



Ataskaitinė informatikos inžinerijos krypties
doktorantų konferencija
2017-10-24

Už 2016/2017 mokslo metus

Studijų laikas 2014 m. – 2018 m.

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Preliminari disertacijos tema:

Pagrindinių informatikos konceptų ugdymo modelis

Tyrimo tikslas – pritaikius funkcinio modeliavimo metodą identifikuoti pagrindinius informatikos konceptus ir parengti jų ugdymo proceso modelį.

Tyrimo objektas – pagrindiniai informatikos konceptai.



Planuojami rezultatai:

- Ištyrus įvairių šalių patirtį ir atsižvelgus į ekspertų siūlymus sudaryti pagrindinių informatikos konceptų sąrašus, kurie skirti įvairaus amžiaus mokinių grupėms.
- Parengtas pagrindinių informatikos konceptų ugdymo mokykloje modelis.



2016/2017 m. m. darbo planas:

- Pagrindinių informatikos konceptų ugdymo modelio aprobavimas.
- Gautų duomenų analizė, apibendrinimas, išvadų parengimas.
- Dalyvavimas mokslinėje konferencijoje.
- Publikacija tarptautiniame žurnale.



Mokslinių tyrimų publikavimo faktas (1)

Konferencija	Data
1. XIII Informatikos mokomųjų uždavinių kūrimo ir analizės simpoziumas Italijoje.	2017 m. gegužės 29 d. – birželio 2 d.
2. Vykstama į tarptautinę konferenciją The 10th International Conference on Informatics in Schools , (Helsinkis, Suomija): <ul style="list-style-type: none">• Pristatomas priimtas straipsnis „Introduction to Bebras Challenge Management: Overview and Analyses of Developed Systems (V. Dagienė, G. Stupurienė, L. Vinikienė).• Darbinis seminaras: The Card Game of Bebras-like Tasks for Introducing Informatics Concepts (V. Dagienė, G. Stupurienė, G. Futschek, J. Koivisto).• Stendinis pranešimas tema „Algorithms Unplugged: a Card Game of the Bebras-like Tasks for High School Students“ (V. Dagienė, G. Stupurienė). Publikuojamas recenzuojamuose konferencijos darbuose.• Dalyvavimas doktorantų konsorciame.	2017 m. lapkričio 12-15 d.



Mokslinių tyrimų publikavimo faktas (2)

Straipsniai

1. Dagienė, Valentina; Sentance, Sue; Stupurienė, Gabrielė. **Developing a two-dimensional categorization system for educational tasks in informatics** // *Informatica*. Vilnius: Matematikos ir informatikos institutas. ISSN 0868-4952. 2017, Vol. 28, No 1, p. 23-44.
2. Izu, Cruz; Mirolo, Claudio; Settle, Amber; Mannila, Linda; Stupurienė, Gabrielė. **Exploring Bebras tasks content and performance: a multinational study** // *Informatics in education*. Vilnius : Matematikos ir informatikos institutas. ISSN 1648-5831. eISSN 2335-8971. 2017, Vol. 16, No. 1, p. 39-59.
3. Benaya, Tamar; Zur, Ela; Dagienė, Valentina; Stupurienė, Gabrielė. **Computer science high school curriculum in Israel and Lithuania - comparison and teachers' views** // *Baltic journal of modern computing*. Riga : Latvijas Universitate. ISSN 2255-8942. eISSN 2255-8950. 2017, Vol. 5, No. 2, p. 164-182.
4. Dagienė, Valentina; Stupurienė, Gabrielė; Vinikienė, Lina. **Informatics based tasks development in the Bebras contest management system**. *Communications in Computer and Information Science*. Vol. 756. ISSN 1865-0929, eISSN 1865-0937, p. 466-477.



