Informatics Education at School: What Should We Teach?

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Lithuania – **LIETUVA**

- Territory – 65 300 km²
- Population – 3 mln.
- Lithuanians – 84%
- Vilnius – 550 000
- Currency – Litas
- Borders: with Latvia, Belorussia, Poland, Russia and Baltic sea

About Vilnius University

Established **1579**

In 1579, King Stephen Bathory's charter transformed the Jesuit college, founded in 1570, into an establishment of higher education, Academia et Universitas Vilnensis Societatis Jesu

About me

- involved in teaching Informatics since 1986
- wrote more than 60 textbooks in Informatics
- published more than 150 research papers and methodical works
- involved in establishing national Informatics and later IT curricula at schools
- heading the group at the Ministry of Education on preparing strategy for Informatics and ICT at schools in 2015-2020
- established international contest Bebras on Informatics and Computer Fluency
- Editor of the international journals

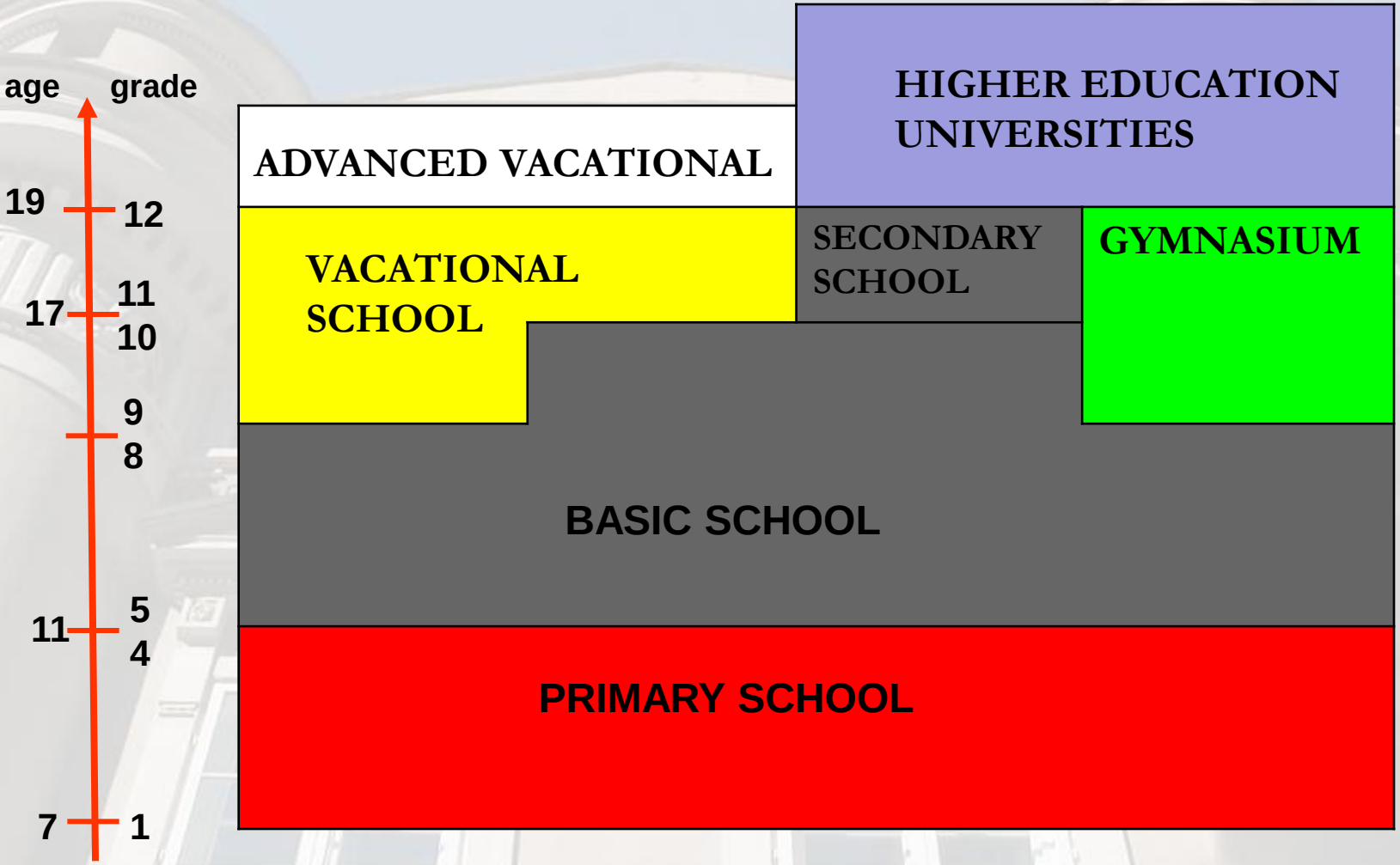
  INFORMATICS IN EDUCATION and

  OLYMPIADS IN INFORMATICS

My research areas

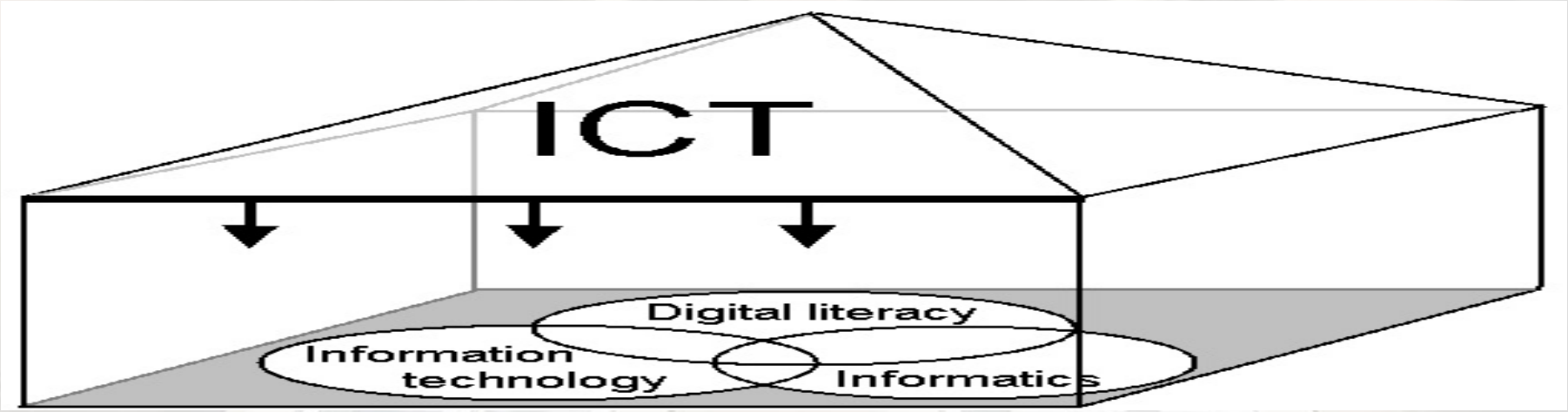
- Logo-based programming and constructionism
- Teaching algorithms and programming
- Teacher (Informatics) training
- Technology based learning
- Learning sciences and computing
- Educational information and communication technologies
- Informatics (Computer Science) Didactics
- Education software design and localisation
- Informatics engineering education research methods
- Computational thinking

The Education Structure in the Republic of Lithuania



Informatics (CS) and ICT (IT)

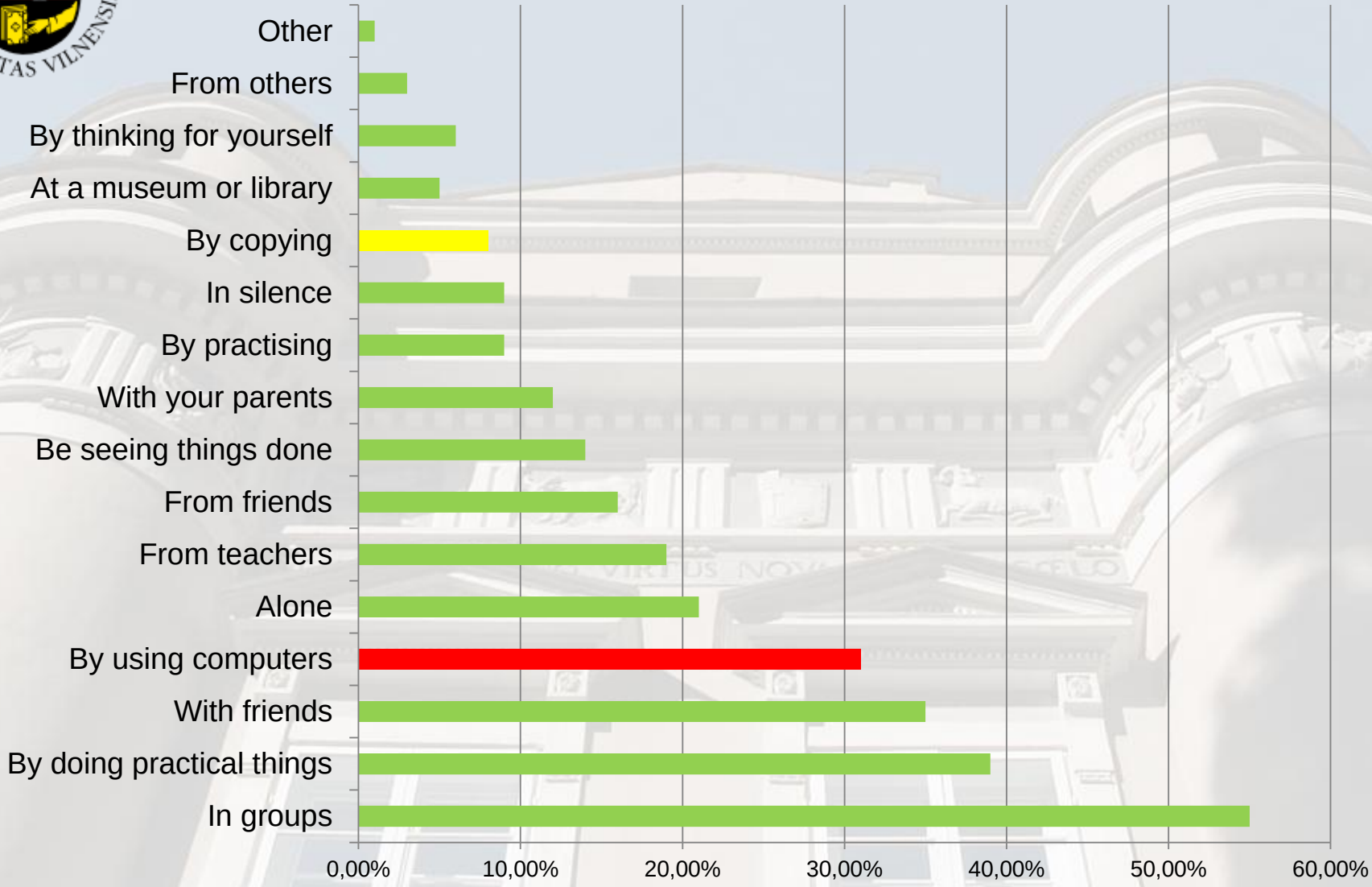
- **Informatics** is defined as the science dealing with design, realization, evaluation, use, and maintenance of information processing systems, including hardware, software, organizational and human aspects
- **Computer science** (CS) is the study of computers and algorithmic processes, including their principles, their hardware and software designs, their applications, and their impact on society (CSTA).
- **Information Technology (IT)** is defined as the technological applications of informatics in society
- **ICT** means the combination of IT with other, related technologies



