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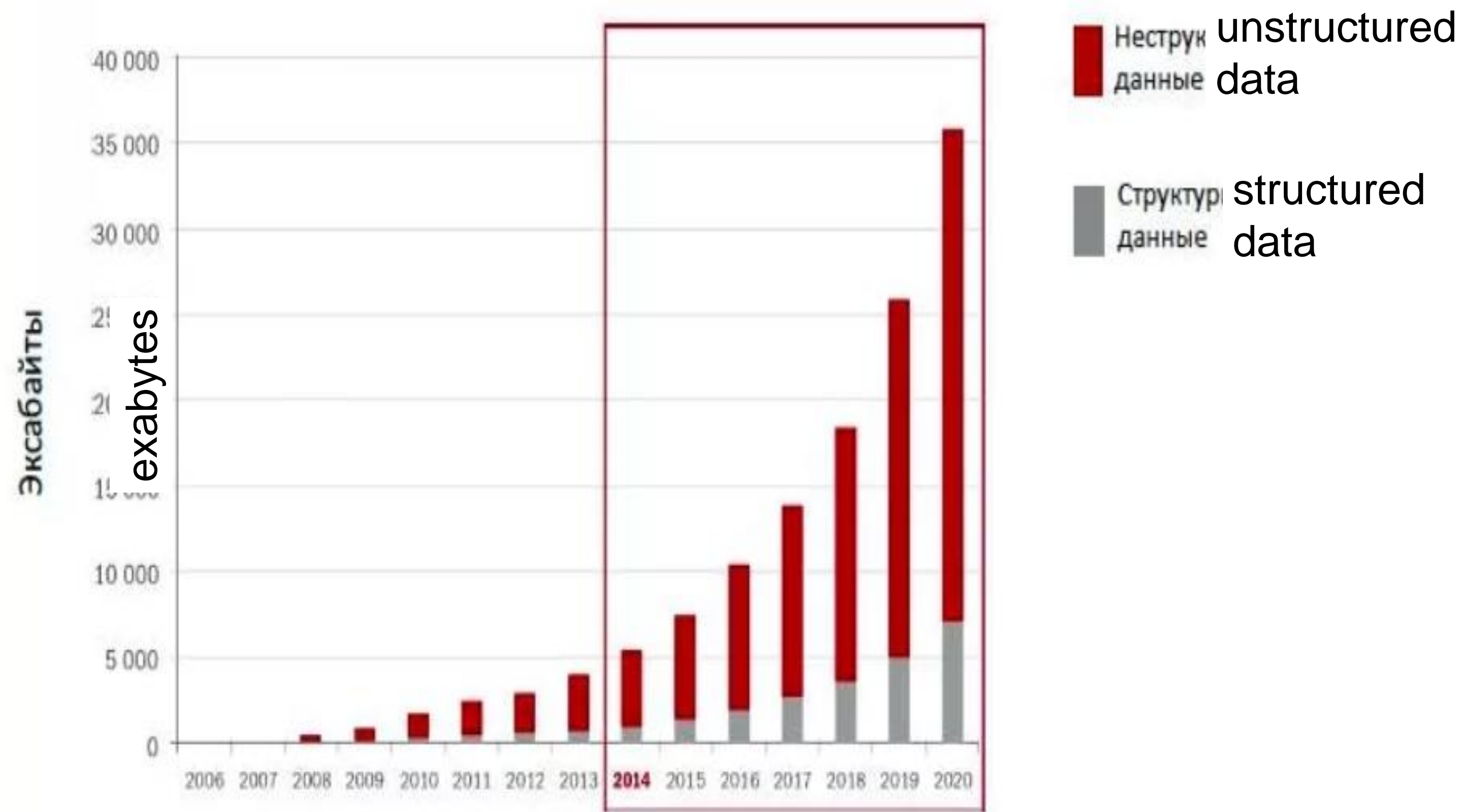
THE LINK BETWEEN CRITICAL THINKING AND ACTIVE LEARNING

