#### (1) Hello, I am Dr. Valentin Voroshilov,

#### http://www.phystec.org/conferences/2016/ Physics Improving the Education of Teacher Future Physics Teachers Education Coalition » home » PhysTEC Conferences » 2016 Conference **PhysTEC Home** Conference About PhysTEC 2016 Physics Teacher Education Coalition Conference **Physics Teacher** Shortage March 11, 2016 - March 13, 2016 in Baltimore, Maryland at the Outcomes Royal Sonesta Harbor Court - Baltimore Project Leadership The Physics Teacher Education Coalition Conference is the nation's Institutions largest meeting dedicated to physics teacher education. It features workshops, panel discussions, and presentations by national **Key Components** leaders, as well as excellent networking opportunities. The conference will precede the APS March Meeting. Conferences & Workshops Physics Baltimore The Conference begins at 7:00 pm Friday, March 11 and ends a Teacher 2016 Education 2:00 pm Sunday, March 13. Publications & Coalition Presentations video: https://voutu.be/Ix5Mu3M3YFk pdf: http://www.teachology.xyz/pr16.pdf LINKS:

(2) I've been in the field of education for many years playing many different roles.

I was born and grew up in Russia. I had a pretty good career in Russia, but when I got a chance to move my family to the US, I took that chance.

#### www.TeachOlogy.xyz Dr. Valentin Voroshilov Professional experience and areas of expertise: **Consulting: Teaching:** Individual teachers **Algebra based physics** School administrators Calculus based physics District administrators Physics for science teachers School and district teams of **Physics for students with** educators learning disabilities on strategies and tactics for Algebra advancing teaching practices Geometry and improving learning Trigonometry Baltimore 2016 outcomes. Methods for teaching physics

(3) After starting again from the bottom I have regained most of my previous career achievements. I am pretty proud of this, considering I had no formal education in English and no professional network to support my efforts.

## Dr. Valentin Voroshilov

## www.TeachOlogy.xyz

#### Professional experience and areas of expertise:

Teaching:CoAlgebra based physicsIndividual teCalculus based physicsSchool admiteCalculus based physicsSchool admitePhysics for science teachersDistrict admitePhysics for students withSchool and teIearning disabilitiesSchool and teAlgebraon strategieGeometryadvancing teTrigonometryand improvioMethods for teaching physicsOutcomes.Dr. Valentin Voroshilov

<u>Consulting:</u> Individual teachers School administrators District administrators School and district teams of educators on strategies and tactics for advancing teaching practices and improving learning outcomes.



Some of our publications

#### click here for more

Thinking about becoming a STEM teacher? ThinProfessional Designing As One Of The Key CompEducation reform needs a new paradigm.A confirmation of good teaching.How I flipped my class without even knowing it.

Physics Baltimore Teacher 2016 Education Coalition

Helping people with achieving their goals! Consulting Teach/logy.xyz 617-657-9436

LINKS: video: https://youtu.be/Ix5Mu3M3YFk pdf: http://www.teachology.xyz/pr16.pdf

Teachology

(4) The title of my presentation is "Project-oriented form of teacher professional development for pre-service and inservice physics teachers"

I would like to start my presentation from two statements:

# Physics Baltimore "Project-oriented form of Teacher teacher professional development for pre-service and in-service physics teachers" (a.c.a "Professional Designing")

LINKS: video: https://youtu.be/Ix5Mu3M3YFk pdf: http://www.teachology.xyz/pr16.pdf

(5) Physics is a science.Teaching physics is not.Of course, these statements are based on a certain definition of "science".

# Physics is a science.





Teaching physics is

not.



LINKS: video: https://youtu.be/Ix5Mu3M3YFk pdf: http://www.teachology.xyz/pr16.pdf

(6) Personally, I do not like descriptive definitions like "science is the intellectual and practical activity encompassing the systematic study of the structure and behavior of the physical and natural world through observation and experiment" (this is the top Google search result for "definition of science"). In fact, such a definition does not really allow to distinguish a science from a religion. I prefer operational definitions, like "A science is an internally consistent body of knowledge based on the scrupulous and logical analysis of a vast amount of data". In particular, this definition allows us to see when a school of thoughts becomes a science.