IT and Informatics

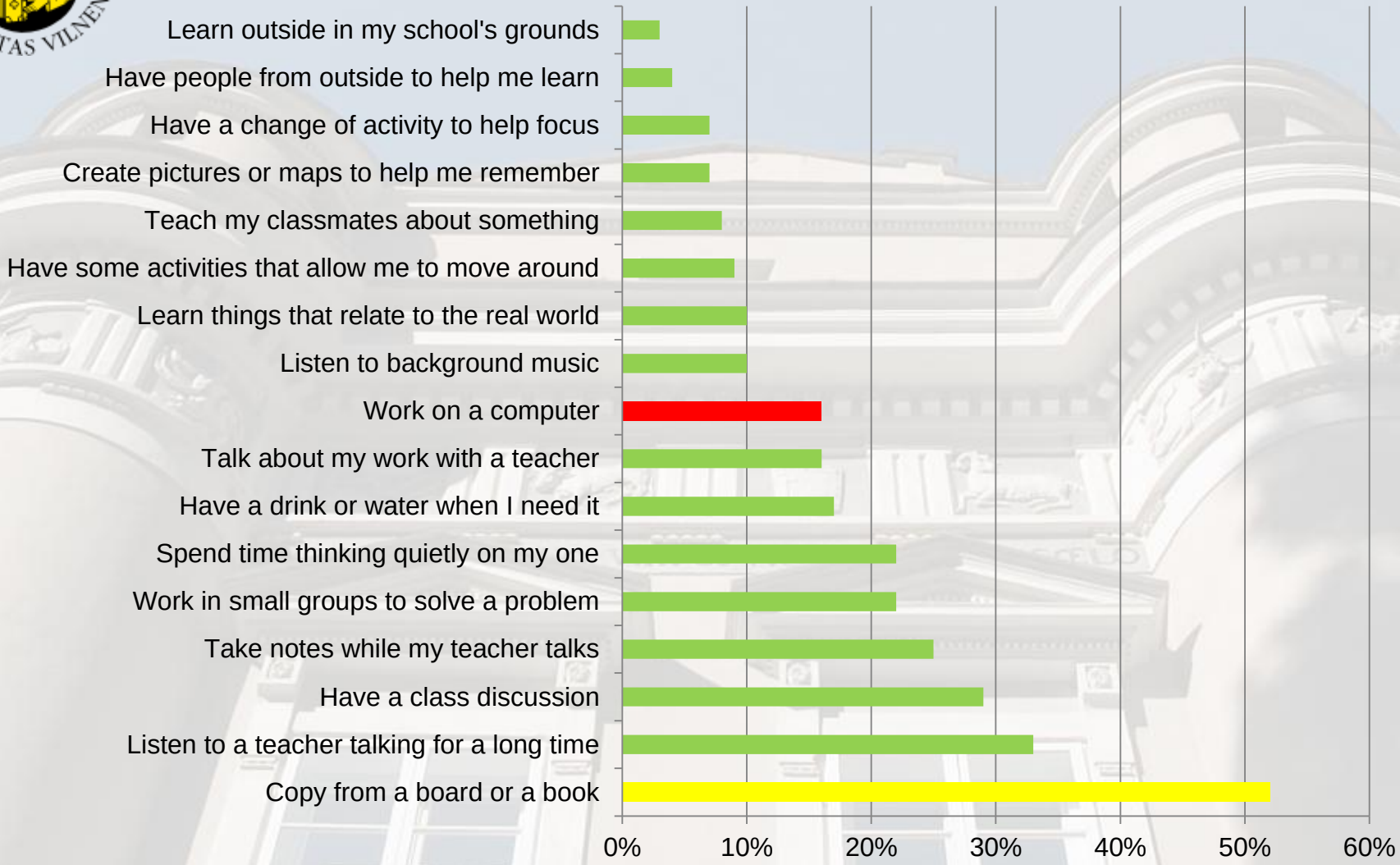
- IT and CS are distinct subjects, with different purposes, although they have areas of synergy.
- **Informatics or Computer Science or Computing is an academic discipline, in the same way that mathematics and physics are.**
- Digital literacy is a core skill for accessing subjects across the curriculum, including CS and IT themselves.

Most preferred ways to learn



Source: Ipsos MORI Pupils: 2417

Common classroom activities



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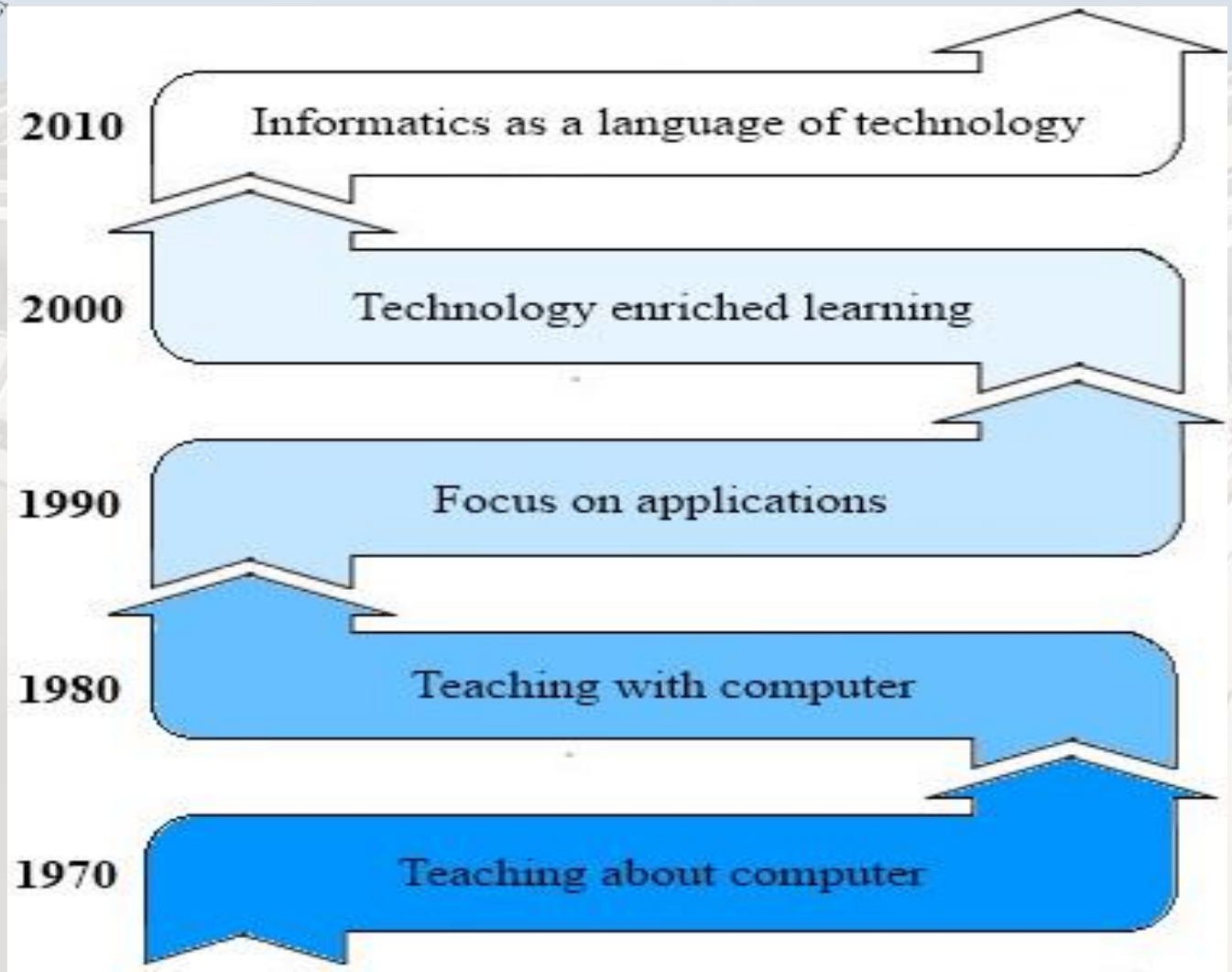
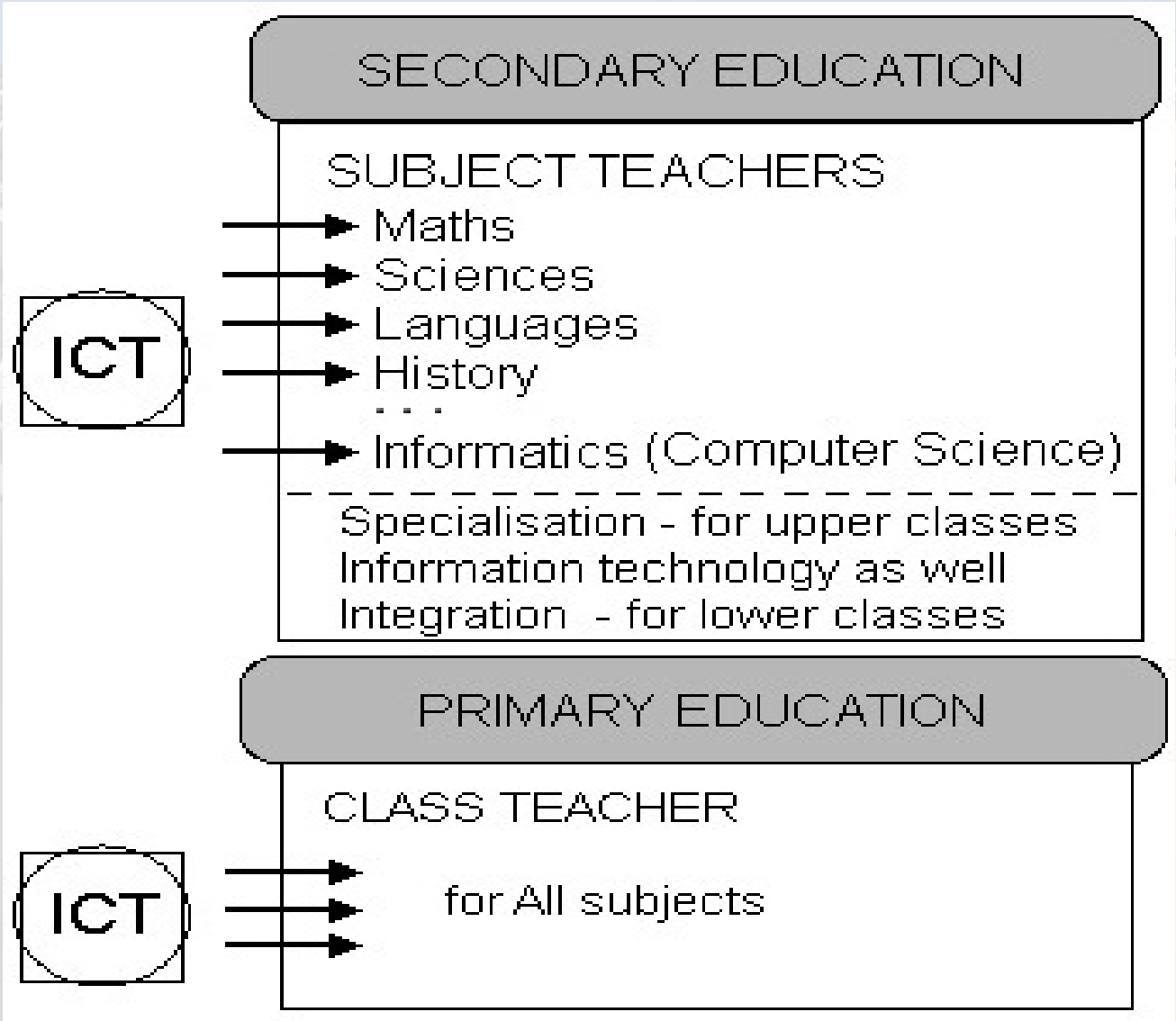
Short glance to Informatics at School



IT and Informatics teachers



Informatics in Lithuanian schools

- The name: Informatics (1986-2002), then Information Technologies, IT (since 2002)
- **Compulsory subject for grades 5-10** (lower secondary school)
  - approximately 1 hour per week (35 hours per year) for grades 5 and 6; 7 or 8; 9 and 10
- **Optional modules for grades 11 and 12** (programming, data base, desktop publishing) for upper secondary school

IT in Lithuanian schools

Starting from 2005 information technology has begun to be taught in grades 5–6 to 10.

The curricula for 5th – 10th grades include a compulsory course in IT. Students are being prepared to the further life as citizens of the information and knowledge society that are able to use modern technologies. They are prepared to adapt themselves in a changing world and are ready to develop their professional skills constantly.

Goals, aims, means, and scope of learning Informatics

The development of students' **information culture** was chosen as the main goal of teaching informatics.

The main concepts included into the information culture were:

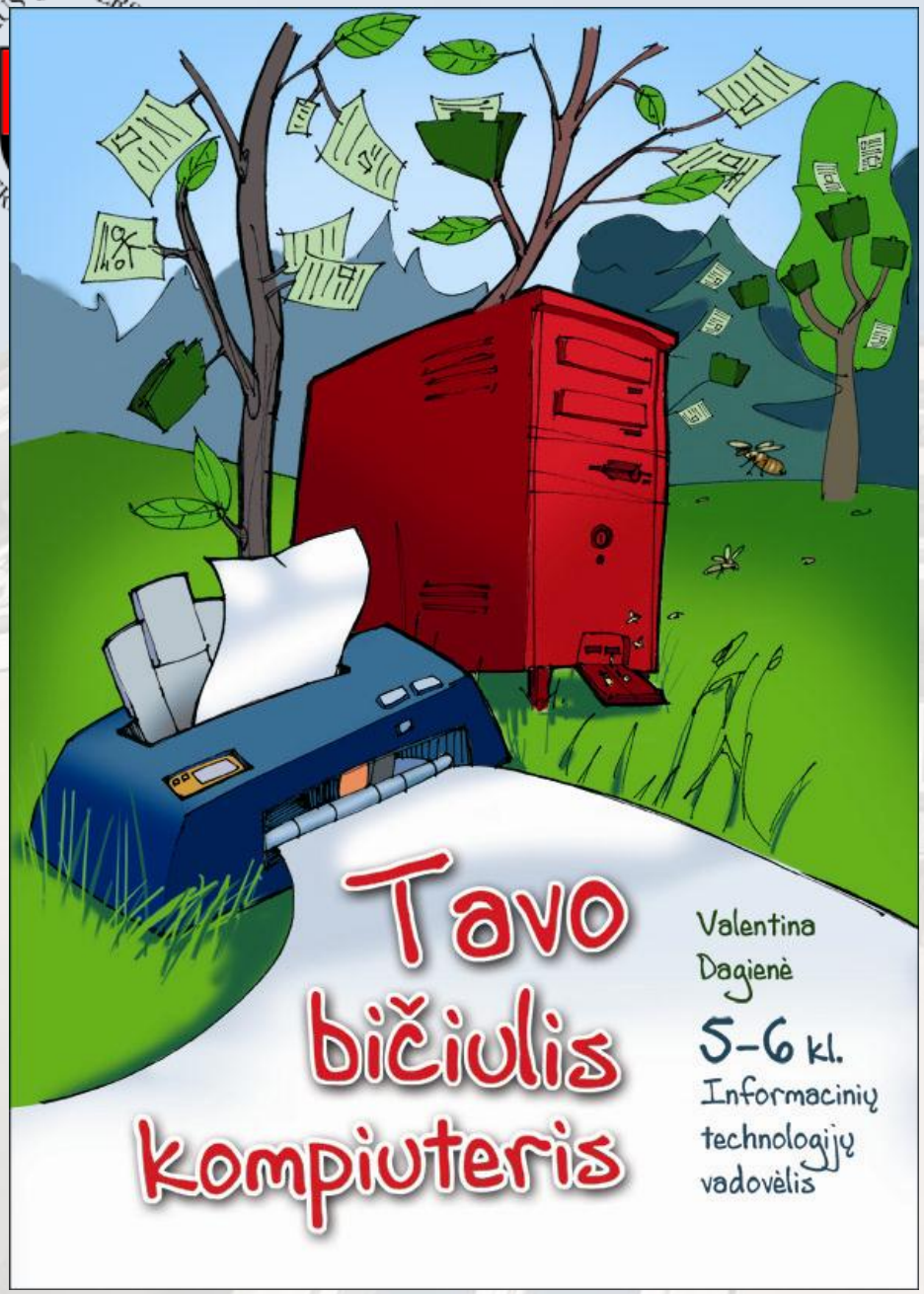
1. knowledge of the essential systems of informatics and the ability to apply the knowledge in cognition and creation,
2. apprehension of informatics terms,
3. comprehension of the influence of informatics means on the general culture,
4. skills of using ICT,
5. ability of logical as well as algorithmic thinking,
6. readiness for constant improvement of one's information style of activities.