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THE RELEVANCE OF THE STUDY

Growth of information in the world

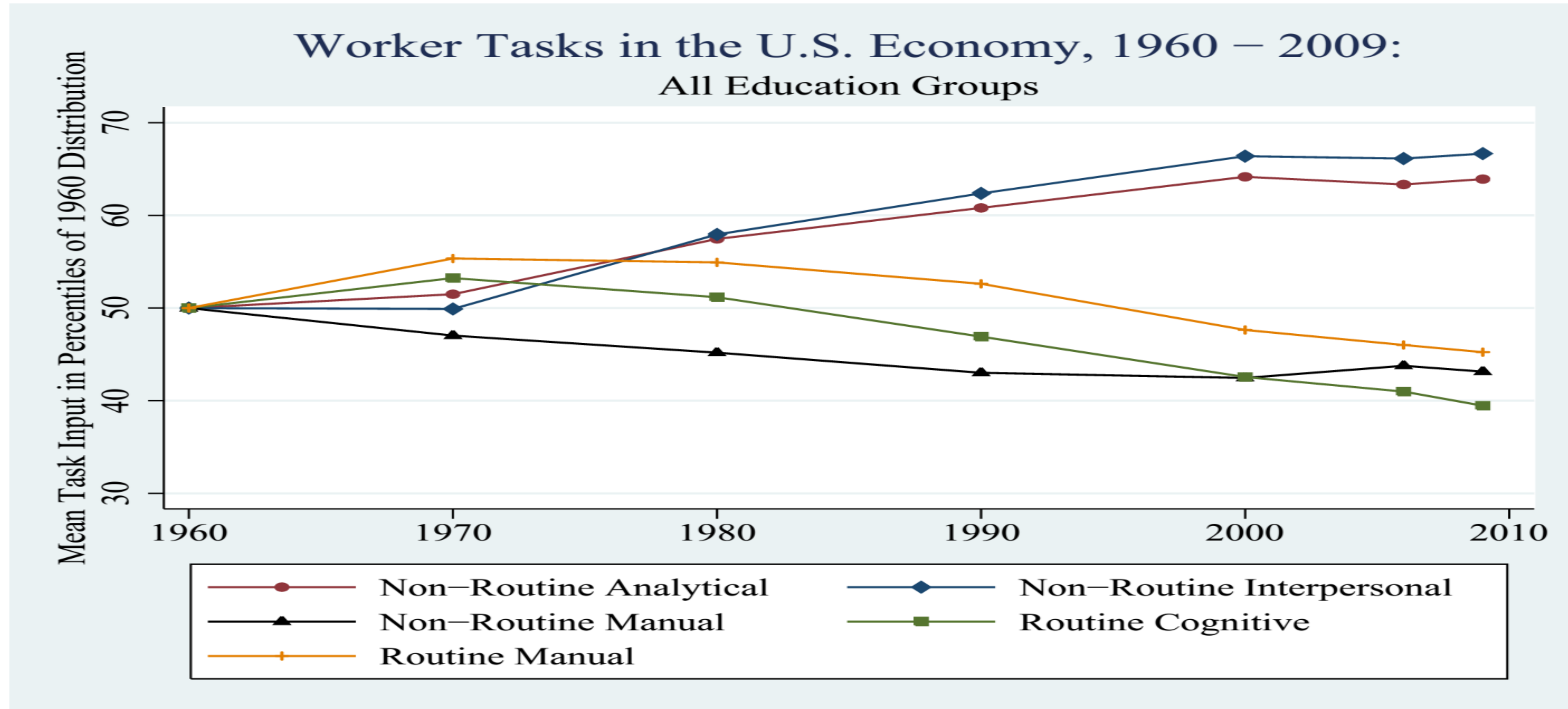


False information?
[arrest of investigative journalist Ivan Golunov](#)



Source: IDC analytical report DC.

TRENDS IN THE WORKER TASKS - ROLE OF 21ST CENTURY SKILLS



HUMAN CAPITAL STRUCTURE IN THE 21ST CENTURY (I. FROUMIN, P. SOROKIN)



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**Traditional Specific HC (specific cognitive and professional skills)
(1950-1960 Becker, Schultz)**

**Traditional General HC
(basic cognitive skills)
(1950-1960 Becker, Schultz)**

**New General HC #1 (non-cognitive skills , personal traits)
(1980-1990, Heckman)**

**General HC #2 (Universal Competences)
(1980-1990, OECD)**

**General HC #3 (Allocative Abilities. Entrepreneurial Element)
(1975, Schultz)
Most underdeveloped**

CHANGES IN THE GOALS OF HIGHER EDUCATION

- A major goal of university systems is to produce skilled graduates (Spellings, 2006; Alexander, 2000)
- Skilled graduates can contribute towards the productivity and innovation → higher economic growth (Goldin and Katz, 2008; Autor et al., 2003; Bresnahan et al., 2002; Bresnahan, 1999; Katz and Krueger, 1998)
- Academic skills such as math, science, language, major-specific skills (Pascarella & Terenzini, 2004)
- Higher order thinking skills such as critical thinking and creativity—perceived by employers to be among the most important skills for college graduates (ETS, 2013; AAC&U, 2011; Casner-Lotto and Barrington, 2006)

