

To: President Barack Obama
The White House
1600 Pennsylvania Avenue
Washington DC 20500

Dear Mr. President (I truly hope that at least this page reached you instead of “Department of Education basket”),

I urge you – when you leave the white House - to use your will, experience, status, and connections (a very important social item!), to concentrate on solving the number one problem of the Country – poor education at too many places and levels.

My name is Valentin Voroshilov.

For the last twelve years I have been teaching at a two-year for-profit college, four-year state and private colleges and universities. All my students had a high school diploma or an equivalent; but I would estimate that at least one third of them did not have skills and knowledge corresponded to the high school syllabus. **The problem is not just poor mathematical skills, but also inability to reason (in particular to keep track of several consecutive logical steps), inability to express their thoughts in a clear and logical way, poor writing skills.**

When I think about your idea of providing college education to all Americans, in general, I agree with it. However, from a practical point of view it would require fixing high school education first. Otherwise colleges essentially would have to become an extension of high schools (but why to pour funds in making colleges teaching high school material if the same funds could have been poured into high schools to help them to teach that material?). The worst case scenario, we would be at risk of having college graduates with “faked” diploma (in the same sense as a high school graduate whose skills are at the 8th grade level has a “faked” high school diploma).

I like a “joke” that to solve any problem we have to answer only two questions: “Whose fault is that?”, and “What do we do now?” I will concentrate on answering the second one.

The biggest problem of contemporary education is not an insufficient teaching, but an insufficient teacher preparation.

Currently there is no such thing as a systematic teacher professional development (or a teacher professional development system); there is a chaotic collections of various programs, workshops, degrees with no common view on what makes a person a good teacher, how to help a person to become a good teacher, how much time and through what stages should this preparation take place, which form of teacher professional development is more effective, etc.?

Instead of funding mostly a research which helps researchers to publish research papers but does not affect much learning outcomes of students in our schools, the vast amount of those funds should have gone directly to teachers (in the forms of teacher associations, say, unions). Teachers would be selecting what professional development program to attend and to pay for. And teachers would have been reporting on the quality of those programs (a word of mouth is the best review), making the programs to be tailored toward the actual needs of teachers – and also weeding out programs which do not help.

We need to give teachers time and money (directly to teachers!) to grow professionally, we need to trust them with their choice of professional development programs. But we also need to watch closely the results of their work and we need to make them to be aware of us watching. The government needs to develop the system which would allow to measure – objectively and uniformly (i.e. comparably) – learning outcomes of students.

One might say that we tried it and it did not work, meaning the development and implementation of common core standards. Long story short, it would never work – but not because of politics; it would never work because *standards do not measure learning outcomes!* Learning outcomes are based on specific measuring procedures and tools, hence *specific measuring procedures and tools have to be standardized* (a word play, so to speak).

Is it possible? Technically – yes. Practically – very hard and requires a lot of political will and power (including yours Mr. President), and a social pressure. **Without moving toward “the system which would allow to measure – objectively and uniformly (i.e. comparably) – learning outcomes of students” we will not be able to finally develop the science of education, which we need in order to reform the way we reform education.**

The way education has been reforming so far has not leaded to the significant change in the quality of education.

Dear President Obama, you always have been honest with people of America. **Someone of your social weight needs to stir up an honest discussion about how to redirect the reform in the direction it needs to be redirected.**

Sincerely Yours,

Dr. Valentin V. Voroshilov

P.S. If you would be willing to obtain more detailed information on the matter, the next 6 pages represent an extended version of this letter (or you can find it on the Web), and I really hope you will find my book useful, too.

Dear President of the USA, Mr. Barak Obama,

All media are eagerly discussing if your legacy will be positive, seen and remembered.

I would not worry much about it.

You have done so many great things for this Country, so you will be leaving the Country in much better shape than you got it eight years ago.

People who do not see that, will not see it anyway because they are blinded by the sheer hatred toward you.

