, too.

Neither higher nor secondary education satisfies these demands in the present time. Large companies more and more often try (not always successfully) to solve this problem for themselves. Here is a typical example: the American company 'Bell telephone system' has organized the Humanitarian institute for promising managers as a remedy from particular specialization.¹⁸

Mastering of knowledge by the students of today's school is divided into separate subjects. I give a problem at the lesson of physics to a strong group of students. In order to solve the problem one must use his knowledge of chemistry. The results are poor. We begin to analyse. And the students say 'Well, why didn't you say that we should use chemistry? We would solve the problem!'

It's hard to expect that after many years of education divided into subjects the system thinking should appear itself. Constantine Ushinsky said about it figuratively: 'Concepts and even ideas lies in the head in dead rows, like swallows, benumbed by frost, do according to a legend. One row is lying close to another, knowing nothing about each other, and two ideas, which are allied with each other, may live in such really benighted head for decades without seeing each other.'¹⁹

A well-known physicist Leo Szillard proposed a simple image: let us imagine all the humanity's knowledge to be a ball. Then the space outside the ball is the field of unknown. The surface of the sphere symbolizes the border between the known and the unknown. But the greater the knowledge volume, the more is the area of contact with the unknown. And every point of this area is an opened problem.

In principle, nothing prevents from filling the school education with opened problems. The regular collision with the creative, research problems, including those the answers for which is not known yet, is necessary for the forming mind, as well as vitamins are necessary for the growing organism. And there are such problems in every school subject and between the subjects. And they are responsible for developing the creative intuition. As for the intuition, it is not only the Gift of the Heaven. It is the creative experience, organized in a special way. It's the experience of solving the non-typical problems, built into the subconsciousness.

The methods of training the imagination and inventive thinking have already come to the education. For example the patent department of the USA has worked out a special programme PROJECT XL that is urged to support the development of inventive thinking skills at all the level of studying: the department has also worked out the 'Handbook of the inventive thinking resources' for teachers^{iv}.

But we shall go still further. 'Imagination is more important than knowledge' – said Albert Einstein. We shall agree with this, but with a reservation: knowledge how to think in a non-standard way, that is to imagine, is just more important. Such knowledge and, above all, the skill

of solving non-standard problems, is developed by the theory of solving the inventive problems. And in spite of the fact that this theory has become world property already, the most interesting experimental sites of using it in the field of education are situated in Russia. Certainly, they are tiny sparks in the awaking volcano of new education. But a spark may give the birth to flame.

To tell the truth, the developed inventive thinking isn't yet enough for success. In order to be productive, one must have at least one more skill – to organize the creative work. This includes planning the work and the working time calculation, skill of working with data bases, mastering the estimation of scientific work and much else. And certainly, discipline. Not stupid executive discipline but conscious creative one. It's possible.

Conclusion

Ideal didactics is its absence. A student strives for knowledge HIMSELF in such a way that nothing can prevent him from that. Let the light go out – he will read with candles!

We have the **Ideal ruling** when there are no ruling actions but their function is carried out. Everyone knows what he must do. And everyone does it because he wants it HIMSELF!

The future of the school is determined not by the president of a separate country, not by the minister of education and even not by the teacher. But every participant of the educational process decides himself whether he wants to keep step with future or to march with his heels forward.

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¹ French engineer and scientist. Quoted after "Ideas and our world"/ under general editorship of R. Stewart.

² *E. Toffler*. "The third wave".

³ E. Use wrote this in 1935. Quoted after *E. Toffler*. "The third wave".

⁴ Data from *A.N. Dzhurinsky*. "History of pedagogics".

⁵ The author does not give any appreciative sense to this image. The school-factory is neither good nor bad in this context. It is just a fact.

⁶ The nature of this resistance was not always progressive.

⁷ American psychologists have studied the biographies of 400 prominent people. It turned to be that 60% of them had serious problems at school in respect of adaptability to school conditions. The fact taken from *Yu.Z. Gilbukh*. "Attention! Gifted children".

⁸ Here we use the model of dividing the history of society into stages, suggested by E. Toffler.

⁹ The new mailing system was based upon the principle of preliminary paying. The first postage stamp – 'the Black Penny' appeared in England in 1840.

¹⁰ The fact taken from the "Yuny tekhnik" magazine, No. 1, 1990.

¹¹ *E. Toffler*. "The third wave".

¹² We say nothing about the girl.

¹³ An opened problem is characterized by the fact that it has neither correctly formulated terms nor previously known algorithm of solving and the only correct answer.

¹⁴ Quoted after *E. Toffler*. "The third wave".

¹⁵ *A.A. Guin*. "Technique of teaching"

¹⁶ See "Basis of the pedagogical mastery", edited by I.A. Zyazyun.

¹⁷ For example, the technological paradigms of radio construction have changed 4 times within a generation: electrovacuum devices – transistors – microcircuits – large-scale integration circuits.

¹⁸ The fact taken from *M. and E. de Liu*. "How to study to read quickly".

¹⁹ Quoted after *V.S. Rottenberg, S.M. Bondarenko*. "Brain. Studying. Health".

²⁰ World Patent Information, Vol. 12, No 2, pp. 81–82, 1990.