A descriptive definition

"Science

An operational definition

is the intellectual and practical activity encompassing the systematic study of the structure and behavior of the physical and natural world through observation and experiment." religion

is an internally consistent body of knowledge based on the scrupulous and logical analysis of a vast amount of data."



(7) For example, Astronomy dropped Astrology and became a science when Kepler finished his analysis of huge amount of data collected before him, and wrote his famous laws. Of course, in reality there is always back and forth between theorizing and data collecting, or as we call it today – data mining, but in the end,



(8) every science is based on a solid foundation of the results of intensive data mining. If teaching physics is not a science, can it become such? Of course. All we need is to mine a lot of reliable and comparable data.

![](_page_7_Picture_1.jpeg)

![](_page_7_Picture_2.jpeg)

Physics Baltimore Teacher 2016 Education Coalition

LINKS: video: https://youtu.be/Ix5Mu3M3YFk pdf: http://www.teachology.xyz/pr16.pdf

## (9) I want to stress the latter word – comparable. Educational data mining is a young field. It starts producing a large amount of data.

#### International Educational Data Mining Society

Home JEDM Proceedings Resources Related Orgs Mailing

![](_page_8_Picture_3.jpeg)

Educational Data Mining is an emerging discipline, concerned with developing methods for exploring the unique and increasingly large-scale data that come from educational settings, and using those methods to better understand students, and the settings which they learn in.

LINKS: video: https://youtu.be/Ix5Mu3M3YFk pdf: http://www.teachology.xyz/pr16.pdf

Not yet an IEDMS member? Join or Renew Now!

#### Recent News

Proceedings of the Eighth International Conference on Educational Data Mining now available here.

Journal of Educational Data Mining issue 7(2) now available here.

#### Upcoming Conferences

Ninth International Conference on Educational (10) However, having a lot of data without being able to make a comparison is like using different currencies without establishing exchange rates.

![](_page_9_Picture_1.jpeg)

## Do we have the same knowledge?

LINKS: video: https://youtu.be/Ix5Mu3M3YFk pdf: http://www.teachology.xyz/pr16.pdf

(11) The history of physics shows us a means for establishing the comparability we need – such means are called standards.

# Standard (metrology)

From Wikipedia, the free encyclopedia

In metrology (the science of measurement), a standard (or etalon) is an object, system, or experiment that bears a defined relationship to a unit of measurement of a physical quantity.<sup>[1]</sup> Standards are the fundamental reference for a system of weights and measures, against which all other measuring devices are compared. Historical standards for length, volume, and mass were defined by many different authorities, which resulted in confusion and inaccuracy of measurements. Modern measurements are defined in relationship to internationally-standardized reference objects, which are used under carefully controlled laboratory conditions to define the units of length, mass, electrical potential, and other physical quantities.

ᅯ The International Prototype Kilogram (IPK) is an artifact standard or prototype that is defined to be exactly one kilogram mass. Baltimore

Teacher 2016 Education

Physics

video: https://youtu.be/Ix5Mu3M3YFk pdf: http://www.teachology.xyz/pr16.pdf LINKS:

#### (12) We would have never had a hadron collider built in Geneva if after an almost hundred year long journey physicists would not agree on a set of common standards. KING HENRY DIED DRINKING CHOCOLATE MILK

