

The Goals:

- Achieving higher levels of cognitive knowledge**
- Improving basic competences**

SLAM-STEM
Estonia
07.12.2018



Cognitive or higher cognitive processes

* perception

* attention

* thinking

* memory

(number of tasks that brain does continuously)

For STEM we can rename cognitive skills as...

....information processing

How to use different information (text, numbers, objects etc)

How to read, translate, explain, describe and understand it

How to connect them with things we already know.

Most important skills for this STEM project (individual) are:

- * **Functional reading**
- * **Mathematical writing**
- * **Scientific writing**
- * **Logical thinking**
- * **Spatial thinking**
- * **Problem-solving**



PIAAC (The Programme for the International Assessment of Adult Competences)

.2013 report had very high correlation ($r=0,85$) between **problem-solving** (II and III level) and **employment**.

.Report said that if you have a very high skill level on something and do not know how to use it - it becomes useless.

[https://www.oecd.org/skills/piaac/Skills%20volume%201%20\(eng\)--full%20v12--eBook%20\(04%2011%202013\).pdf](https://www.oecd.org/skills/piaac/Skills%20volume%201%20(eng)--full%20v12--eBook%20(04%2011%202013).pdf)

Non-cognitive skills

To be in balance with cognitive skill it's very important to develop non-cognitive skills (personality traits):

social skills

emotional stability,

confidence,

entrepreneurship,

self-control etc

8 key competences

- 1. Communication in mother tongue**
- 2. Communication in foreign language**
- 3. Mathematical, scientific and technological competence**
- 4. Digital competence**
- 5. Learning to learn**
- 6. Social and civil competences**
- 7. Sense of initiative and entrepreneurship**
- 8. Cultural awareness and expression**



What do we do in Estonia to improve students cognitive skills

Self-directed learner

Flipped classroom

Group work (boys and girls, mixed teams, random team generator)

Cooperative learning

Formative assessment (Grade 1-6, and 7-9 (gym, art, music, literature, social lesson)

E-learning day

Topic Based Learning week

Project days

Teachers day

Big Brother Project

Research study – (8th grade),

International projects

Design based learning (5E) – Chemistry , Physics

Science school (Tartu University)

Student personalizing

General lesson / *Topic based learning* (1th – 4th grade)

One active moving hour per day (1th - 6th grade)

Drama lesson once in week (1th – 8th grade)

On Tuesdays from 14:00 to 15:30 - teachers cooperation

Thursdays from 15:00 to 16:00 „learning circles“ for teachers

5 “E” concept (STEM, STEAM, DBL)

Engage: An "engage" activity should do the following: Make connections between past and present learning experiences. Students should become mentally engaged in the concept, process, or skill to be learned.

Explore: During this phase, students actively explore their environment or manipulate materials through experiments

Explain: They have opportunities to verbalize their conceptual understanding or to demonstrate new skills or behaviour. This phase also provides opportunities for teachers to introduce formal terms, definitions, and explanations for concepts, processes, skills, or behaviours.

Elaborate: Through new experiences, the learners develop deeper and broader understanding of major concepts, obtain more information about areas of interest, and refine their skills.

Evaluate: This phase of the 5 E's encourages learners to assess their understanding and abilities and lets teachers evaluate students' understanding of key concepts and skill development.

Grades are just marks (numbers).

You have to compare them with students **motivation** and **needs** (*competence, relatedness, autonomy*).

„Self-determination theory“ (Deci and Ryan)

<https://www.youtube.com/watch?v=hj4em2gC5EQ>