What I personally hope for is that among many of your plans for your “retirement” you plan on supporting

EDUCATION!

Improving the US (or any country’s) educational system is a very hard job. The educational system needs to be considered as a number one element of national security, and the state of education should be considered as national emergency.

Without making drastic changes in the system leading to drastic improvement in learning outcomes of students the Country will be doomed to fall behind and will be at risk of losing its world leadership status.

That is why I urge you to use your will, experience, status, and connections (a very important social item!), to concentrate on solving the number one problem of the Country – poor education at too many places and levels.

I know that because I teach, and I care.

I have been teaching mathematics, physics, logic, problem solving to students of almost all categories – starting from 5th graders and all the way up to college and university students, elementary, middle and high school teachers (including method of professional self-improvement), and students with learning disabilities. A lot of my teaching had happened before I moved to the US. Lately I have been teaching college and university physics. Am I good at teaching? The answer is “Yes”. This answer has been officially and unofficially given to me and my superiors by many many of my former students ([Appendix I](#) provides pages of quotes from my student evaluations – even with my English which I learned on my own; [you can also see there](#) how large and diverse experience in education I have – so, if I speak about something, I know what I am talking about – BTW, one of the things students said about me).

For the last twelve years I have been teaching at a two-year for profit college, four-year state and private colleges and universities. All my students had a high school diploma or an equivalent; but I would estimate that at least one third of them did not have skills and knowledge corresponded to the high school syllabus. The problem is not just poor mathematical skills, but also inability to reason (in particular to keep track of several consecutive logical steps), inability to express their thoughts in a clear and logical way, poor writing skills.

When I think about your idea of providing college education to all Americans, in general, I agree with it. However, from a practical point of view it would require fixing high school education first. Otherwise colleges essentially would have to become an extension of high schools (but why to pour funds in making colleges teaching high school material if the same funds could have been poured into high schools to help them to teach that material?). The worst case scenario, we would be at risk of having college graduates with “faked” diploma (in the same sense as a high school graduate whose skills are at the 8th grade level has a “faked” high school diploma).

I like a “joke” that to solve any problem we have to answer only two questions: “Whose fault is that?”, and “What do we do now?”.

I will try to concentrate on the second question.

Firstly, the task is huge! If the problem could have been solved without using drastic changes in approaches and policies, it would have been solved years ago. The development of the solution requires the use of infamous “critical thinking” so loved and advocated for by many reformers (BTW, if it is not “critical” it is not thinking).

1. Teachers.

School buildings, libraries, computers, textbooks and all relevant infrastructure are important, but the key factor of teaching is teachers. When I read or hear people saying “we need to study the correlation between the quality of teachers and learning outcomes of students” I think “What a waste of time and money” (also “What a load of BS – Beyond Sense-making). This “study” has nothing to do with a science or research.

A scientific approach would require a different kind of reasoning: “1) Based on our logic and experience we start from a working hypothesis that to insure the high quality of student learning outcomes we must insure the high quality of teaching provided by teachers. 2) Based on this working hypothesis we employ all possible methods to improve the quality of teaching practices.

3) Based on this working hypothesis, to study the expected correlation, we advance methods for measuring student learning outcomes in order to do it objectively and uniformly. 4) The second working hypothesis states that the quality of teaching practices demonstrated by teachers is directly and “proportionally” related with the quality of teacher preparation. 5) Based on the second working hypothesis we advance methods for measuring the quality of teacher preparation in order to do it objectively and uniformly.”

Below is a quote from my book [“Breaking The Mold of Conventional Thinking: a Personal Quest for Teaching Philosophy \(and a Teacher’s Quest for Personal Philosophy\)”](#):

(Start of the quote) “University are conducting research on the relationship between mathematical knowledge for teaching (MKT), teaching practice, and student outcomes. The study of MKT is embedded in a study of the effectiveness of the Math Solutions professional development model. Math Solutions is a widely used professional development provider started by Marilyn Burns. The study builds on work of the research team and differs from earlier work in that 80 fourth and fifth grade teachers in twelve Albuquerque, NM schools are randomly assigned to either the treatment group or the control group. Randomization occurs within grades within schools. Math Solutions provides teachers in the treatment group professional development that has a strong focus on MKT. Teachers in the control group receive the typical professional development offered by the district.