Mnemonic	King	Henry	Died	Base Unit	Drinking	Chocolate	Milk
Length: Abbreviation:	Kilometer km	Hectometer hm	Decameter dam	Meter m	Decimeter dm	Centimeter cm	Millimeter
Weight: Abbreviation:	Kilogram kg	Hectogram	Decagram dag	Gram	Decigram dg	Centigram cg	Milligram mg
Volume: Abbreviation:	Kiloliter kL	Hectoliter hL	Decaliter daL	Liter L	Deciliter dL	Centiliter cL	Milliliter mL
How many are in 1 meter/gram/liter	.001	.01	.1	1	10	100	1000
How many meters/grams/liters are in this unit?	1000	100	10	1	.1	.01	.001
	BIGGER				SMALLER		$\geq$

#### Standard (metrology)

![](_page_11_Picture_4.jpeg)

From Wikipedia, the free encyclopedia

In metrology (the science of measurement), a standard (or etalon) is an object, system, or experiment that bears a defined relationship to a unit of measurement of a physical quantity.<sup>[1]</sup> Standards are the fundamental reference for a system of weights and measures, against which all other measuring devices are compared. Historical standards for length, volume, and mass were defined by many different authorities, which resulted in confusion and inaccuracy of measurements. Modern measurements are defined in relationship to internationally-standardized reference objects, which are used under carefully controlled laboratory conditions to define the units of length, mass, electrical potential, and other physical quantities.

![](_page_11_Picture_7.jpeg)

The International Prototype Kilogram (IPK) is an artifact standard or prototype that is defined to be exactly one kilogram mass.

![](_page_11_Picture_9.jpeg)

LINKS: video: https://youtu.be/Ix5Mu3M3YFk

pdf: http://www.teachology.xyz/pr16.pdf

(13) There are standards in education, too. But when an educator says "a standard", he or she means something very different from what it meant in physics. In education, a standard is a description of "the learning goals for what students should know and be able to do at each grade level".

However, people using the same educational standards still can use different measuring procedures leading to incomparable results.

#### Motion and Forces

#### 1. Newton's laws predict the motion of most objects. As a basis for understanding this concept:

Students know how to solve problems that involve constant

**PHYSICS STANDARDS** 

- a. speed and average speed.
  - Students know that when forces are balanced, no acceleration
- occurs; thus an object continues to move at a constant speed or stays at rest (Newton's first law).

Students know how to apply the law F=ma to solve one-

 c. dimensional motion problems that involve constant forces (Newton's second law).

Students know that when one object exerts a force on a

d. second object, the second object always exerts a force of equal magnitude and in the opposite direction. (Newton's third law).

![](_page_12_Figure_12.jpeg)

Do we use the same measuring procedure?

![](_page_12_Picture_14.jpeg)

(14) Based on those results all we can conclude so far is that: if we take two large groups of similar students, and one group of students will have a more extensive or divers learning experience (for example, more contact hours, or more time spent on certain exercises, or training through more different exercises, etc.) students from that group, on average, will demonstrate better learning outcomes than the students in a controlled group.

![](_page_13_Picture_1.jpeg)

(15) This conclusion becomes almost obvious if we employ the notion that a brain is basically a muscle, or a collection of muscles, the development of which strongly correlates with the variety and intensity of exercises it goes through.

![](_page_14_Figure_1.jpeg)

(16) In order to move beyond the obvious we need to adapt to teaching physics the same approach which had been adopted to doing physics. We need a standard which, like in physics, is an actual object, or a feature of an object, accompanied by a specific procedure which allows comparing similar features carried by other objects with the one of the standard (that is why "a standard" is also called "a prototype", or "an etalon"). For example, a standard of mass is an actual cylinder. A verbal description such as: "A standard of mass looks like a cylinder "with diameter and height of about 39 mm, and is made of an alloy of 90 % platinum and 10 % iridium" would not work as a standard, because it is impossible to compare the mass of an object with a sentence.

A standard is an object, or a feature of an object, accompanied by a specific procedure which allows comparing similar features carried by other objects with the one of the standard.

![](_page_15_Picture_2.jpeg)

"A standard of mass looks like a cylinder "with diameter and height of about 39 mm, and is made of an alloy of 90 % platinum and 10 % iridium" Teacher Educatio

Baltimore

(17) By now everyone who is still listening might be thinking, how the heck is this all related to the title of the presentation?