Computational Thinking

- Logically organizing and analyzing **data**
- Representing data through **abstractions** such as models and simulations
- **Automating** solutions through a series of ordered steps
- Identifying, analyzing, and implementing possible solutions with the goal of achieving the most **efficient** and **effective** combination of steps and resources
- **Generalizing** and transferring this problem solving process to a wide variety of problems
- Formulating problems in a way that enables us to use a computer and other tools to **help solve** them

Distribution themes and time for 5-6 grades

Themes, subthemes	IT hours	Subjects, integration is addressed to
Introduction to computer application	**10**	
Principles of computer use	**6**	
Drawing with computer	**4**	Art; 10
Text and keyboard	**14**	Mother tongue; 10
Internet and electronic mail	**10**	Mother tongue; 4 Foreign language; 10
Modelling with Logo	**24**	



1. *Introduction to computer*
2. *Drawing*
3. *Text processing*
4. *Internet and emails*
5. *Modeling (Logo)*

Modelling with Logo

- Computer control understanding through Logo
- Control the dynamic object (turtle): by commands, keyboard, mouse
- Repeating
- Drawing, scanning, composition
- Using several objects (turtles)
- Turtles and their shapes
- Basics of animation

Contents of Informatics and IT subjects

Compulsory course, 9-10 grades	Compulsory course, 11-12 grades	Advanced (optional) course, 11-12 grades
Computer (principles of the work)	Advanced elements of text editing	Data base
Text processing	Presentation	Multimedia
Information (basics of information handling)	WWW and electronic mail	Programming
Algorithms (main concepts and commands)	Social and ethical issues of using IT	
	Spreadsheet	

IT maturity exam in Lithuania

- Based on optional programming module for grades 11-12
- The exam is based on the optional programming module which consists of four parts:
  - basic elements and constructs of programming;
  - data structures;
  - developing algorithms;
  - testing and debugging programs.

Structure of IT maturity exam

The exam consists of two parts:

- 30% - computer literacy;
- 70% - programming:
  - 20% programming test (examine the level of students' knowledge and understanding the tools required in programming),
  - 50% two practical tasks (students must write Pascal programs using PC; this part examine the students' ability to use programming as a tool for problem solving).

Practical tasks

- A first task is intended to examine the students' abilities
  - to use the procedures or functions,
  - to use the data types,
  - to realize the algorithms for work with data structures,
  - to manage with input and output in text files.

- A second task is intended to examine the students' understanding and abilities to implement data structures. The core of the task is to develop the appropriate structures of records together with arrays. Students are asked:
  - to input data from the text file to arrays containing the elements of record type,
  - to perform operations by implementing algorithms,
  - to present the results in a text file.

Evaluation system

- Both tasks intentionally requires to write batch style programs, as they are more suitable for blackbox testing.
- Semi-automatic evaluation system with blackbox testing is develped for evaluation of programs.
- Exam evaluation system has different requirements than systems used in programming courses or programming contests

Evaluation schema

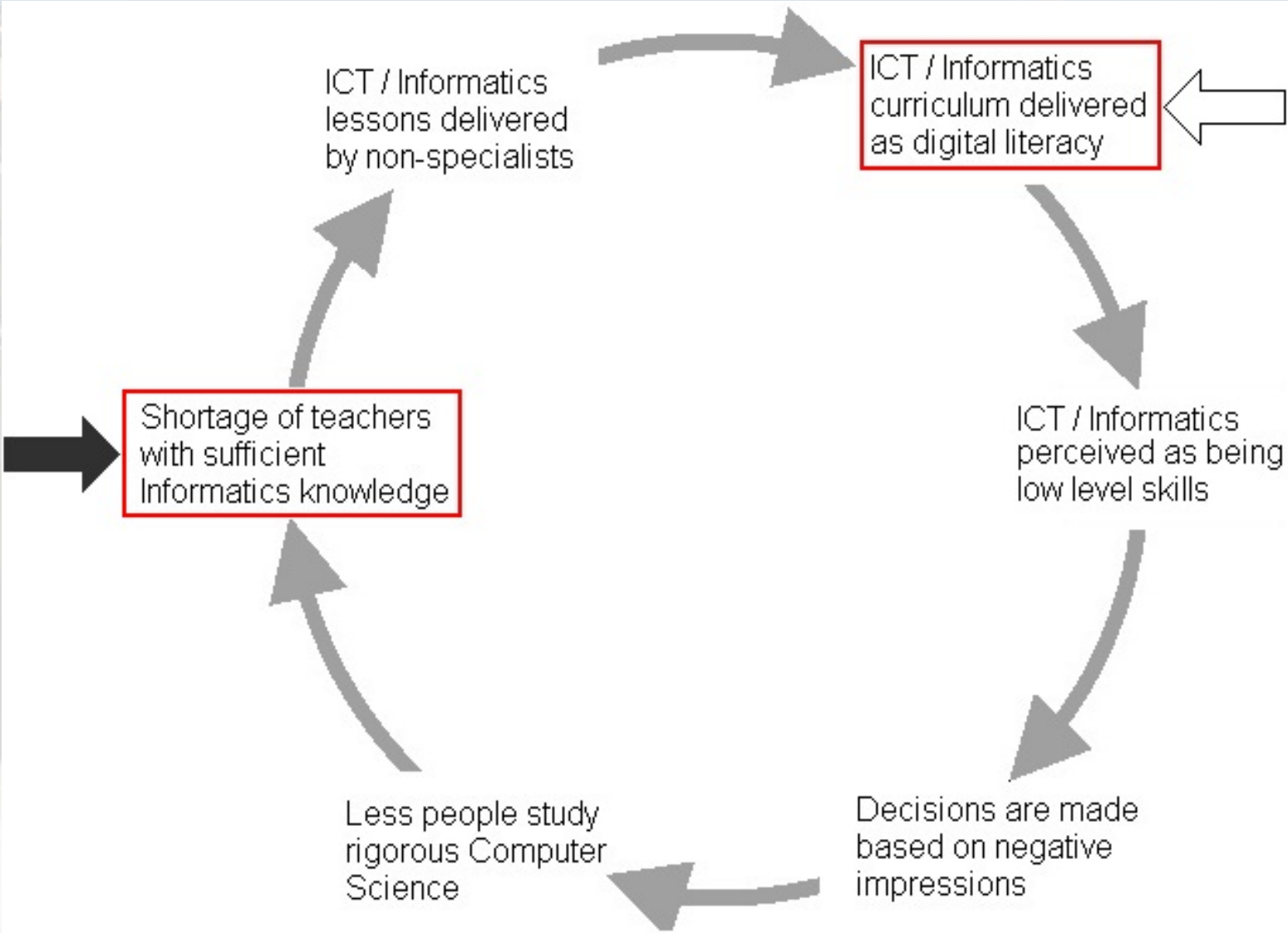
First task: evaluation criteria	Points	Comments
Tests	20	Full points if the program provides correct outputs to all tests.
Correct reading from file	4	Evaluated only if the program scores no points for the tests.
The result is outputted correctly	2	
The function, which calculates the number of chess sets that can be collected from the pieces brought by the students is created	5	
Other functions, procedures (if there are ones) and the main program are correct	9	
The data type of one-dimensional array is declared correctly	1	Always evaluated
The function which performs the indicated calculations is crated	1	
Meaningful names of the variables. Program parts are commented, spelling is correct.	1	
Programming style is consistent, no statements for working with the screen.	2	
Total	**25**	

Informatics at UK school

- The Royal Society: Shut down or restart? The way forward for computing in UK schools January 2012, report, 122 pages

- This report analyses the current state of Computing education in schools and sets out a way forward for improving on the present situation
- http://royalsociety.org/uploadedFiles/Royal_Society_Content/education/policy/computing-in-schools/2012-01-12-Computing-in-Schools.pdf

Main findings



Redefine name (recommendation 1)

- The term ICT as a brand should be reviewed and the possibility considered of disaggregating this into clearly defined areas such as digital literacy, IT and CS. There is an analogy here with how English is structured at school, with reading and writing (*basic literacy*), English Language (*how the language works*) and English Literature (*how it is used*).
- The term 'ICT' should no longer be used as it has attracted too many negative connotations

Informatics should be recognized

- There is a need to improve understanding in schools of the nature and scope of Computing
- In particular there needs to be recognition that Computer Science is a rigorous academic discipline of great importance to the future careers of many pupils
- The status of Computing in schools needs to be recognised and raised by government and senior management in schools

Shortage of Informatics teachers

- there is a shortage of teachers who are able to teach beyond basic digital literacy

- there is a lack of continuing professional development for teachers of computing

Teacher preparation

- The government should set targets for the number of Computer Science and Information Technology specialist teachers, and monitor recruitment against these targets in order to allow all schools to deliver a rigorous curriculum. This should include providing training bursaries to attract suitably qualified graduates into teaching – for which industry funding could be sought.
- Education Scotland should ensure that the declared entitlement of all learners to third-level outcomes in Computing Science is implemented in all schools for all learners using appropriately qualified teachers.

Develop qualifications in CS
(recommendation 7)

- In order to redress the imbalance between academic and vocational qualifications in this area – and to ensure that all qualifications are of value to those who take them – the departments for education across the UK should encourage Awarding Organizations to review their current provision and develop Key Stage 4 (KS4) qualifications in Computer Science in consultation with the UK Forum, universities and employers.
- Awarding Organisations across the UK should review and revise the titles and content of all new and existing qualifications in this area to match the disaggregation described above (e.g. Computer Science, Information Technology and digital literacy).

Educational tools

- Suitable technical resources should be available in all schools to support the teaching of Computer Science and Information technology. These could include pupil-friendly programming environments such as Scratch, educational microcontroller kits such as PICAXE and Arduino, and robot kits such as Lego Mindstorms.

Curriculum

- The Department for Education should remedy the current situation, where good schools are dis-incentivised from teaching Computer Science, by reforming and rebranding the current ICT curriculum in England. Schemes of work should be established for ages 5–14 across the range of Computing aspects, e.g. digital literacy (the analogue to being able to read and write), Information Technology, and Computer Science.
- These should be constructed to be implementable in a variety of ways, including a cross-curricular approach for digital literacy at primary and early secondary school. Schools may prefer not to impose a timetable or separately staff these elements at this age, but the existence of separately-defined learning experiences will ensure that each strand is always properly developed – unlike at present.

Teaching Informatics: Estonian case

- Informatics not a subject in curriculum
  - ICT considered a cross-cutting concern
  - Skills to be acquired by use in other subjects
  - No centrally provided materials for the above
- Implementation
  - Many schools do offer IT classes
  - Mostly usage for standard office work
  - Very eclectic, due to lack of curriculum

Estonia's plan to get 6 year olds coding is a stroke of genius — European technology news - Mozilla Firefox

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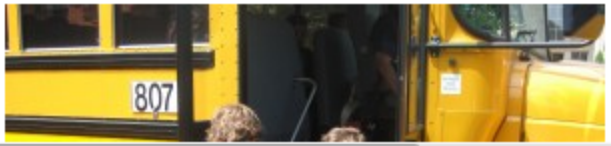
Sep 5, 2012 - 6:00AM PT

Estonia's plan to get 6 year olds coding is a stroke of genius

BY Bobbie Johnson

20 Comments



When should children learn to code? Estonia's Tiger Leap Foundation wants children as young as six to be enrolled in coding classes —

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Why Estonia Has Started Teaching Its First-Graders To Code

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Estonia, a small country with a population of 1.3 ion people, punches above its own weight when it os to advancements in tech. It was the birthplace

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05 Sep 2012 09:32 | by Nick Farrell in Rome | Filed in Software Skype Europe

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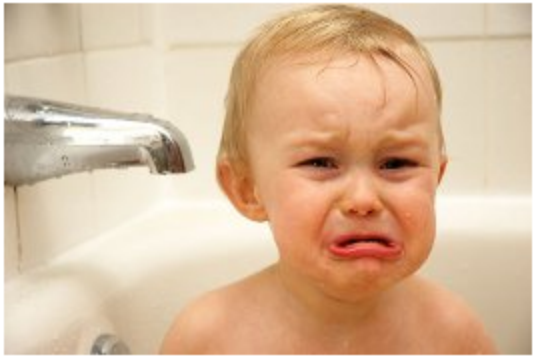

Estonia is hoping to push kids into programming from an early age.