This consists of a combination of summer mathematics institutes and three-to-six hour introductions to Everyday Mathematics, the instructional materials used by the schools in the study. The research questions are as follows. How effective is Math Solutions as compared to a typical ad-hoc mathematics professional development?

Does Math Solutions improve teachers’ MKT, the quality of their instruction, and/or their students’ outcomes? How are different aspects of teachers’ mathematical knowledge and instructions related to student achievement? Teacher MKT is measured by Learning Mathematics for Teaching (instruments developed by the PI and colleagues) and student achievement is measured by assessments developed recently by the PI with the NSF support. Classroom observations and video provide data on classroom instruction.” (end of the quote)

Above was a quote from an abstract of a grant proposal of a certain university (the grant received an award from the NSF close to \$5,000,000.00).

I don’t know about you, but when I read this, I picture an entomologist looking at the bunch of ants, or maybe an Army marine biologist who studies how to better train dolphins to attack enemy submarines. “Hey teachers, this is what we are going to do to you, and then we will measure if you ever become better”.

I believe that research like this one will generate many academic papers, and reports, and policy recommendations, and future grant applications, but in the end it will not make much of a difference for students of those teachers (researches simply will move on to study new aspects of their theories).

I believe that nowadays we do not need to spend considerable amount of money to study what is teaching or what is learning or what school teachers should know (by today this should have become obvious).

Instead:

1. We should agree (as a working hypothesis) on a working definition of teaching and learning, and on benchmarks for student learning outcomes for each subject and at each grade, and use them to propel positive changes in teaching practices (and those who do not agree with “working” definitions and benchmarks must provide their own and clearly explain the difference between the “working” ones and their own).
2. We need to concentrate available funding on teacher preparation, which will result in propelling positive changes in teaching practices.

By the way, the grant I mentioned above had been funded by almost five million dollars. I could give the answer to the “research question” immediately and for free: (a) for a math teacher teaching n-th grade math his/her math skills have to be no lower than corresponding to (n+3)-th grade math (why (n+3)? This is what a scientist call “a working hypothesis”); (b) ANY method which prepares the n-th grade math teacher with (n+3)-th grade math knowledge is good. There is no need to study if one syllabus, or workshop, or professional development program is better than another one. Instead ALL have to be funded - *as long as they lead to the required teacher knowledge* (measurement procedures, of course, must be a part of the grant proposal and have to be aligned with the previously agreed “working” benchmarks). (c) Finally, the answer to “research question” “How effective is Math Solutions as compared to a typical ad-hoc mathematics professional development?” is - it does not really matter (see part (b)).

By the way, if I was given the exact description of the “Math Solutions” and “ad-hoc” methods (people, syllabi, hours, examination materials) I could answer the question within a day or two. I know that I sound arrogant, but trust me this is not arrogance, this is just confidence based on years of successful teaching and research experience. In fact, this alone could have been an interesting experiment, if I would have provided my report which would have been compared with the five million dollars one.

And one last thing; asking millions of dollars to find out “Does Math Solutions improve teachers’ MKT, the quality of their instruction, and/or their students’ outcomes?” is not really practical, but even less practical is giving millions of dollars to answer that question. NSF should have demanded that applicant would *guaranty* that their professional development approach would definitely and visibly “improve teachers’ MKT, the quality of their instruction, **and (!)** their students’ outcomes” – or money back.