Fair question!

I divide my presentation into two parts. The first part – the practical one – is almost done, and its goal is to demonstrate in practice such essential elements of professional designing as goal making, and collaboration seeking.

# Part I - conclusion

# A brief demonstration of aspects of "Project-oriented form of teacher professional development for pre-service and in-service physics teachers"

![](_page_16_Picture_5.jpeg)

(18) This conference is a big professional development event. When attending such an event, the result depends heavily on the attitudes of the attendees.

Having a passive attitude means, that during an event an attendee does not search for a specific means for advancing his or her own practice; the activity is limited by seeing or hearing something new.

Having an active attitude means, that during an event an attendee searches for a specific means for advancing his or her own practice. Such a means can include a specific knowledge, or a technical instrument, or a potential collaborator, or else.

![](_page_17_Figure_3.jpeg)

(19) For example, I believe that "a standard" for measuring learning outcomes must satisfy the following five conditions:

(a) Every aspect of the development and the use of the standard has to be open to public and be able to be examined by *anyone*.

(b) The use of the standard must lead to gradable information on student's skills and knowledge.

(c) The use of the standard must lead to gradable information on student's skills and knowledge, AND must not depend on any specific features of teaching or learning processes.

(d) The use of the standard must lead to gradable information on student's skills and knowledge, and must not depend on any specific features of teaching or learning processes, AND must allow to compare on a uniform basis the learning outcomes of any and all students using the standard.

(e) Any institution adopting the standard should automatically become an active member of the community utilizing the standard and can propose possible alternations to the standard to accommodate changes in the understanding of what students should know and be able to do.

And I am using this professional development event in part to find people who share the same belief.

(a) Every aspect of the development and the use of the standard has to be open to public and be able to be examined by *anyone*.

(b) The use of the standard must lead to gradable information on student's skills and knowledge.

![](_page_18_Picture_9.jpeg)

(C) The use of the standard must lead to gradable information on student's skills and knowledge, AND must not depend on any specific features of teaching or learning processes.

(d) The use of the standard must lead to gradable information on student's skills and knowledge, and must not depend on any specific features of teaching or learning processes, AND must allow to compare on a uniform basis the learning outcomes of any and all students using the standard.

(e) Any institution adopting the standard should automatically become an active member of the community utilizing the standard and can propose possible alternations to the standard to accommodate changes in the understanding of what students should know and be able to do. (20) I have more than just a belief. I have developed a specific approach which will lead to designing such a standard. The approach is based on using MOCCs (MOCC stands for "a map of operationally connected categories"); the link on the screen leads to a detailed description of what MOCC is and ways to use it (<u>http://teachology.xyz/mocc.htm</u>).

A Map of Operationally Connected Categories as an instrument for classifying physics problems and a basis for developing a universal standard for measuring learning outcomes of students taking physics courses (a novel tool for measuring learning outcomes in physics).

#### **By Valentin Voroshilov**

### http://teachology.xyz/mocc.htm

#### Abstract

Currently there is no tool for measuring learning outcomes of students, which would be broadly accepted by teachers, schools and district officials, by parents, policymakers. Educational standards cannot provide a basis for such a tool, since for an educator "a standard" means a verbal description of skills and knowledge which students should be able to demonstrate but not an actual object, or a feature of an object, accompanied by a specific procedure which allows comparing similar features carried by other objects with the standard one (like in physics). There is however an approach to standardization of measurement of physics knowledge similar to standardization of measurements in physics. This approach is based on a specific technique used for classification physics problems. At the core of such classification is the use of graphs, such that 1. every quantity represented by a vertex/node of a graph must have a numerical representation, i.e.

![](_page_19_Picture_6.jpeg)

(21) I believe that the time has come to create a coalition of individuals and institutions which goal is to developing the universal standard for measuring learning outcomes in physics (for starters). And that is one of the reasons why I am attending this conference.