According to *Venture Beat*, the Estonian Tiger Leap Foundation has launched a program called "ProgeTiiger", where students in grades one to 12 will be introduced to computer programming and creating web and mobile applications.

The country which gave the world Skype and Playtech is planning to set its kids onto programming more or less from their first day at school, while British kids are mumbling their way through the alphabet.

Tiger Leap Foundation training sphere manager Ave Lauringson said kids are interested in modern technology from an early age, and the ProgeTiiger programme creates prerequisites for students to develop from consumers of software to developers of software.

At the moment the programme is being tested in pilot schools with plans to roll it out to state schools later.

However, the first ones to start the lessons will be primary school students - after their teachers go through corresponding training in September.

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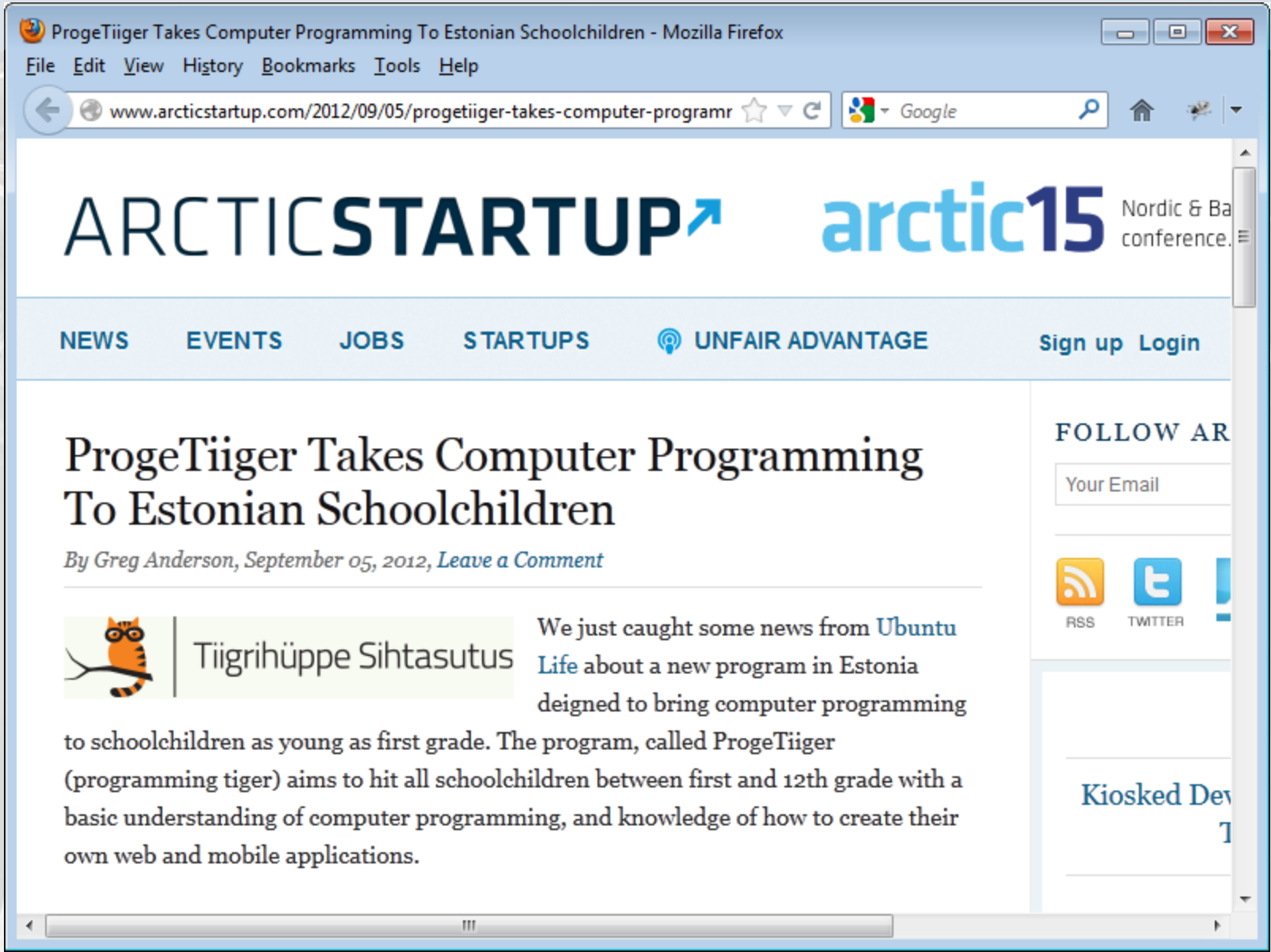
How do I fix the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ProgeTiiger Takes Computer Programming To Estonian Schoolchildren
By Greg Anderson, September 05, 2012, Leave a Comment
Tiigrihüppe Sihtasutus
We just caught some news from Ubuntu Life about a new program in Estonia deigned to bring computer programming to schoolchildren as young as first grade. The program, called ProgeTiiger (programming tiger) aims to hit all schoolchildren between first and 12th grade with a basic understanding of computer programming, and knowledge of how to create their own web and mobile applications.
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Estonia: Primary school

- Grades 1 to 3, ages 6 to 9
  - Interactive storytelling with Kodu http://fuse.microsoft.com/page/kodu
  - Moving on to Scratch in grade 3 http://scratch.mit.edu/
- Implementation
  - Already used in one school
  - Course for pilot teachers this fall
  - Pilot roll-out from January

Estonia: Basic school

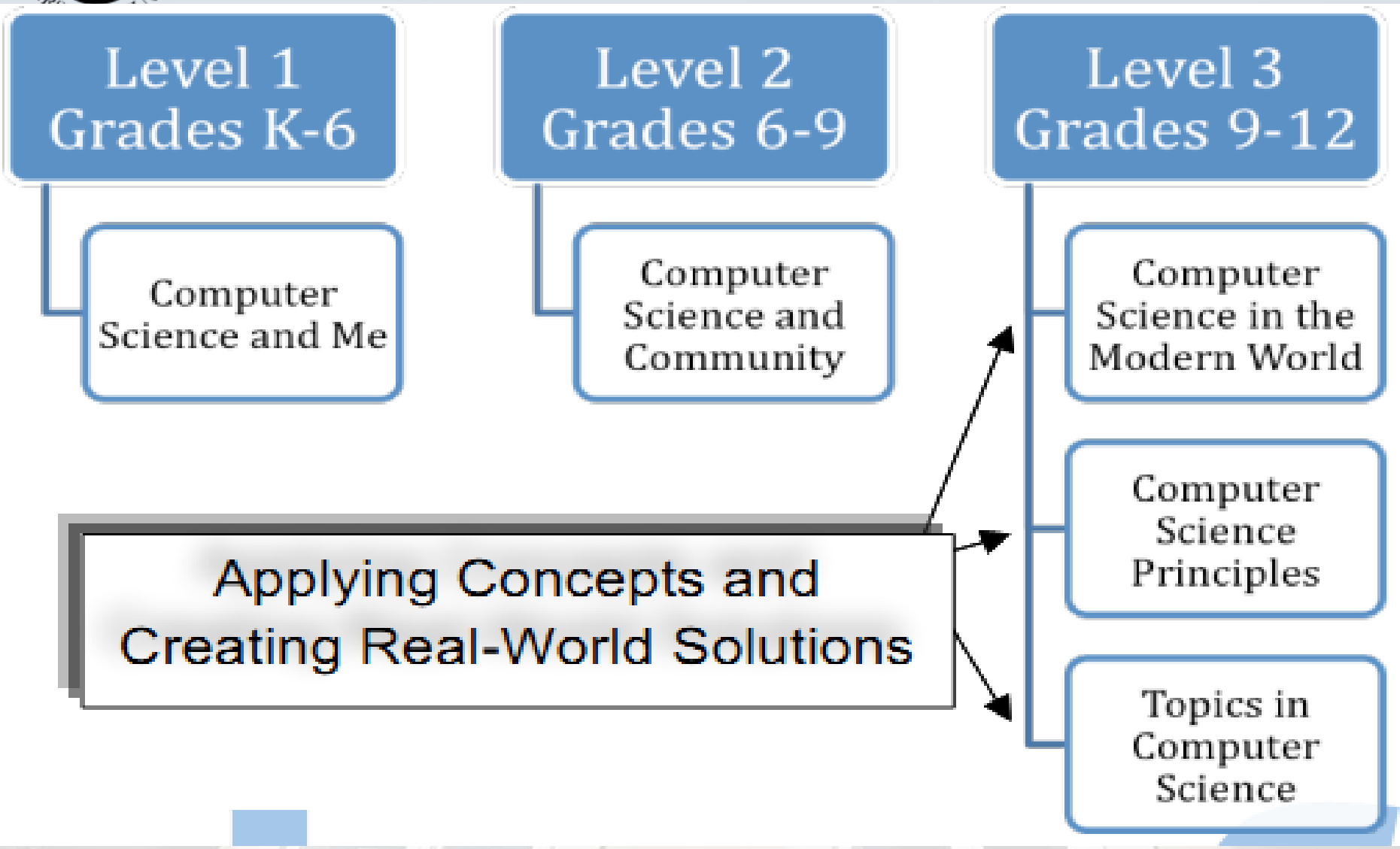
- Grades 4 to 9, ages 9 to 15
  - Continuing with Scratch, adding Logo
  - Robotics (LEGO NXT/NXC or a local kit)
  - Web pages and simple web applications
- Implementation
  - Already used in computer clubs
  - Pilot roll-out from next September
  - Some modules will remain extracurricular

Estonia: Secondary school

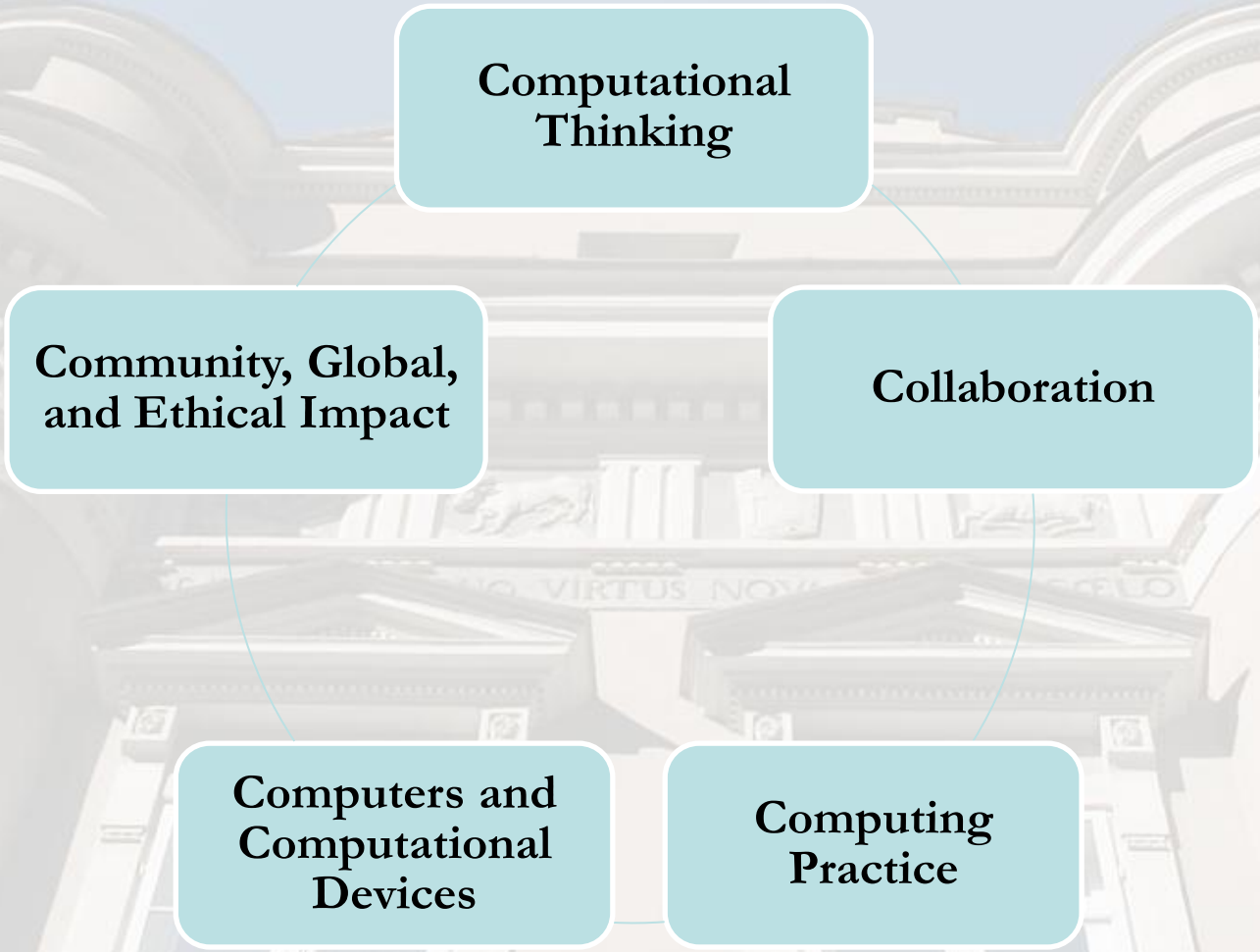
- Grades 10 to 12, ages 15 to 18
  - Continuing with web development
    + catch-up for those who missed out in primary
  - Programming in spreadsheets
  - Introduction to informatics
- Implementation
  - Computer club or elective course in school
  - May be compulsory in science-oriented schools

International curriculum development

- ACM K-12 curriculum (1999), revised March 2011
- CSTA (CS Teacher Association, USA) K-12 Computer Science Standards
- Computer Science as a Core Discipline
  - CS is intellectually important
  - Leads to multiple career paths
  - Teaches problem solving
  - Supports links to other sciences
  - Can engage all students
- Other
  - Information technology fluency
  - Scales: concepts, capabilities, and skills


Level 1
Grades K-6
Level 2
Grades 6-9
Level 3
Grades 9-12
Computer Science and Me
Computer Science and Community
Computer Science in the Modern World
Computer Science Principles
Topics in Computer Science
Applying Concepts and Creating Real-World Solutions

Strands in the Computer Science Standards



CSTA K-12 Computer Science Standards

10 fundamental concepts:

- Computer organization
- Information systems
- Networks
- Digital representation of information
- Information organization
- Modelling and abstraction
- Algorithmic thinking and programming
- Universality
- Limitations of information technology
- Societal impact of information technology.