International Consortium

- Institute of Education, University College of London
- Ontario Institute for Studies in Education, University of Toronto
- Graduate School of Education, Peking University
- Evidence Institute and Warsaw University, Poland
- Lynch School of Education, Boston College
- Faculty for Educational Sciences, University of Helsinki
- College of Education, Seoul National University
- Moscow City University, Russia

In cooperation with:

- OECD
- World Bank

Initiated and supported by the Sberbank Charity Foundation *Investment into the Future*

Project lead: National research university Higher School of Economics, Moscow

COMPETENCES AND LITERACIES: OUR FRAMEWORK



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Thinking competence

Competence of interaction with others

Competence of “interaction with self”

Foundational tool-based literacy

Fluent practical knowledge

Domain-general

Domain-specific

WHAT UNIVERSITIES AND GOVERNMENTS DO TO FOSTER THINKING?

- teaching of students, along with scientific and technical knowledge, humanities, including philosophy (teaching philosophy is positively linked with the development of critical thinking);
- some universities include courses on the development of critical thinking in their educational programs
- critical thinking is stated as an objective in curricula (including national curriculum) in higher education
- inclusion of critical thinking tests in external evaluation

Cognitive dimensions (i.e., key skills or dispositions) of critical thinking	Affective, dispositional components of critical thinking
(a) interpretation,	
(b) analysis,	“inquisitiveness with regard to a wide range of issues,”
(c) evaluation,	“concern to become and remain generally well-informed,”
(d) inference,	
(e) explanation,	“alertness to opportunities to use critical thinking”
(f) self-regulation	

(Facione, 1990b, p. 13)

TEACHING FOR THE DEVELOPMENT OF CRITICAL THINKING



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- The level of critical thinking increases when teachers use appropriate teaching methods and curricula (Gadzella & Masten, 1998; Halpern, 1993; McMillan, 1987),
 - active learning strategies (Kim, 2009),
 - well-structured interaction between students and between students and teachers (Cooper, 1995; Howe & Warren, 1989).
 - In addition, for the development of critical thinking, it is important that critical thinking is seen as the goal of learning through the formulation of hypotheses, design, execution, and analysis of a series of studies (Dell'lio & Donk, 2007, p. 11). 33; Gomez, 2002; Wiles & Bondi, 1989).
 - It also highlights the importance of learning that occurs through an environment with an active role of learners, existing learners' thoughts, beliefs, attitudes and values (Schunk, 2008, pp.17e18).

Teaching critical thinking

- as a separate subject;
- within a specific subject, stating that the development of critical thinking is one of the goals of teaching the subject **(learning and teaching practices)**;
- within a specific subject, but without emphasis on the formation of critical thinking **(content develops CT)**
- throughout the program, during the entire period of study **(environment develops CT)**