Maybe in the future robots will replace human teachers, but until AI becomes powerful enough, the focus of education reform must be on teacher preparation. Like in any other profession, 99% of teachers are only as good as good was their teacher preparation. Qualitative (drastic, significant, visible) changes in results of school education must be based on qualitative (drastic, significant, visible) changes in teacher preparation.

The biggest problem of contemporary education is not an insufficient teaching, but an insufficient teacher preparation.

2. Teacher preparation.

I put aside a discussion about how to attract people into teaching, or how to keep people into teaching, or how to improve in general social status of teachers.

The facts are:

(a) Not anyone can be a good teacher (like not anyone can be a good cook, despite the fact that everyone can cook something)

(b) Becoming a true teacher takes years of hard work; when one gets Masters in education that is only a beginning of a long learning process.

(c) Currently there is no such thing as a systematic teacher professional development (or a teacher professional development system); there is a chaotic collections of various programs, workshops, degrees with no common view on what makes a person a good teacher, how to help a person to become a good teacher, how much time and through what stages should this preparation take place, which form of teacher professional development is more effective, etc.?

“What do we do now?”

You may not like my answer, but your fellow opponents from Republican party would: “We have to create a market for teacher professional development programs”.

No one knows better than a teacher what really helps him or her to teach his or her students. A teacher may not be able to find scientifically sound words to describe what works and what doesn’t, what is needed and what is just a distraction and waste of time, but a teacher always knows!

Instead of funding mostly a research which helps researchers to publish research papers but does not affect much learning outcomes of students in our schools, the vast amount of those funds should have gone directly to teachers (in the forms of teacher associations, say, unions). Teachers would be selecting what professional development program to attend and to pay for. And teachers would have been reporting on the quality of those programs (a word of mouth is the best review), making the programs to be tailored toward the actual needs of teachers – and also weeding out programs which do not help.

Another quote from my book: teachers “should be placing orders for various teacher preparation activities/programs, and also keep track of the effectiveness of those programs (government officials should keep track of the results of teaching and make them openly available, and parents should keep teachers to be accountable for the results of teaching). To advance the preparation of the current and future teachers we all need to start trusting them with the way they improve their work (trust, of course, should be balanced by verifying that the results of their work show an improvement).

Instead of experimenting on teachers (will they learn something or not if we make them do this and that?) universities (and other providers) should reach out to teachers and ask them what do teachers need to be developed (in exchange for the money the teachers have from the NSF or other sources), or market to teachers already developed solutions.

Don't we usually say that the best way to teach someone to take responsibilities is making the person to be in charge? Maybe it is time for teachers to say: "Let us make in charge for our own professional growth"?" (end of the quote).

I know that after reading this paragraph many people would begin saying (or at least thinking) that we cannot trust teachers, there are many lousy and even lazy teachers, teachers have to be accountable for learning outcomes of students and we cannot just give away money without having a full control on how would teachers use the money, etc.

I would like to say first that if we still have too many lousy and even lazy teachers that should be considered as a sign to try something very different from what had been used for decades.

For the last two decades (at least) government and charitable organizations spent billions of dollars on teacher preparation, but – still – we hear again and again about having “too many lousy and even lazy teachers”.

The discussion has been circulating between “charter schools v. public schools”, or “merit pay v. tenure”. Instead we should have a discussion on “accountability v. measurability”.

When people say “accountability” they mean a trivial application of “a stick and a carrot” approach: “You are a good teacher – take some extra money”; “You are a bad teacher – we will punish you”.

There are many technical barriers for using this approach, like, deciding who and how will be judging the quality of teachers' work. But it will not work in the first place simply due to human psychology.

Many parents know that even for children “a stick and a carrot” approach does not really work (at least in a long run). And yet there are so many proponents of the approach who want to apply it to adults who have to govern behavior of dozens of children. It is not wise and it is not going to work. **At the best people start mimicking behavior demanded from them and faking the results** (exactly like kids!).

For every professional, including teachers, the strongest motive to work as good as possible is to be recognized as a professional. In one word, the strongest motive to work as good as possible is “visibility”.