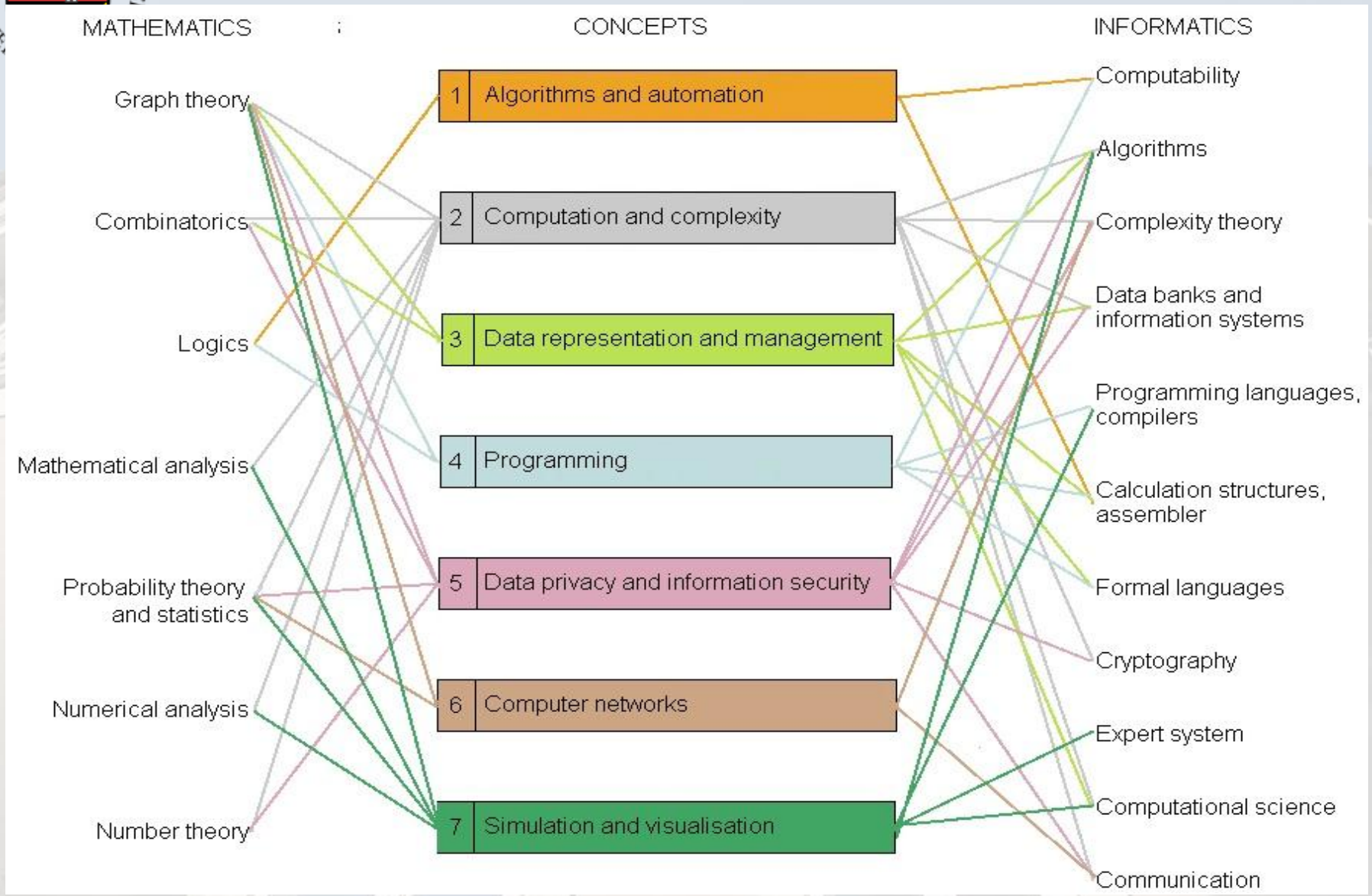
International curriculum development

- UNESCO/IFIP (2002)
- The German Society for Informatics GI:
  - grades 5 to 10
  - ***content*** area and ***process*** area
  - The content part covers 5 basic concepts:
    - information and data
    - algorithms
    - languages and automata
    - informatics systems
    - informatics, man and society

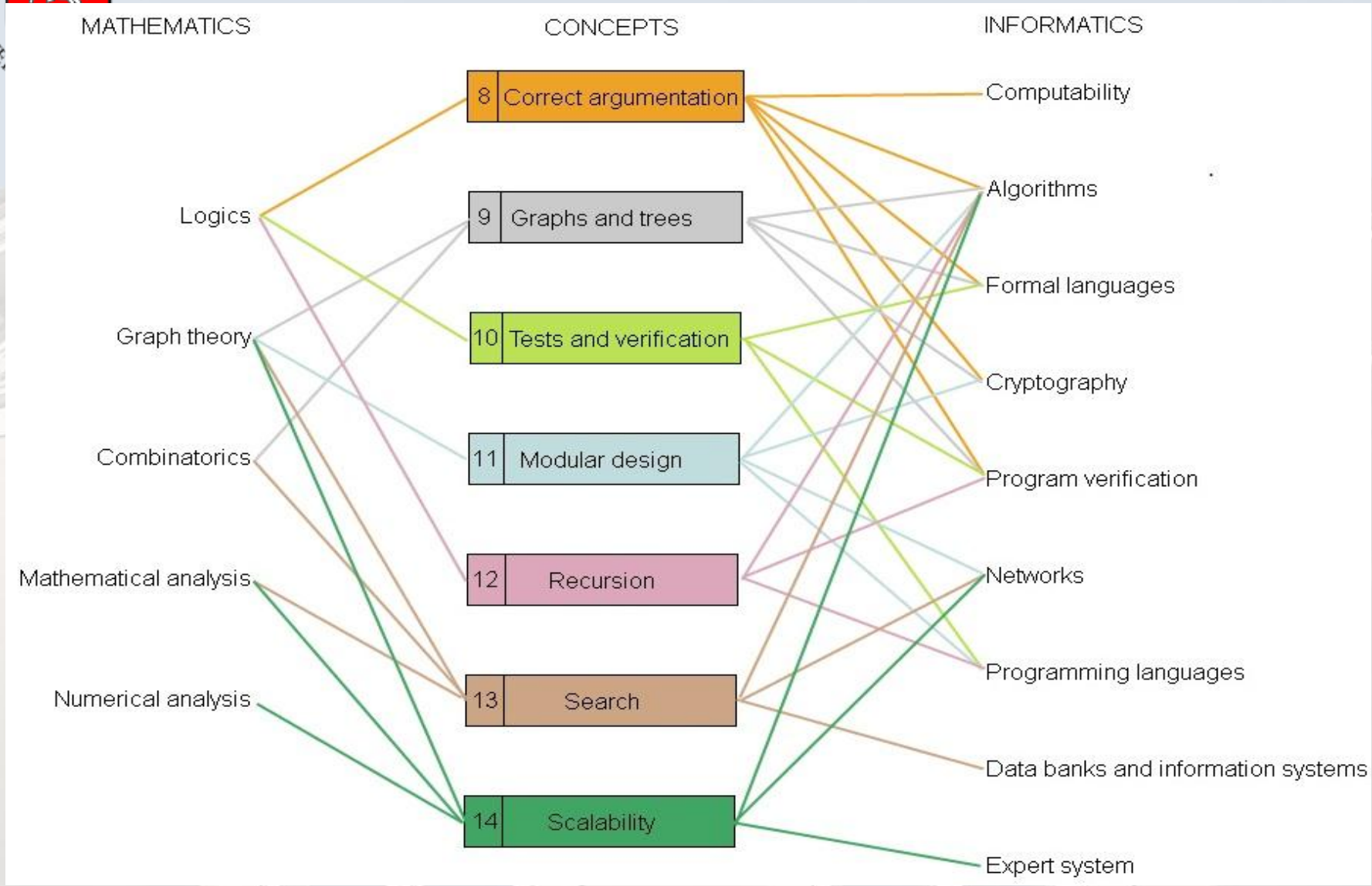
What concepts should Informatics include in secondary schools?

- The answer is problematic due to several reasons:
  - Informatics, information technology is a new and rapidly evolving science.
  - The variety of different practical applications of informatics overruns the core theoretical and scientific concepts.
  - **No common framework**, what should be introduced in school from the theory of informatics, and whether it should be introduced at all.