CRITICAL THINKING IS NOT NATURAL RESULT OF ANY TEACHING

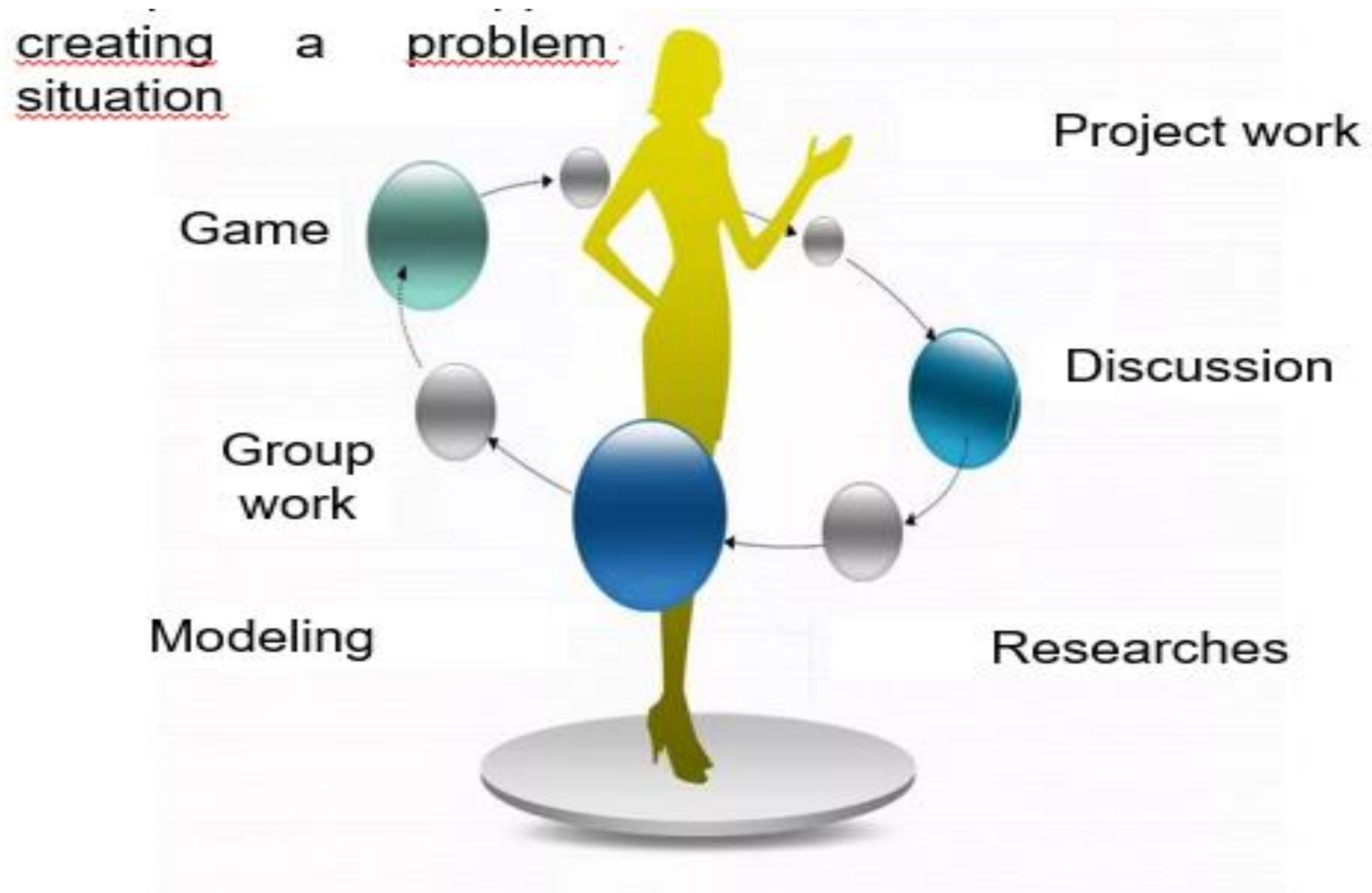


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Studies that are being carried out in different countries show that, in most cases, teachers ignore the necessity of making students acquainted with critical thinking concepts, assuming that it is being formed automatically during studies (Baron, 1990). **However, critical thinking cannot be formed in this way or as a side result of any kind of studies (Ennis, 1989).**



ACTIVE LEARNING STRATEGIES FOSTER CRITICAL THINKING. WHERE IS AN ASSESSMENT?



RESEARCH QUESTION

Do critical thinking abilities grow when supported by regular assessment that includes participation in group or individual projects and making public presentations?