Imagine what a strong motivation to do the best he/she can would a teacher had if at the end of every week/month/semester/year everyone could see how his/her students performed compared to the rest of the class/school/district/state/country!

Make the work of teachers truly visible is the task that federal and state governments must solve – this is the “measurability” part. However, the judging – what to do about his or that teacher (i.e. “accountability”) - should be decided in a way chosen by a school, a school district, a school committee.

We need to give teachers time and money (directly to teachers!) to grow professionally, we need to trust them with their choice of professional development programs, but we need to watch closely the results of their work and we need to make them to be aware of us watching.

The last part requires measurability of the educational process, including (but not limited) measurability of learning outcomes of students (by the way, learning outcomes of n-th graders automatically become learning backgrounds of (n+1)-th graders).

3. Measurability.

There is no person in the whole world who would defend *absolute* absence of measurability in education (“Just let teachers teach, no need for quizzes, test, exams”).

People differ on what to measure, how to measure, and how to use the results.

My approach is simple:

- (a) everything what can be measured should be measured, and documented, and be open to general public, unless
- (b) the measuring procedures or results might impede students' learning.

Part (a) represents the objective, part (b) represents the limits.

The biggest problem with measurements in education is not that we don't have enough or accurate measurements, it is that we cannot compare any of those.

Imagine unthinkable: all 50 states have different temperature scales (or standards of mass, or time) and they do not have conversion factors, hence, measurements done in one state cannot be understood in another state. Sounds kind of ridiculous, doesn't it? Imagine now that all 50 states have different currency, and there are no exchange rates, there is no way to use money from one state in another one (what's left is just using barter). This situation is even more than just ridiculous, it is impossible! And yet, this is exactly the current situation with measuring learning outcomes of students. In an ideal world any parent, teacher, official should be able to compare how a child is doing at a school relative to any other child anywhere in the country.

In the previous part I made a statement that in order to improve teacher professional development the government should get out of this business and create a market which would regulate the quality of teacher professional development programs.

Now I want to point at what the government needs to do: it has to develop the system which would allow to measure – objectively and uniformly (i.e. comparably) – learning outcomes of students.

One might say that we tried it and it did not work, meaning the development and implementation of common core standards. Long story short, it would never work – but not because of politics; it would never work because *standards do not measure learning outcomes!* Learning outcomes are based on specific measuring procedures and tools, hence *specific measuring procedures and tools have to be standardized* (a word play, so to speak).

Is it possible? Technically – yes ([see the Appendix II](#)). Practically – very hard and requires a lot of political will and power (including yours Mr. President), and a social pressure. Without moving toward “the system which would allow to measure – objectively and uniformly (i.e. comparably) – learning outcomes of students” we will not be able to finally develop the science of education, which we need in order to reform the way we reform education.

4. Science of education.

I belong to a group of scholars who believe that there is no yet such a thing as a science of education. There are many scientific activities (hence many people enacting those activities - scientists), but the field is currently in a pre-science stage (nowadays we have an “alchemy” of education, i.e. many common sense rules, recipes, case studies of a good and bad education, etc.).

In his book “Toward a Science of Education” Dr. James M. Kaufmann writes: “I have endeavored to make the point that founding a true science of education is indeed difficult. We don't have all the evidence we need, nowhere near it, and we too seldom act on the basis of the evidence we do have”.

The first step toward science of education is to accept the fact that it does not exist. From a point of view of a scientist in the field this should be a good thing, meaning there is lot to discover!

However, after accepting this fact we have to reconsider the way we fund all activities related to improvement in the field of education.

Not any possible question should be called a hypothesis, and not any possible activity which leads to an answer should be called a research.

In general, there are three kinds of human practices/projects with the goal of advancing human life: (a) scientific research - the goal of a scientific research is discovering new knowledge; (b) engineering and art - the goal of an engineering development is building new devices (and systems of devices), the goal of art is bringing/developing artifacts of art; (c) social advancement - the goal of a social advancement project is developing or adopting new collective practice(s) (new for the given social group).