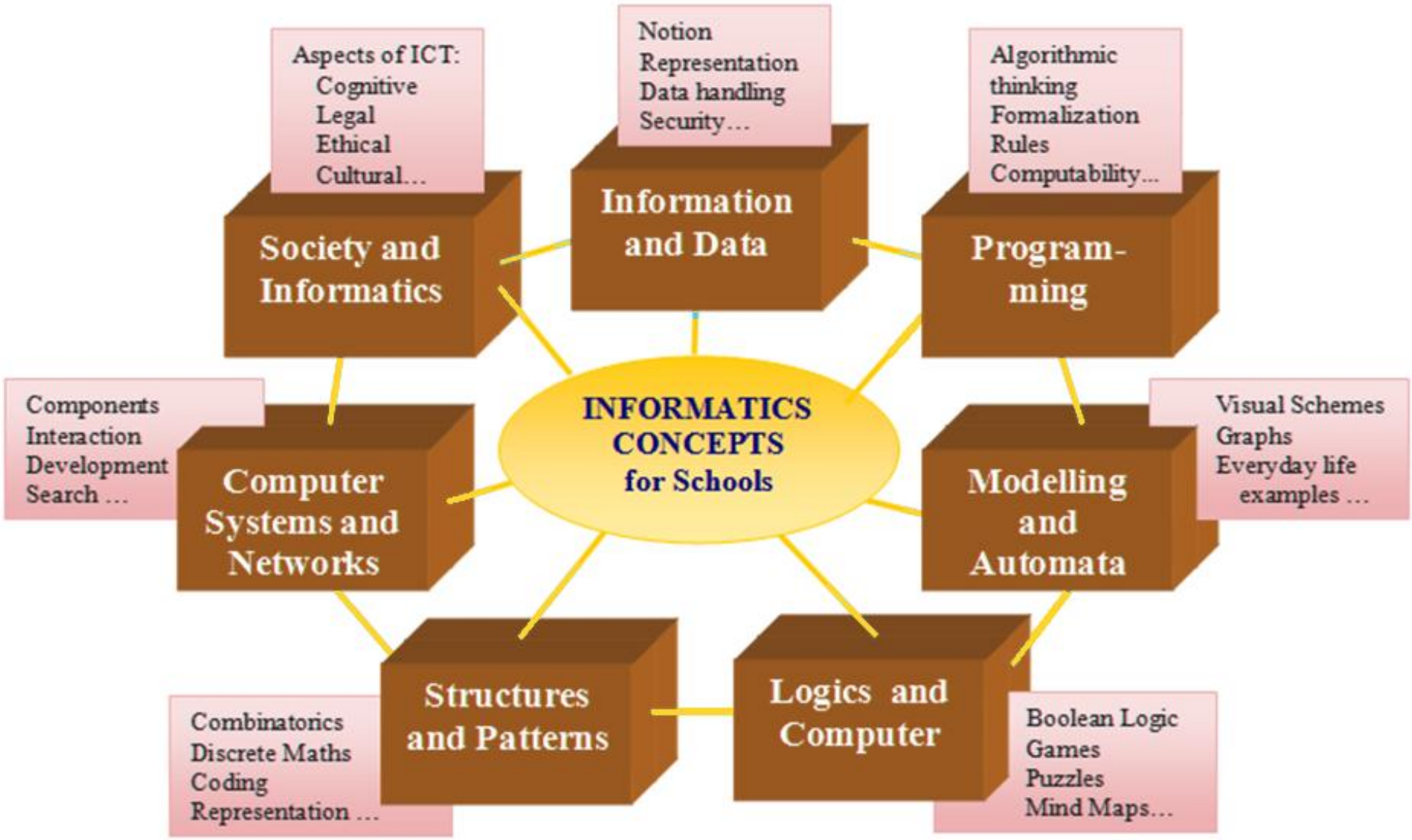
Informatics concepts at school



Informatics concepts at school



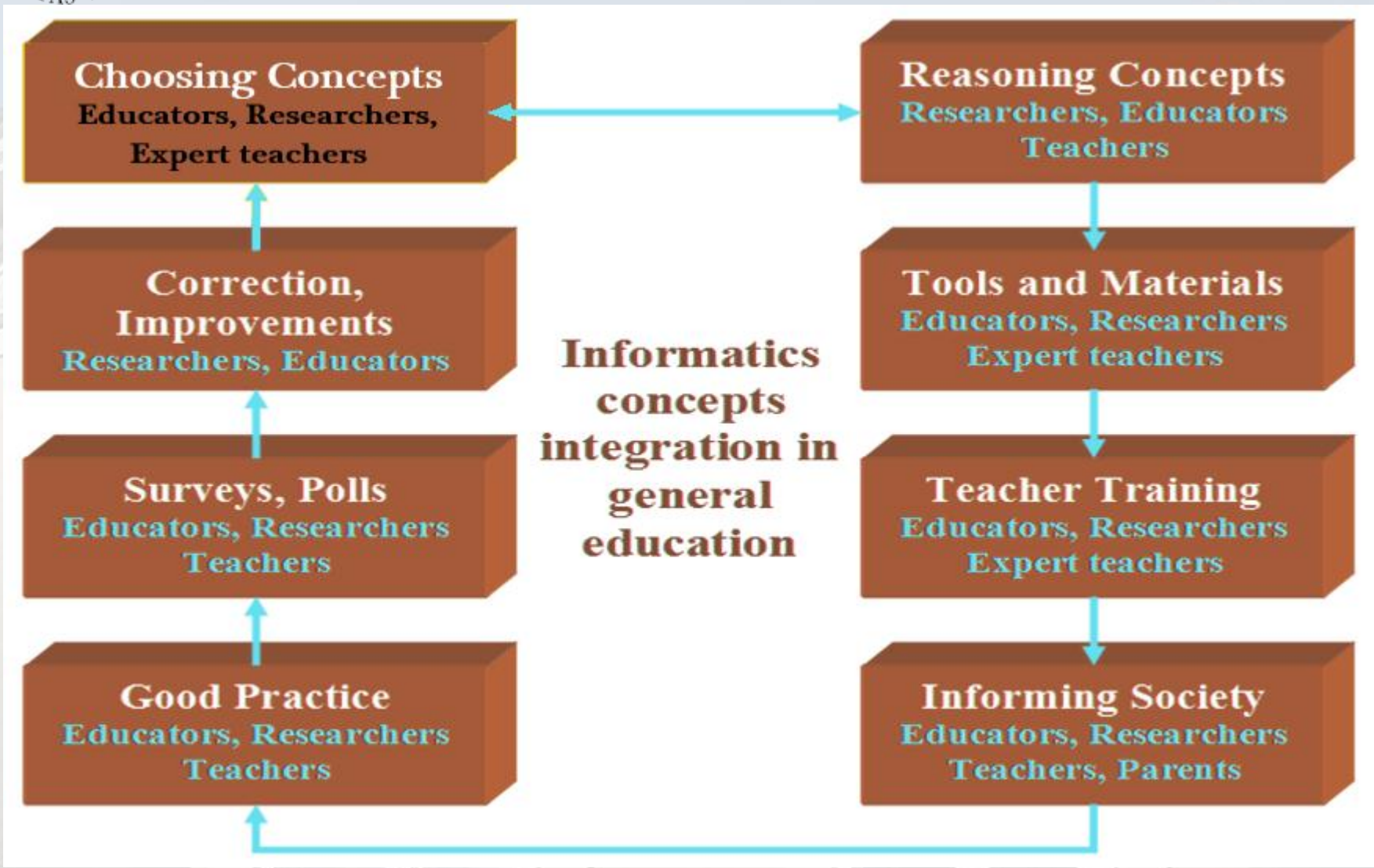
Key informatics concepts for schools



Few "commonly agreed" concepts of informatics for secondary schools

- Algorithms and programming
  - Decomposed into data, variable, cycle, procedure, object, class, etc.
- Structures and patterns
- Information
- Automata and graph theory elements

Process of integration of informatics concepts in general education



How we should teach Informatics?

- Bringing informatics to schools through curriculum in a formal track
- Supporting the informal ways of introducing pupils to informatics
- ... **to introduce informatics through contests**

Contest on Informatics and Computer Fluency

- Contests are a source of inspiration and innovation
- Contests may be the key to the potential of new knowledge and attractive way to bind up technology and education
- *Bebras* (Beaver) – International Contest on Informatics and Computer Fluency
- The main principles of the *Bebras* contest are borrowed from the international mathematical contest *Kangaroo*

International Contest on Informatics and Computer Fluency BEBRAS (Lithuanian word for beaver)

Task oriented contest for school pupils aged 10 to 19

Goals

- to **motivate** pupils to solve problems using informatics methods
- to **stimulate** pupils' interest in informatics and information technology
- to **encourage** pupils to *think* deeper while using computers and information technolgies
- to **inseminate** concepts of informatics

Concepts of Informatics

are related to „Fundamental Ideas of Computer Science“ that

- are applicable in different areas of computer science
- may be taught on every intellectual level
- will be relevant in the long run
- have meaning in everyday life

Concepts are independent from specific informatics systems
Concepts can be applied in new situations in the future
Concepts are valuable in the long run

Concepts consist of aspects

- Algorithmic thinking
- Symbolic representation
- Patterns, Structrurs
- Parallelism, Synchronization
- Iteration, Recursion

etc.

Bebras Countries

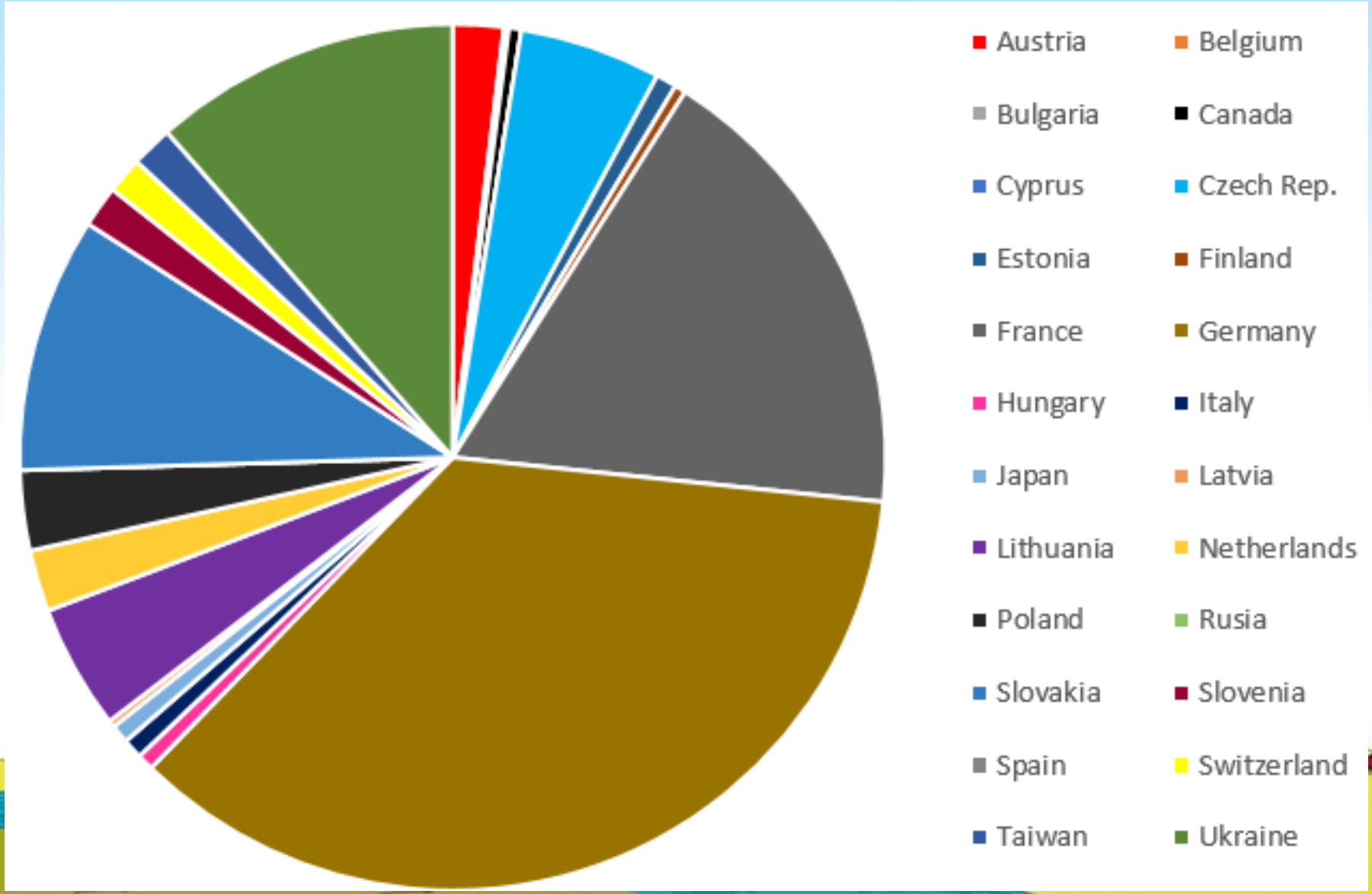
24 countries

Trials
Israel
Sweden

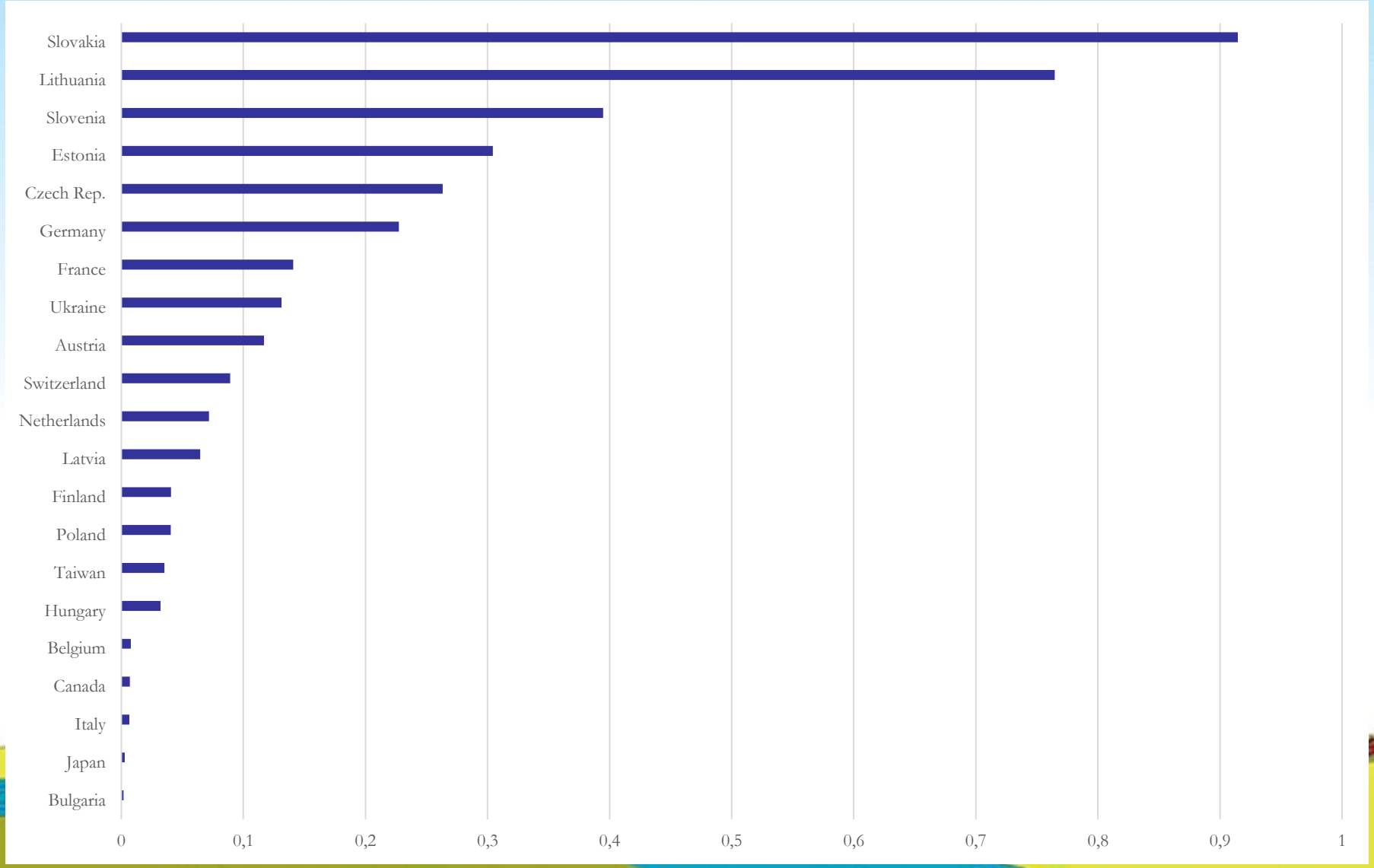
New countries
Australia
Ireland
Malaysia
Mexico
UK
USA
R. of S. Africa
S. Korea

Country	Particip. 2010	Particip. 2011	Particip. 2012	First Contest
Austria	8 425	9 171	9877	2007
Belgium	-	-	848	2012
Bulgaria	-	-	137	2012
Canada	-	200	2400	2011
Cyprus	-	-	?	2012
Czech Rep.	14 867	19 280	27650	2008
Estonia	3 956	4 807	4012	2005
Finland	1 472	2 045	2197	2010
France	-	46 346	92000	2011
Germany	117 950	155 419	186048	2006
Hungary	-	1 911	3200	2011
Italy	1 325	1 597	3885	2009
Japan	-	1 600	3600	2011
Latvia	1 072	893	1336	2005
Lithuania	13 889	19 277	24390	2004
Netherlands	10 231	11 252	12000	2005
Poland	9 962	11 945	15587	2005
Russia	-	-	?	2012
Slovakia	22 139	36 382	49798	2008
Slovenia	-	3 454	8120	2011
Spain	-	-	?	2011
Switzerland	3 470	4 475	7086	2010
Taiwan	-	-	8100	2012
Ukraine	25 971	42 176	59918	2008

Absolute Participation 2012



Relative Participation 2012



Bebras workshops for creating tasks

- **2005** in Balsiai, Pasvalys, Lithuania
- **2006** in Balsiai, Pasvalys, Lithuania
- **2007** in Balsiai, Pasvalys, Lithuania
- **2008** in Torun, Poland
- **2009** in Balsiai, Pasvalys, Lithuania
- **2010** in Dagstuhl, Germany
- **2011** in Druskininkai, Lithuania
- **2012** in Druskininkai, Lithuania
- **2013** in Torun, Poland, June 27 – July 1
- **2014** in Vilnius, May 28 – June 2

Influence of *Bebras* Contest

- On **teaching informatics** (computing)
  - Introduces concepts to pupils
  - Encourages exploring
  - Gives examples of good tasks
  - Stimulates learning some topics of Informatics
- On **developing curriculum**
  - Sets an international standardization
  - Helps to agree on concepts
- On **teacher training**
  - Challenges teachers to deal with new concepts
  - Improves deeper understanding of informatics

IL-06 Data Transmission (Benjamin easy)

We are in 18th century. Popeye The Sailor Man found a treasure chest on a Caribbean island and wants to send a message to his friends on land. When Popeye eats spinach, he is capable of making different kinds of water waves.
His friends know the meaning of the following signs.