STUDY SuperProject

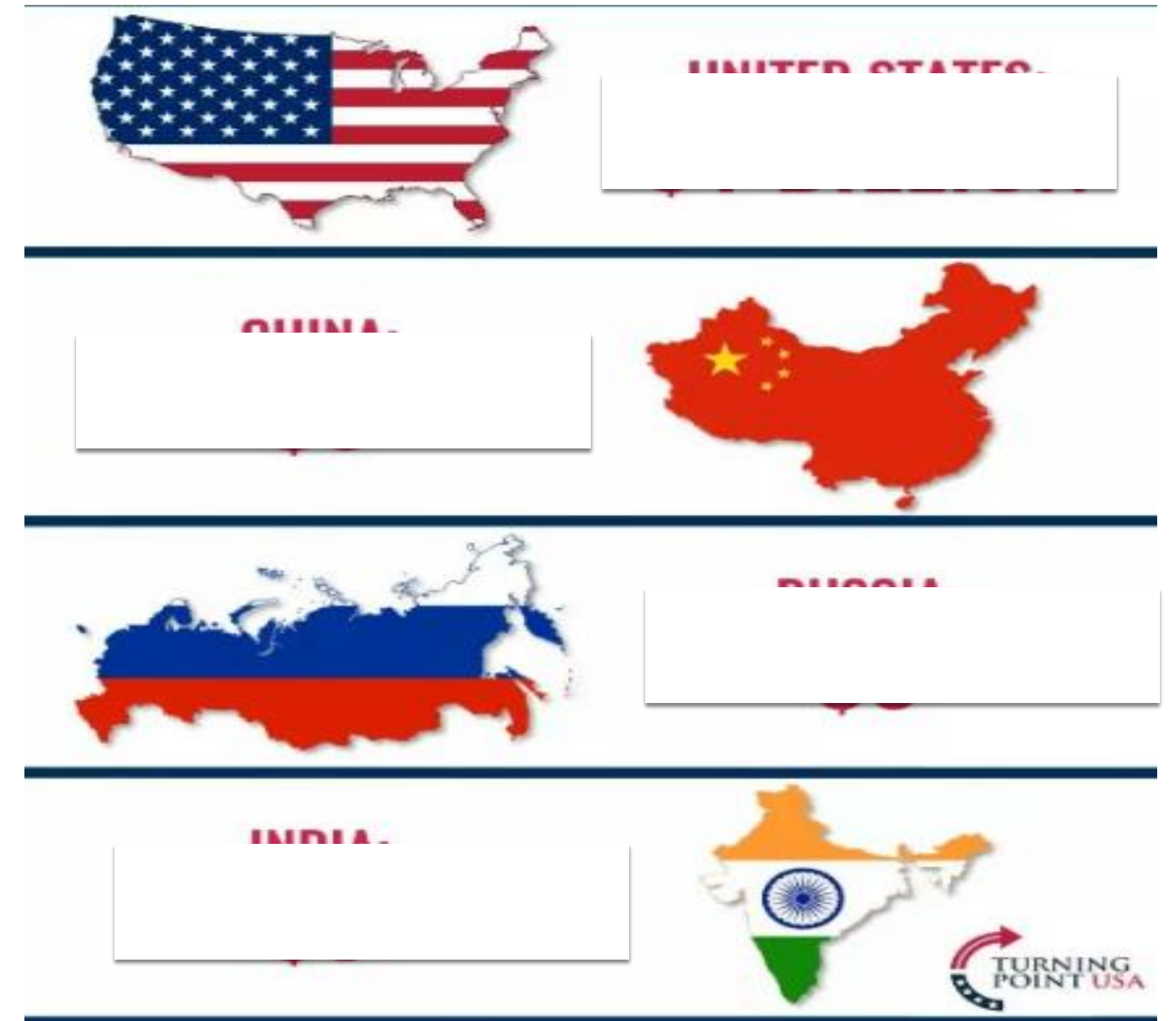


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SUPER project (Study of Undergraduate Performance) – International comparative study of educational achievements of engineering students.

<https://ioe.hse.ru/superproject/>

The project is implemented by Institute of education NRU HSE in cooperation with Stanford University, Tsinghua University, Educational Testing Service.



Participating countries: Russia, China, India, United States of America.

SuperProject - 2 MAIN GOALS.

- 1) Assess and compare university student skills (levels and gains) within and across countries
- 2) Examine which types of factors (institutional, faculty, instructional, curricular, student behavior) help students develop skills