![](_page_20_Picture_1.jpeg)

![](_page_20_Picture_2.jpeg)

![](_page_20_Picture_3.jpeg)

![](_page_20_Picture_4.jpeg)

An association for developing objective standards for measuring knowledge and skills in STEM subjects

![](_page_20_Picture_6.jpeg)

LINKS: video: https://youtu.be/lx5Mu3M3YFk pdf: http://www.teachology.xyz/pr16.pdf

(22) When a teacher attends a professional development event, he or she always has a choice to make.

## Part II

The concept of "Project-oriented form of teacher professional development for preservice and in-service physics teachers" (a.c.a "Professional Designing"

LINKS: video: https://youtu.be/Ix5Mu3M3YFk pdf: http://www.teachology.xyz/pr16.pdf

(23) The teacher can take a passive position ("I am just looking for something new and interesting"). Or, the teacher can take an active position ("I have a problem and I need to find a means to solve it").

![](_page_22_Figure_1.jpeg)

(24) The latter position significantly increases chances that after the event the teacher will be making some constructive changes in his or her teaching practice. And that is what we all want from a professional development event.

The outcome and effectiveness of a teacher professional development event is viewed via changes in the teaching practice made by the participant (attendee) after the event, and focusing on making advancement in the teaching practice by solving specific problems and overcoming specific

![](_page_23_Figure_2.jpeg)

(25) "When I started my career, I did not have a say in the menu of courses that my district taught. We logged into a training system and chose, based on what was being provided. The problem was that *none of the provided sessions applied to what I needed*, and when district requirements were that a certain number of hours be earned through indistrict training, it meant that *a large majority of teachers were taking courses just to earn the hours*. That was more than 10 years ago, and sadly, in many school districts, this is still the case."

This is a quote from a book by Rafranz Davis, "The Missing Voices in EdTech", 2015 (CORWIN)

"When I started my career, I did not have a say in the menu of courses that my district taught. We logged into a training system and chose, based on what was being provided. The problem was that *none of the provided sessions applied to what I needed*, and when district requirements were that a certain number of hours be earned through in-district training, it meant that *a large majority of teachers were taking courses just to earn the hours*. That was more than 10 years ago, and sadly, in many school districts, this is still the case."

From a book by <u>Rafranz</u> Davis, "The Missing Voices in <u>EdTech</u>", 2015 (CORWIN)

![](_page_24_Picture_4.jpeg)

(26) Various researchers have been looking for methods to ensure that after attending a professional development workshop a teacher will bring into his or her practice new knowledge presented at the workshop. One of the practices which proved to be efficient is based on the activity theory, and called "Professional Designing".

![](_page_25_Figure_1.jpeg)

(27) Professional Designing helps to ignite and maintain a process of transformative development of an individual or an institutional educational practice.

The theoretical foundation of this branch of the research can be found in publications of G.P. Shchedrovitsky (1964, 1966, 1971, 1977, 1981), and his colleagues, such as N.G. Alekseev (1992) and followers such as A.P. Zinchenko (2014).

#### Center for Activity Theory and Developmental Work Research

Main Menu:	Yrjö Engeström, Professor	Put
Home		DBI
News and Events		SEL
About the Center		pub
Research		YEA
People	Email: yrjo.engestrom@helsinki.fi	puo b.fm
PhD Programs	Tel.: +358-9-191 44574	COL
What Are CHAT&DWR	Fax: +358-9-191 44579	publ
		USA

#### The Moscow Methodological Circle

Moscow Methodological Circle (MMC) is the philosophical and methodological intellectual and practical school established by <u>Georgy Petrovich Shchedrovitsky</u> (or, GP, as many of his pupils nicknamed him)

The Circle emerged in the early 1960s and took its final shape in 1954 in the course of the discussion on the issues of logic that was held at the Philosophy Department of the Moscow State University. It was first known as the Moscow Logical Circle (MLC). The founding fathers of the MLC were A. A. Znoviev, G. P. Schedrontsky, B. A. Gnahin and M. K. Mamardashvili.