I found the treasure .

I'm waiting on the island

hurry

Popeye sends his friends the following message by creating water waves:

What does this message mean?

A.I found the treasure. I'm waiting on the island. Hurry.

B.Hurry. Hurry. I found the treasure. I'm waiting on the island.

C.Hurry. I found the treasure. Hurry. I'm waiting on the island.

D.I'm waiting on the island. Hurry

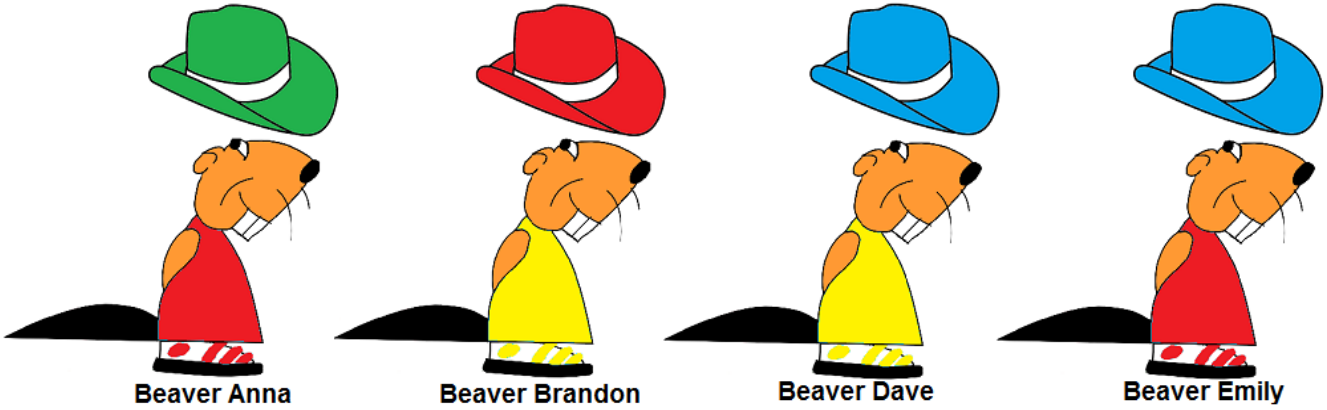
This is informatics
To transport information we need a represention (code), a transport medium, a sender and a receiver. Digital communication is an important part of all informatics systems.

NL-12 Wrong hat (Cadet medium)

The beavers Anna, Brandon, Dave und Emily have in dressing style two rules:

- All four beavers have the hat with their preferred colour.
- None of the beavers prefer the same hat colour as the colour of the shirt

But at the moment all four beavers have the wrong hat colour:



To which beaver belongs the green hat?

A. Anna

B. Brandon

C. Dave

D. Emily

It is informatics
Logic deduction is the basis of computer science. Exclusion of impossible arrangements can lead to the desired solution.

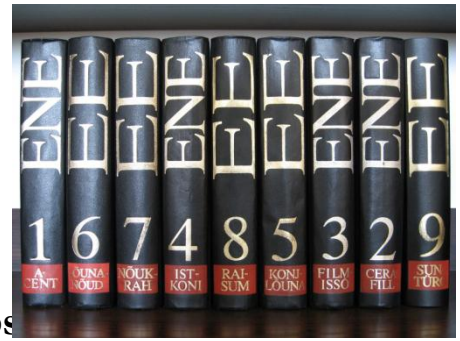
EE-03 Bookshelf (Junior medium)

The librarian wants to order the volumes of an encyclopaedia with as few steps as possible.

For doing one step he takes a volume out of the shelf, shifts some of the remaining ones to left or right and puts the volume in his hand to the new free space.

The following example sorts 5 volumes using just one step:

Now he wants to order the following 9 volumes:



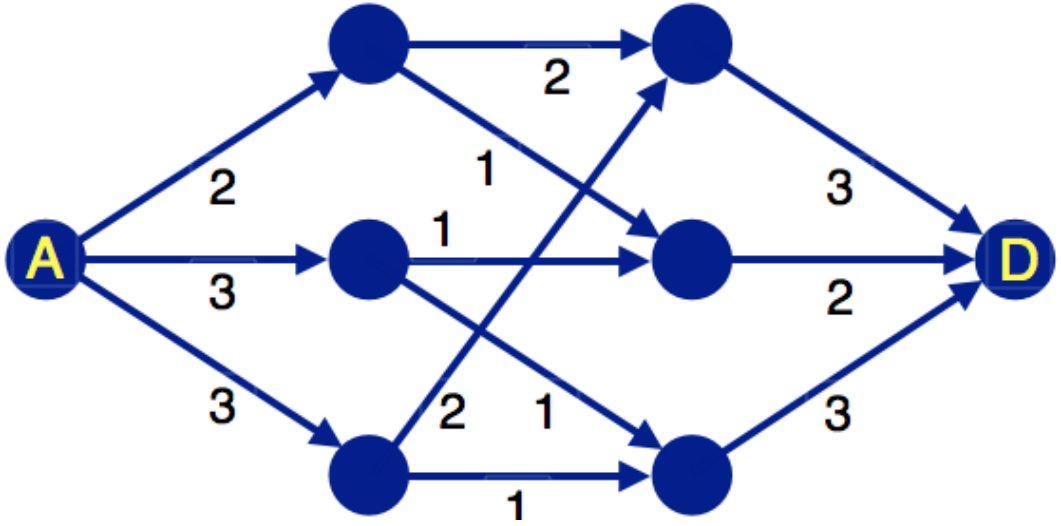
What is the smallest number of steps

This is computational thinking

A largest increasing subsequence remains untouched in the optimal solution . To find substructures that remain invariant is a key competence of computational thinking.

CH-09 Beaver's log factory (Senior hard)

The beavers have established a site (A) where they do all their log chopping. They want to transport them through a series of canals to the biggest dam ever built (D). Unfortunately the canals allow the transport only of a certain number of logs per minutes (the number at each arrow).



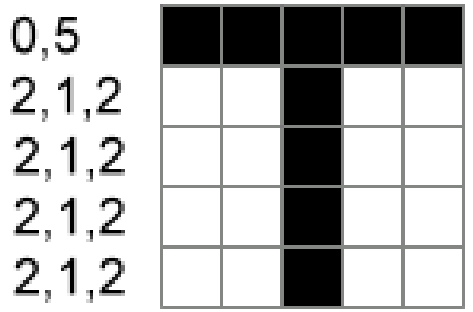
How many logs can reach the dam (D) per minute?

This is informatics

The "maximal flow" in a network with capacities is a typical optimization problem. It can be solved on a computer even for large networks with help of a systematical algorithm, that can efficiently calculate the exact solution.

NL-08 Black and white images (BENJAMIN)

Images on a computer are divided up into a grid of small dots called pixels.
In a black and white image, each pixel is either black or white. The computer can represent black and white images with numbers, for example:



The first number always gives the number of white pixels, the next number giv
the number of black pixels and so on. So the first line consists of 0 white pixels
followed by 5 black pixels. The second line consists of 2 white pixels, 1 black
pixel and 2 white pixels.

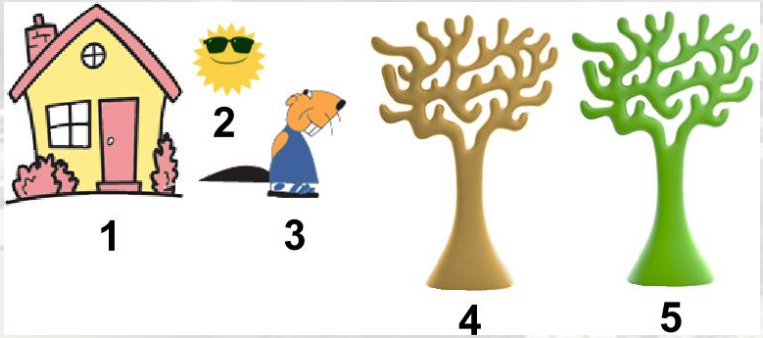
Which letter is represented by the following numbers?

0,1,3,1
0,1,3,1
0,5
0,1,3,1
0,1,3,1

A) B B) U C) H D) E

BEBRAS: Stamping

- Beaver has five stamps and they are numbered from 1 to 5:



He stamped a nice picture:

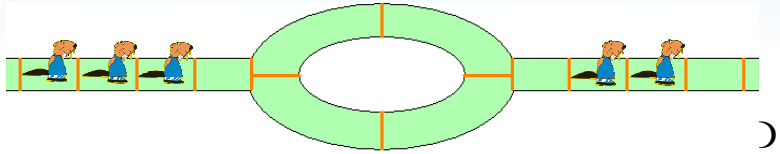
In which order did beaver use the stamps?

A) 5 - 2 - 4 - 3 - 1
B) 5 - 3 - 4 - 2 - 1
C) 5 - 2 - 3 - 4 - 1
D) 5 - 4 - 2 - 3 - 1

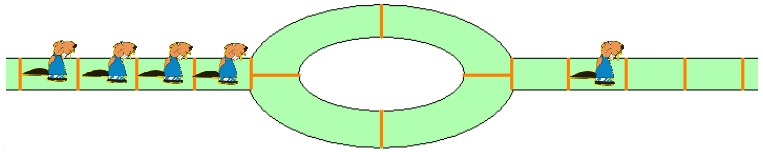
Beaver Den

In the Beaver Den there are some tracks. Because Beavers don't go backwards there are some parallel tracks to give way. Look at the figure. In the each cell can be only one beaver. In which situation a total traffic jam is **unavoidable**?

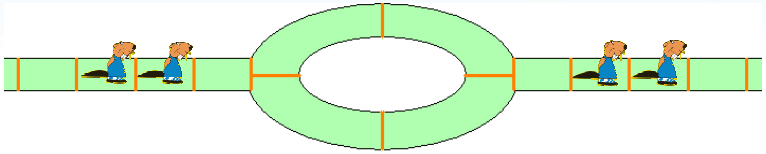
A



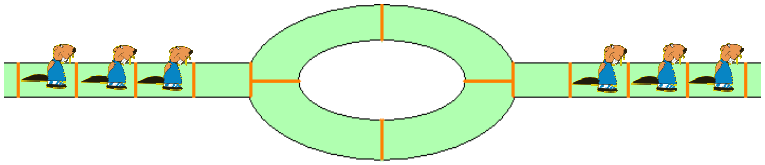
B



C



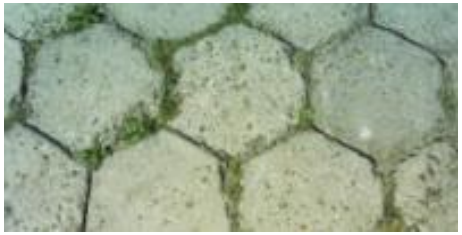
D

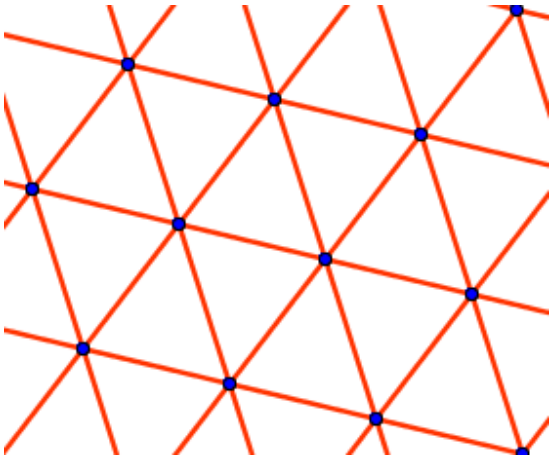


Correct ans: D

A pavement (Junior-Medium), Lowest Girls/Boys rate (0,83)

Peter took a photo of a pavement in front of his house and then created a graph which describes the paving (see pictures).