SUPERPROJECT

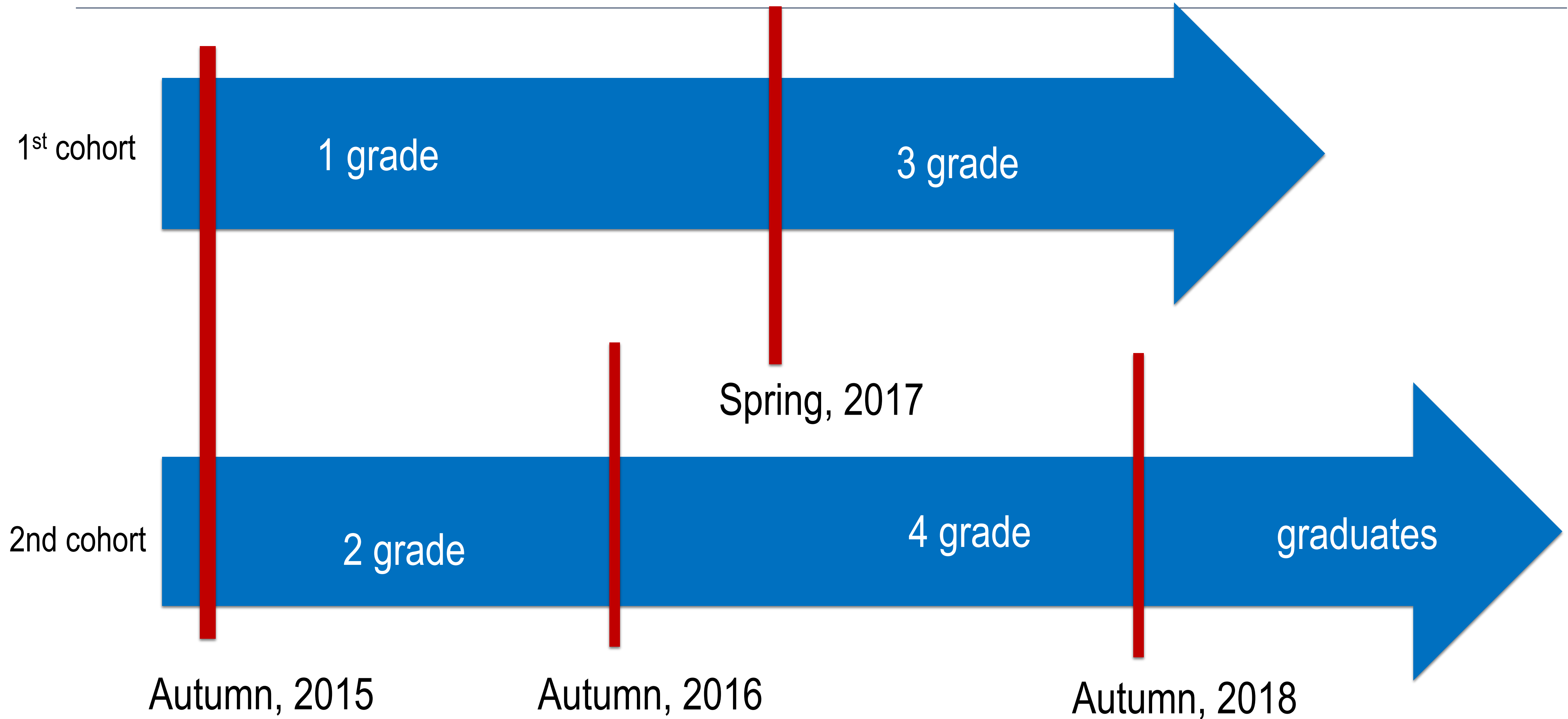


- Focus on computing and engineering majors (CS/IT and EE)
- Assess skills over time: academic skills, higher order thinking skills
- Survey students, professors, administrators
- Use *quasi-experimental* methods to find factors behind skill gains
- Loyalka, Prashant, Ou Lydia Liu, Guirong Li, Igor Chirikov, Elena Kardanova, Lin Gu, Guangming Ling, Ningning Yu, Fei Guo, Liping Ma, Shangfeng Hu, Angela Sun Johnson, Ashutosh Bhuradia, Saurabh Khanna, Isak Froumin, Jinghuan Shi, Pradeep Kumar Choudhury, Tara Beteille, Francisco Marmolejo, and Namrata Tognatta. [Computer Science Skills across China, India, Russia, and the United States](#) // *Proceedings of the National Academy of Sciences*. 2019. [doi](#).

SCHEME OF THE STUDY SuperProject.



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3 STAGES OF THE PROJECT.

Stage №1

Pilot Stage (Fall, 2014):

- Developing and validating assessments
- 10 institutions (~2,500 students) in China
- 10 institutions (~2,500 students) in Russia
- Institutions in US (data collected by ETS)

3 STAGES OF THE PROJECT.



Stage №2

Baseline Stage (Fall 2015):

- Nationally representative (random) sample of institutions (~10,000 grade 1 and 3 CS and EE students) in China
- Nationally representative (random) sample of institutions (~5,000 grade 1 and 3 CS and EE students) in Russia
- Institutions in the US (data collected by ETS)

3 STAGES OF THE PROJECT.

Stage №3

Follow-up Stage (2016-2017):

- Same students (grade 2 and 4 students) in China
- Same students (grade 2 and 4 students) in Russia
- Institutions in the US (data collected by ETS)

THE STUDY SAMPLE SuperProject.



The study has a longitudinal design and uses nationally representative samples.