Since all three practices/projects have different goals, they all should be managed differently.

Clearly, every practice has some elements of a scientific research: when we start a project, we generally have some understanding of what we want to achieve and how we want to achieve that (“a hypothesis”), and how will we assess (measure) how close we are to the goal (“facts”).

But if we want to induce some societal change, we have to initiate and manage a social project. Social progress is the result of innovative practices of people doing something new - to them – which they did not do in the past. Scientific progress is the result of practices when people do something new to a large part of human culture (“scientific field of study”).

Many of the “research” projects “imposed” on teachers are *social* projects by their nature, and should be treated and managed as such (for example, redirecting funds from NSF).

It does not mean, however, that there is no fundamental research left to do in education. There are lots of fundamental questions to study.

If I had to select what to fund I would start from looking around for a list of fundamental scientific facts and relationships that had been discovered in the science of education over the last two or three decades, and then for the list of questions that should be studied now and answered as soon as possible (an analog of the Hilbert’s list of problems). The first thing I would ask every researcher applying for a scientific grant is what is his or her version of this list, and how his or her research is connected to the fundamental questions to be answered by the research community. If they give an answer, that is a research project (belongs to the NSF), *otherwise the project is social* (belongs to N Social F?).

My view is that everyone who applies for a grant to fund a *scientific* research in education should demonstrate the use of the *scientific* method developed in physics, math, chemistry, but applied to study phenomena in the realm of education.

In many cases to begin a scientific research a scientist starts from building up a classification table of the objects and processes under study (the first step of collecting data is becoming an original “botanist”).

In education everything is happening with people and in people (in their brains and muscles).

The number of different kinds of learners (different by age, gender, race, social background, economic background, intellectual background, language, motivation, learning abilities and psychological characteristics) is finite. The number of combinations of different learners in different class settings is also finite. The number of scientific subjects to learn is finite. The number of stages for each subject to be learned (and, hence, the time to learn it) is finite.

For any subject, the process of learning it has a finite number of steps, elements, “atoms”. Hence, the “grand classification table of learning spaces and trajectories” has a finite number of elements, and, hence, needs a finite time and resources to be developed. If developed, it would have answered a question: “for the given type of a student, and for the given learning and social environment, what learning activities should the student perform in order to master the given subject?”

Time is the most important parameter of any process. Since every learning action, every learning experience takes a certain time (which depends on the type of the learner and the learning environment) - we need to know how much time it might take for learners of different types to learn each “atom” of a subject, so we could better plan and perform teaching activities using for each student the most efficient ones.

The government spends billions of dollars on collecting the ocean of information about citizens. It could spend some of the money on collecting data on students (anonymously, of course); race, age, gender, short term memory, long term memory, concentration, attention span, and correlate with grades, and with social parameters of the learning environment.

Finally, when we talk about education, we talk about controlled process, i.e. about teaching managed by a certain person – a teacher.

Every single thing a teacher does, every teaching action, every instructional move also takes time.

Teaching practice also is composed of “atoms”. If we want that teachers could manage teaching practices effectively and efficiently, we need to know in the first place how much time a teacher (of a certain type – which are different) spends on each “atom” of his or her teaching practice.

As we can see, there is a wide open space for fundamental research in education.

The government spends enormous amount of money on developing research facilities to study the world of physics (“Manhattan project”, Apollo program, ISS, the Hadron collider). It is time to spend some money on research facilities to study the world of learning and teaching.

5. Reformation of reformation.

One of the most important qualities of any politician is to be honest with himself/herself. Dear President Obama, you also have been always honest with people of America. The way education has been reforming so far has not led to the significant change in the quality of education. **Someone of your social weight needs to stir up an honest discussion about how to redirect the reform in the direction it needs to be redirected.**

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