In the year of 1958, after the split-up with A. A. Zinoviev, G. P. Shchedrovitsky became the ideological and organisational leader of the Crick and the Crick took the name of the Moscow Methodological Crick. Today GP's pupils established independent organisations proceeding with the intellectual traditions of the Circle, and the MMC took the form of a broader <u>Methodological</u>

![](_page_26_Picture_8.jpeg)

V.B. KHRISTENKO, A.G. REUS.

A.P. ZINCHENKO ET AL

Shchedrovitskiy Georgiy Petrovich (1929-1994) - Russian philosopher and psychologist. Studied the problems of interrelations between Pedagogy, Logic, Sociology and Psychology. Researched intellectual activity, methods of solving mathematical problems by children, the place of play activity in children's communities. Proposed the idea of conceptual-genetic logic. In 1980s developed, in collaboration with his students and followers, participatory planning games combining the characteristics of training and business games with intellectual

methodological discourse.

#### Lev Vygotsky

From Wikipedia, the free encyclopedia

Lev Semyonovich Vygotsky (Russian: Лев Семёнович Вы́готокий ог Выго́токий, born Лев Симокович Выгодский [Lev Simkhovich Vygodskiy], November 17 [O.S. November 5] 1896 – June 11, 1934) was a Soviet psychologist, the founder of a theory of human cultural and bio-social development commonly referred to as cultural-historical psychology, and leader of the Vygotsky Circle.

**Activity theory** 

Vygotsky's main work was in developmental psychology, and he proposed a theory of the development of higher cognitive functions in children that saw reasoning as emerging through practical activity in a social environment. During the earlier period of his career he argued that the development of reasoning was mediated

![](_page_26_Picture_15.jpeg)

Professional Designing helps to ignite and maintain a process of transformative development of an individual or an institutional educational practice.

Physics

Teacher

Education

Baltimore

Coa

2016

(28) By a definition: Professional Designing is an intellectual activity resulting in: (a) constructing an image of the ideal/perfect professional situation (whatever it might mean for a given person), and (b) planning activities aimed at the transformation of the actual professional situation making it closer to the ideal one; the material result of a professional designing is a project.

The link on the screen leads to a broader description of Professional Designing and its application to teacher professional development: <u>http://www.teachology.xyz/pd.htm</u>.

Professional Designing is an intellectual activity resulting in: (a) constructing an image of the ideal/perfect professional situation (whatever it might mean for a given person), and (b) planning activities aimed at the transformation of the actual professional situation making it closer to the ideal one; the material result of a professional designing is a project. <a href="http://www.teachology.xyz/pd.htm">http://www.teachology.xyz/pd.htm</a>

(29) In order to transform his or her professional situation, teachers (a) must be willing to change their own practices, and (b) must be able to make the change. This means that professional skills, abilities, competencies of a teacher should include not only specific subject-related skills or teaching-related personal qualities, but also "meta-skills", allowing to manage processes of idealization (i.e. drawing mental images), reflection, goal-setting, action scheduling, and so on, which are required for transforming a human practice. A combination of such skills forms the ability for designing the own teaching practice.

![](_page_28_Figure_1.jpeg)

(30) A professional designing is an activity that takes place primarily in the area of personal values and motives, goals and objectives, actions and procedures, problems and possible solutions. When conducting a professional designing, or shortly – when designing, one does not deal with real objects or subjects, but manipulate with the abstract concepts relevant to the one's professional practice (here and below a person conducting a professional designing is called a designer, or a projecter).

The first product of a professional designing is the formation of a project idea.

![](_page_29_Figure_2.jpeg)

(31) In simple terms, a project idea of a designer describes in his or her words "what is wrong with what I do", and "how will I fix it". The presence of a project idea does not automatically ensure its future realization, but it indicates the direction of the future actions of the designer; the project idea becomes the basis for the development of a detailed professional project, which is a textual representation of a current professional situation, certain professional problems, and proposed steps for solving those problems, including criteria and procedures for assessing the progress.