	3 year	4 year
CRITICAL THINKING	397	397

ASSESSMENT INSTRUMENTS



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Academic tests

1. Math
2. Physics or basic computing
3. Major-specific knowledge (Computer science and electrical engineering from ETS)

Higher order thinking tests

1. Critical Thinking (ETS)
2. Quantitative Literacy (ETS)
3. Creativity
4. Ability to learn and make good choices

CRITICAL THINKING TEST



The HEIghten[®] Critical Thinking assessment addresses two central aspects of critical thinking — Analytic and Synthetic.

Analytic Skills:

- evaluating evidence and its use, including evaluating the evidence itself and evaluating it in light of its larger context, its relevance to the argument, appropriateness of sources, possibilities of bias and the degree of support the evidence lends to the claims made in the argument
- analyzing and evaluating arguments, including understanding or assessing the structure of the argument independent of the evidence offered, such as identifying stated and unstated premises, conclusions and intermediate steps
- understanding the language of argumentation and recognizing linguistic cues
- distinguishing between valid and invalid arguments, including recognizing structural flaws that may be present in an invalid argument (e.g., "holes" in reasoning)

Synthetic Skills:

- understanding implications and consequences, including identifying unstated conclusions or implications and consequences that go beyond the original argument
- developing arguments that are valid (i.e., exhibiting good reasoning) and sound (i.e., built on strong evidence)
- In addition, some questions may, as part of assessing analytic or synthetic skills, also assess skills in evaluating claims or drawing conclusions pertaining to causation or explanation.

CRITICAL THINKING TEST



Test Design

The HEIghten Critical Thinking assessment is administered in a single 45-minute testing session. Each test taker answers 26 questions. The item types include critical thinking sets, short arguments or informational passages, and sets that present conditions applicable to a fictional situation.

3. The following is an exchange between two contributors to an online literary forum.

Kate: Ursula Seti's undated poem "Eucalyptus," which compares the eucalyptus tree's periodic shedding of its bark to various momentous events in her own life, could not have been written before 1960. Before that date, Seti had never left her native Alaska, where it is far too cold for most species of eucalyptus trees to grow. In 1960, however, she visited Australia, where eucalyptus trees are very common, so the poem must have been written during or after that visit.

Miriam: But Seti could certainly have known that eucalyptus trees periodically shed their bark without having personally observed that process, so she could have written the poem at any time during her career, which began well before 1960.

Which of the following most accurately characterizes Miriam's response to Kate?

- (A) It shows that Kate's argument assumes the very point that it attempts to demonstrate.
- (B) It draws an opposing conclusion from the evidence cited in Kate's argument.
- (C) It refutes Kate's argument by rejecting one of its unstated assumptions.
- (D) It calls into question one of the statements Kate makes to support her conclusion.

“ACTIVE LEARNING” ASSESSMENT

To assess the frequency of students' participation in “active learning” assessment, students were asked

Reflecting back over the last four semesters (including this one), on average, how often did a typical class instructor, require you to participate in the following types of **graded assessments**?

Individual projects	1 = Once a week or more	1=frequently (Once a week or more; Less than once a week but at least once a month) 0= rarely or never (Less than once a month but at least once a semester; Never
Group projects	2 = Less than once a week but at least once a month	
Presentations	3 = Less than once a month but at least once a semester 4 = Never	

THE LINK BETWEEN CRITICAL THINKING AND ACTIVE LEARNING. A REGRESSION MODEL



Dependent variable - Critical thinking test performance score

Independent variable - the frequency of each type of assessment (frequent–1, never–0)

Control variables (Pascarella, Terenzini 2001) :

- critical thinking test results for the latest wave of the study (3 grade),
- social and economic status (SES),
- communication with teachers.