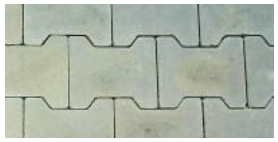


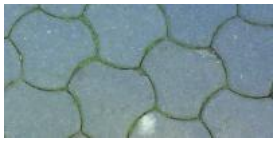


A point on the graph represents a tile. A line joining two points represents any two tiles bordering.
Later Peter was walking in the town and was photographing pavements. When he returned home he realized that all pavements (except of one) were suitable to fit his graph. Can you recognize which of them was not?

A 

B 

C 

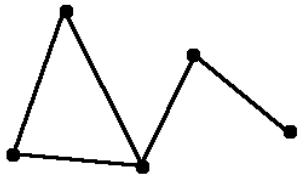
D 

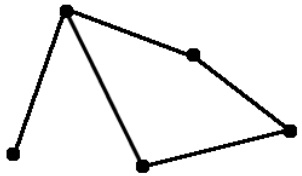
Friends

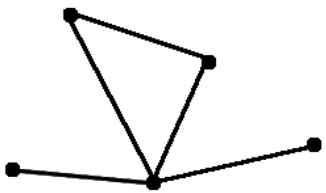
- We know that:
- Michael's friends are John, Peter and Tom
- John's friends are Michael and Anne
- Anne's friend is John
- Peter's friends are Michael and Tom
- Tom's friends are Michael and Peter

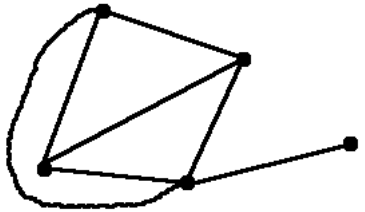
We represent people as points and we draw a line between two people if we know that they are friends with each other.

Which of the given figures can be obtained this way?

a. 

b. 

c. 

d. 

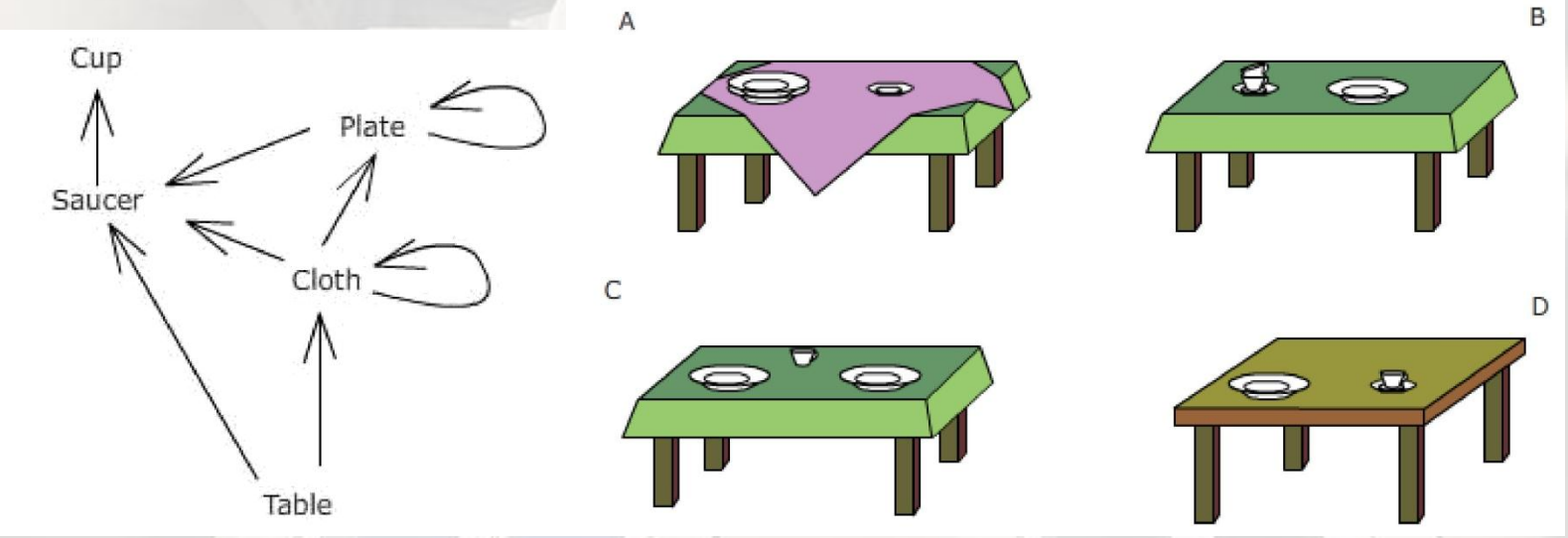
Graph for Waiters

Given is a graph for properly setting a table.

Beaver Bob has a job in a restaurant. He has to set the tables. The given graph defines in what way things may be put on each other.

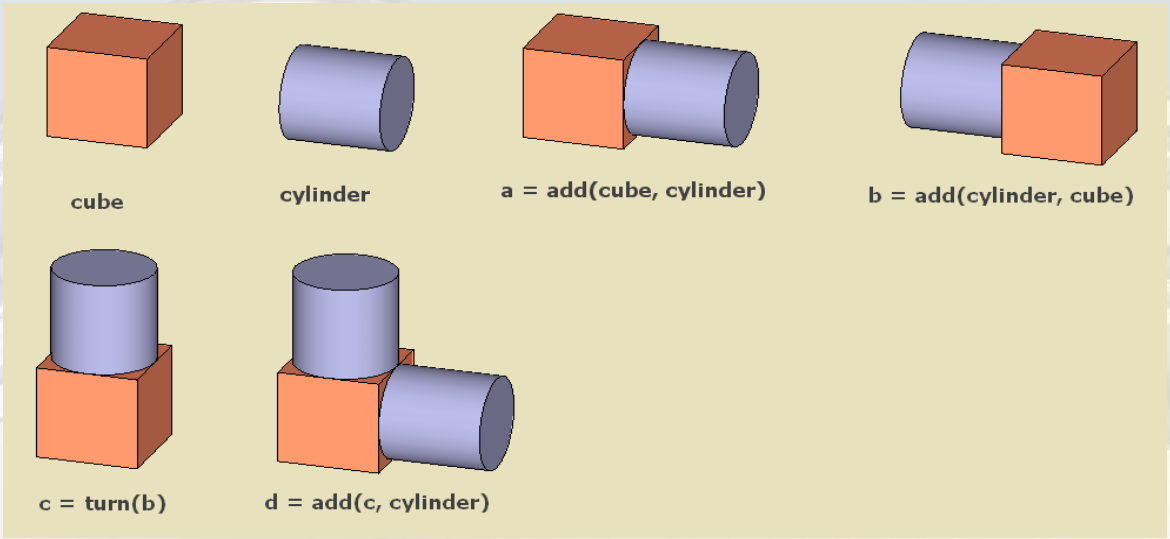
An arrow A ---> B means that a thing of type B may be put on a thing of type A. A thing of type B must not be put on a thing of type A, if there is no arrow from A to B.

Which of the following tables is set correctly according to this picture? ***Juniors, medium/hard***

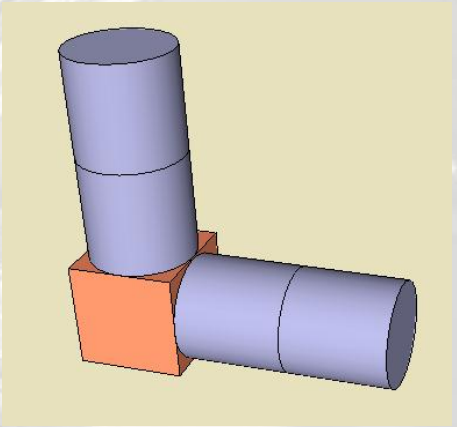


Constructive Beaver

Beaver has developed a very simple modeling language. It consists only of two kinds of objects and two possible operations



Which operation sequences would generate this thing?



The operation add(A, B) means: Put A and B side by side and glue B to the right side of A. The operation turn(A) means: turn A clockwise around 90 degrees.

A

A = add(cylinder, cylinder)

B = turn(A)

C = turn(B)

D = add(C, cube)

B

A = add(cylinder, cylinder)

B = add(A, cube)

C = turn(B)

D = add(C, A)

C

A = add(cube, cube)

B = add(A, cylinder)

C = turn(B)

D = add(C, cylinder)

D

A = add(cube, cylinder)

B = add(A, cylinder)

C = turn(B)

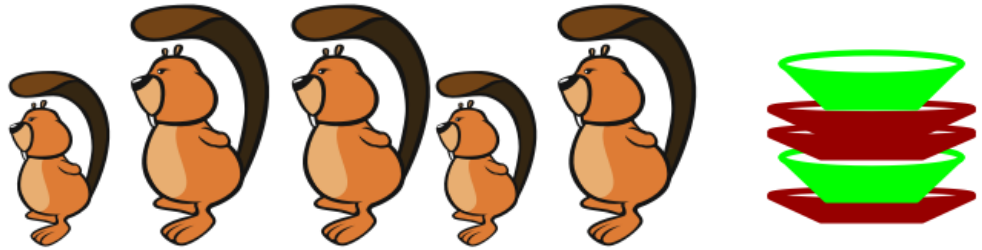
D = add(C, cylinder)

E = add(D, cylinder)

Stack of plates (Benjamin - Medium) - easiest task (68,74%) Least unanswered (1,95%)

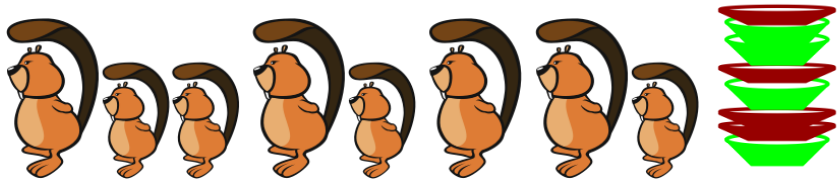
In the restaurant of the Beaver school, there are two different kinds of plates: the high green ones beavers, and the flat brown ones for the big beavers.
One day, due to building activities, there is only room for one stack of plates.

The beaver kids are queuing for their lunch, and the kitchen beavers need to put the plates on the stack in the right order to make the stack match the queue. Example:

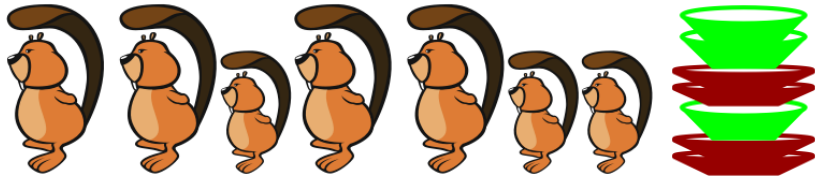


In one of the following pairs of plate stacks and beaver queues, there is a mismatch between queu stack. In which one?

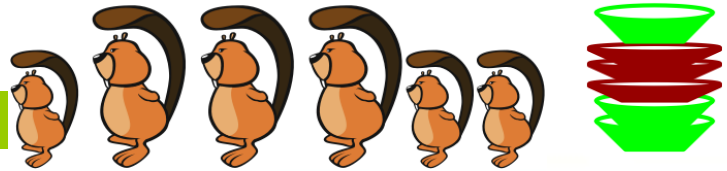
A.



C.



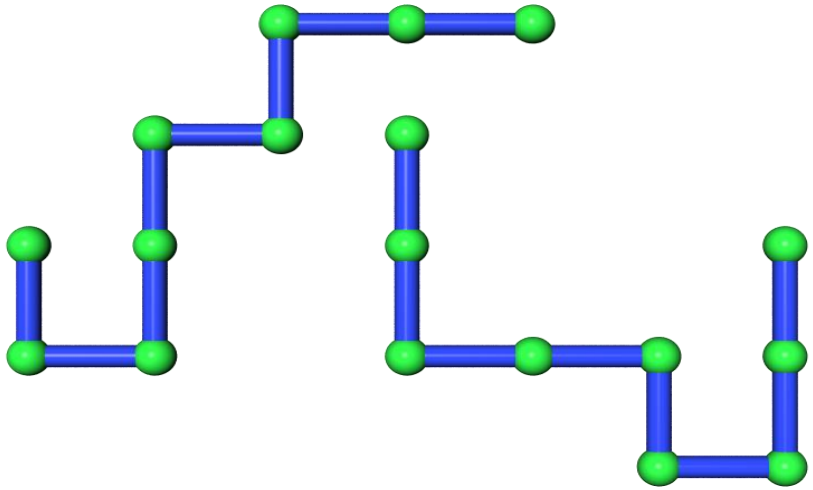
B.



D.

Twiddling (Junior - Medium) - hardest (28,13%)

Each of these two pieces of tube is made of 8 equal segments. These pieces are placed one above the other (they can be turned) so that they coincide partially.



What is the largest possible number of segments of their common part?

A) 6 **B) 5** C) 4 D) 3

Conclusions

- To separate Digital Literacy, IT and Informatics (Computing, CS)
- To elaborate modern framework of Informatics curriculum
- To elaborate modern Informatics teacher education framework
- Focus on fundamental Informatics concepts using different ways – one of them can be using Bebras contest
- *Bebras* contest on informatics and computer fluency is established to introduce Informatics concepts to pupils regardless of whether she or he is taught informatics at school or not
- Learning Informatics should develop young people into 'technology designers and creators' rather than merely 'technology users' – a philosophy of creativity and expression rather than mere productivity

Thanks you for your attention!

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