![](_page_30_Picture_1.jpeg)

LINKS: video: https://youtu.be/Ix5Mu3M3YFk pdf: http://www.teachology.xyz/pr16.pdf

(32) The most important product of a professional designing is a personal professional project, the existence of which significantly increases chance for a teacher implementing in the future practice knowledge presented during a workshop.

![](_page_31_Figure_1.jpeg)

(33) A professional designing – as a human activity – is essentially situational; its ultimate goal is to find mechanisms for self-transforming a concrete current professional situation of a projecter.

A projecter never works alone; there is always a set of active or potential collaborators (or competitors). An effective form for coordinating professional goals and actions, based on the implementation of project-aimed activities, is the so-called "activity-organizing workshop". AOW participants usually represent coworkers from an institution or an institutional entity, or represent the same district. (sometimes at a retreat)

![](_page_32_Figure_2.jpeg)

(34) Communicating processes ignited during AOW and aimed at unveiling images, views, and opinions of participants about professional activities of themselves and others are complicated and sometimes emotional. That demands the involvement of an experienced moderator (a.c.a. a "methodolog", a.c.a. a "methodologist"; the former term is more broadly used in the context of AOW).

Guided by a methodolog, AOW participants become actively engaged into an individual professional designing. As the result of this work, the participants inevitably advance their ability to conduct a professional designing. The effectiveness of AOW strongly correlates with the experience of a methodolog moderating the event.

(AOW)

Coalition

# **Activity-Organizing Workshop**

![](_page_33_Figure_3.jpeg)

![](_page_33_Picture_4.jpeg)

(35) It is very important for the success of the whole event that participants would be willing to openly discuss their teaching experience (including such personal and usually internal matters as their values, moral limits, beliefs, life expectations, professional aptitudes, goals and actions). This conversation usually leads to an eventual realization of the existence of some gap/disconnect/incoherence between the results and the structure of actual teaching practice and the declared teaching goals and methods. When the existence of this gap is clearly presented to a participant, the so-called "problematic situation" has been reached.

![](_page_34_Figure_1.jpeg)

![](_page_34_Picture_2.jpeg)

(36) All precedents of AOW demonstrate that when teachers are immersed into a professional designing it positively affects their teaching practice in general and an ability to self-improve their teaching practice in particular. The conclusions on the effectiveness of the project-oriented methods of organizing teacher professional growth were made on the basis of individual interviews, surveys, and reflective feedback from teachers, and observations of teachers' activities during events and while teaching students before and after events.

![](_page_35_Figure_1.jpeg)

![](_page_35_Figure_2.jpeg)

![](_page_35_Figure_3.jpeg)

Individual interviews, surveys, reflective feedback from teachers, observations of teachers' activities during events and while teaching students before and after events.

![](_page_35_Figure_5.jpeg)

(AOW)

![](_page_35_Picture_6.jpeg)

# **Thank you!**

## **Dr. Valentin Voroshilov**

The link to this video: <a href="https:/youtu.be/Ix5Mu3M3YFk">https:/youtu.be/Ix5Mu3M3YFk</a>

The link to the slides with narrations:

pdf http://www.teachology.xyz/pr16.pdf

html http://www.teachology.xyz/pr16.htm

## www.TeachOlogy.xyz

# I was planning on giving an oral presentation, but was late to register, so I converted it into a poster.

The link to this video: <a href="https://youtu.be/Ix5Mu3M3YFk">https://youtu.be/Ix5Mu3M3YFk</a>

The link to the slides with narrations:

pdf http://www.teachology.xyz/pr16.pdf

html <u>http://www.teachology.xyz/pr16.htm</u>

# **Thank you!**

www.TeachOlogy.xyz Dr. Valentin Voroshilov