THE RESULTS OF THE REGRESSION ANALYSIS



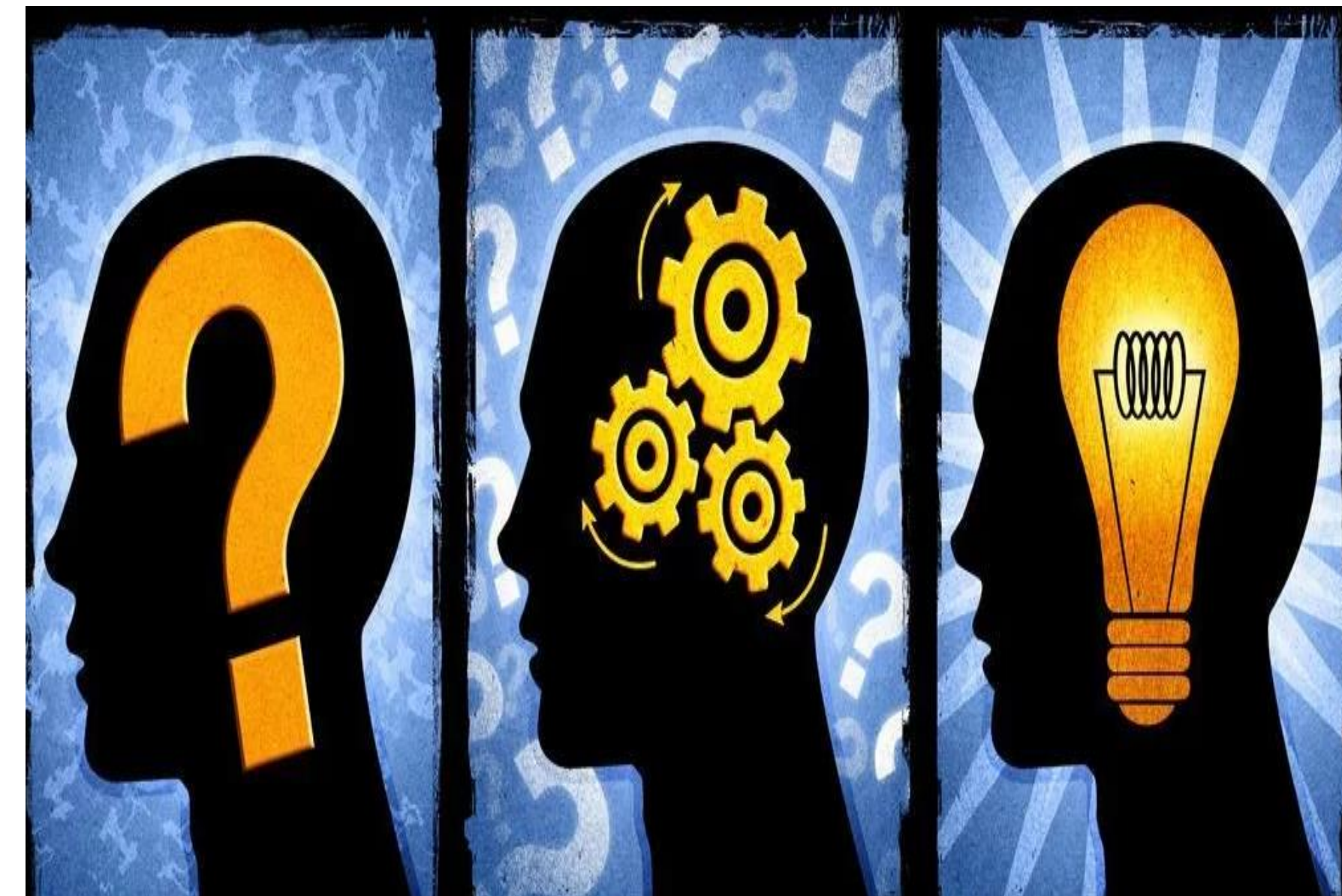
Presentations				Group project				Individual project			
(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
-0,46***	-0,23***	-0,22***	-0,22***	-0,34***	-0,23***	-0,22***	-0,22***	-0,44***	-0,17**	-0,17**	-0,17**
(0,1)	(0,08)	(0,08)	(0,07)	(0,1)	(0,08)	(0,08)	(0,08)	(0,1)	(0,08)	(0,08)	(0,08)

SUMMARY

The results of this study some contradict the results of majority other studies –. The results of other researches show that project activities and presentation are one of the main teaching practices used to form critical thinking within the subject (Fung, D., & Howe, C. 2012, Webb, 1990, Mercer, 2000, Chen, F.C., Lin, M.C., 2003).

Possible reasons for the negative connection :

- the teacher often requires the student only to demonstrate the learned material (Tofade, T et al 2013, Anaya et al. 2010, Sato et al., 2015)
- teachers are often not trained in the methodology of development of students' critical thinking (Broadbear, 2003).
- time constraints prevent the integration into the teaching process conditions to the development of critical thinking skills (Snyder, L. G., & Snyder, M. J., 2008)
- the lack of feedback (Kreitzberg, A., & Kreitzberg, C. 2010; Halpern, 1998).



QUESTIONS FOR DISCUSSION



1. What could be the role of assessment for the development of CT?
2. How to design an experiment to compare different approaches to the development of CT?
3. What the normative (theoretical) dynamics of the development of CT in higher education?