Transition from

"I don't know it"

to "I know it"

is *memorizing*

Transition from

"I can't do it"

to "I do it"

is *training*

Transition from

"I don't understand it"

to "I get it"

is *thinking*

The Comparison Between Russian High School And American College Physics Curricula

Dr. Valentin Voroshilov, Physics Department

Boston University, valbu@bu.edu

2007 AAPT National Winter Meeting

Seattle, WA

For a relatively short period of time several reports on education had been issued showing the increasing demand for more advanced science education to middle and high school students[1].

One of the last reports[2] is based on some general comparison to school curricula such countries as Australia or Czech Republic and other.

In this poster, I present a short comparison between physics curriculum commonly used in high schools in Russia and the physics curriculum which is currently in use in a small two year technical college.

For nine years before moving in the U.S.A. I had been teaching physics and mathematics to middle school, high school, college and university students, as well as to school teachers. Now I teach physics (and mathematics as well) at a two year college (and continue my work with school teachers).

My teaching experience allows me to compare not just two documents having a title “A Curriculum”, but also an experience of employing these documents.

For not having a space to present the whole curriculum, at the end of the poster, the currently using syllabus is presented.

However, the detailed analysis shows that Russian high school graduates are suppose to demonstrate the similar amount of knowledge as American two-year college students when finishing physics class.

On the web-site below

http://www.ed.gov.ru/ob-edu/noc/rub/p_min/pr56-1.html#17

one can find the Minimum of Knowledge in Physics determined by the Department (Ministerstvo) for Education and Science of Russian Federation, that every high school graduate must demonstrate (in Russian).

On the web-site below

http://www.ed.gov.ru/d/ob-edu/noc/rub/standart/pp/16-1-s.doc

one can find the Physics Base Curriculum recommended by the Department for Education and Science of Russian Federation, corresponded to the minimum of Knowledge in Physics (in Russian).

It is needed to say that in Russia all middle and high school students must take physics classes at least at the minimum level.

Let me describe below some differences between two curricula.

There is no much difference in study Mechanics.

In addition to the curriculum I currently use at the college, Russian high school students are supposed to obtain the following knowledge (only the most important laws are mentioned):

* The Ideal-Gas law, The first law of Thermodynamics, The Carnot Engine.

* Faraday's Law of electromagnetic Induction.

* Elementary introduction to quantum physics and astrophysics.

However, the college curriculum provides more attention to study sound.

One of the biggest differences, which cannot be noticed be comparing two documents, but can be seen from a teaching practice only is the problems students are supposed to solve on the final examination.

The variety and the level of difficulty of the problems Russian high school students are supposed to solve are broader and higher then problems recommended to the final examination to my current college students.

Interesting fact is that the total time Russian students spend to study physics is at least 140 45-minutes lesson during the period of two years.

My college students have 40 hours only to cover the material (including all the breaks). For roughly 3 times less time they can spend on the study, the students have to cover approximately 1.5-2 times smaller amount of the physics content.

Another rather important difference is that all Russian high school students had previously physics classes for three years in a middle school, whereas the majority of my college students take physics class the first time in their life.

I hope that this short information can be useful for educators and scholars developing new physics curricula and approaches to teach physics.

References:

See for example;

1. A Test of Leadership; a Report of the Commission Appointed by SofEd Margaret Spellings; see on the edu.dov/about/bdscomm/list/hiedfuture

or

Taking Science to School: Learning and Teaching Science in K-8; Executive Summary; NSTA; science.nsta.org/ nstaexpress/nstaexpress_2006_09_25.htm

2. Tough Choices or Tough Times; executive summary; the report of the *new* commission on the skills of the American workforce; National Center on Education and Economy; on the web www.skillscommission.org

SYLLABUS: Physics

[Onsite]

CREDIT HOURS: 4 CONTACT HOURS: 40

Prerequisite: College Mathematics II or equivalent

COURSE DESCRIPTION

Students in this course study the concepts of mechanical physics. Practical applications demonstrate the theory.

MAJOR INSTRUCTIONAL AREAS

1. Measurement and Problem Solving
2. Kinematics: Description of Motion
3. Motion in Two Dimensions
4. Force and Motion
5. Work and Energy
6. Linear Momentum and Collisions
7. Solids and Fluids
8. Temperature and Kinetic Theory
9. Sound
10. Reflection and Refraction of Light

COURSE OBJECTIVES

After successful completion of this course, students will:

1. Demonstrate the ability to use units in the metric system to solve problems in physics.
2. Demonstrate the ability to solve problems in physics using the equations of kinematics.
3. Demonstrate the ability to solve motion problems in physics in two dimensions.
4. Demonstrate the ability to solve problems with Newton's laws of motion with applications to gravity and friction.