Mokslinių tyrimų publikavimo faktas (3)

Straipsniai

5. Dagienė, Valentina; Stupurienė, Gabrielė, Vinikienė, Lina. **Implementation of Dynamic Tasks on Informatics and Computational Thinking** // *Baltic journal of modern computing*. Riga : Latvijas Universitate. ISSN 2255-8942. eISSN 2255-8950. 2017, Vol. 5, No. 3, p. 306-316.
6. Į *Springer Lecture Notes in Computer Science* priimtas straipsnis **Introduction to Bebras Challenge Management: Overview and Analyses of Developed Systems**, (V. Dagienė, G. Stupurienė, L. Vinikienė).
7. Rengiamas straipsnis „**Identification and Modelling of Informatics Concepts**”, autoriai: V. Dagienė, G. Stupurienė.



2016/2017 m. m. atlikti darbai:

- Identifikuoti pagrindiniai informatikos konceptai, sudarytas rekomendacinis sąrašas.
- Sukurta dviejų dimensijų kategorizavimo sistema informatikos mokomosioms užduotims klasifikuoti. Ši sistema intergruoja informatinį mąstymą įgūdžius ir informatikos konceptus.
- Parengtas pagrindinių informatikos konceptų ugdymo modelis.

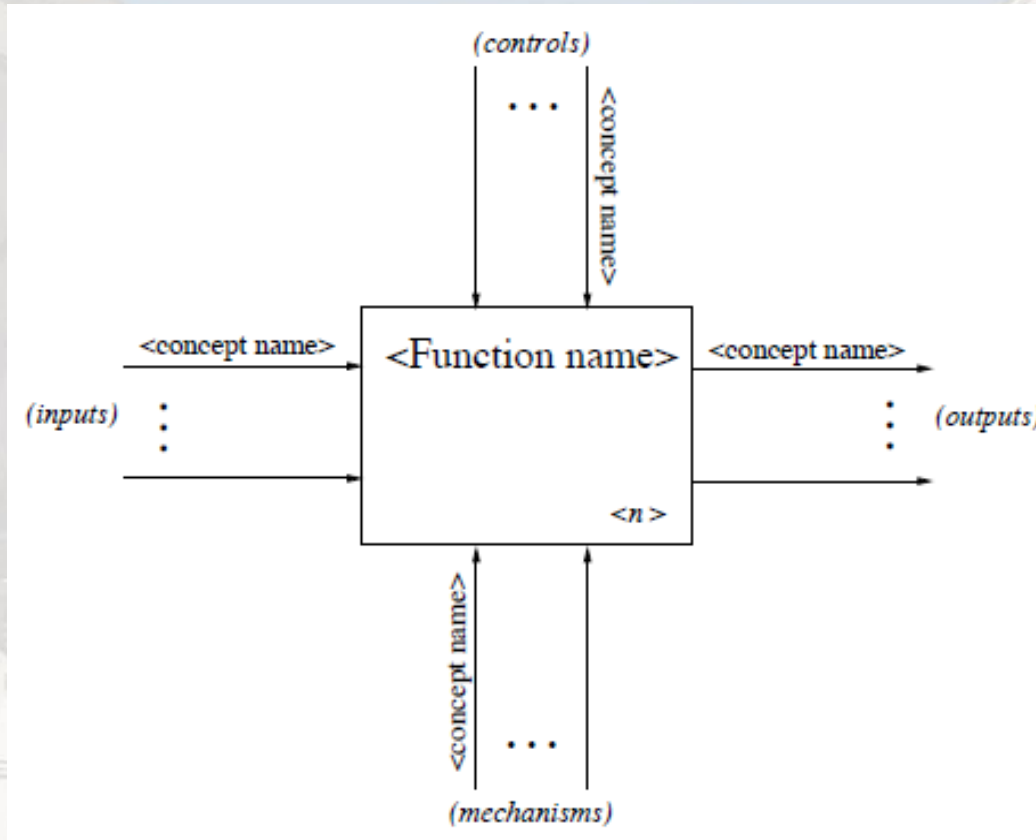


Informatikos konceptų identifikavimas

- Informatikos konceptų identifikavimui pritaikytas funkcinio modeliavimo metodas.
- Praplėstas Zendrel, Seitz ir Klaudt 2016 metais pasiūlytas kompetencijų modelis informatikos mokymui aukštosiose mokyklose.

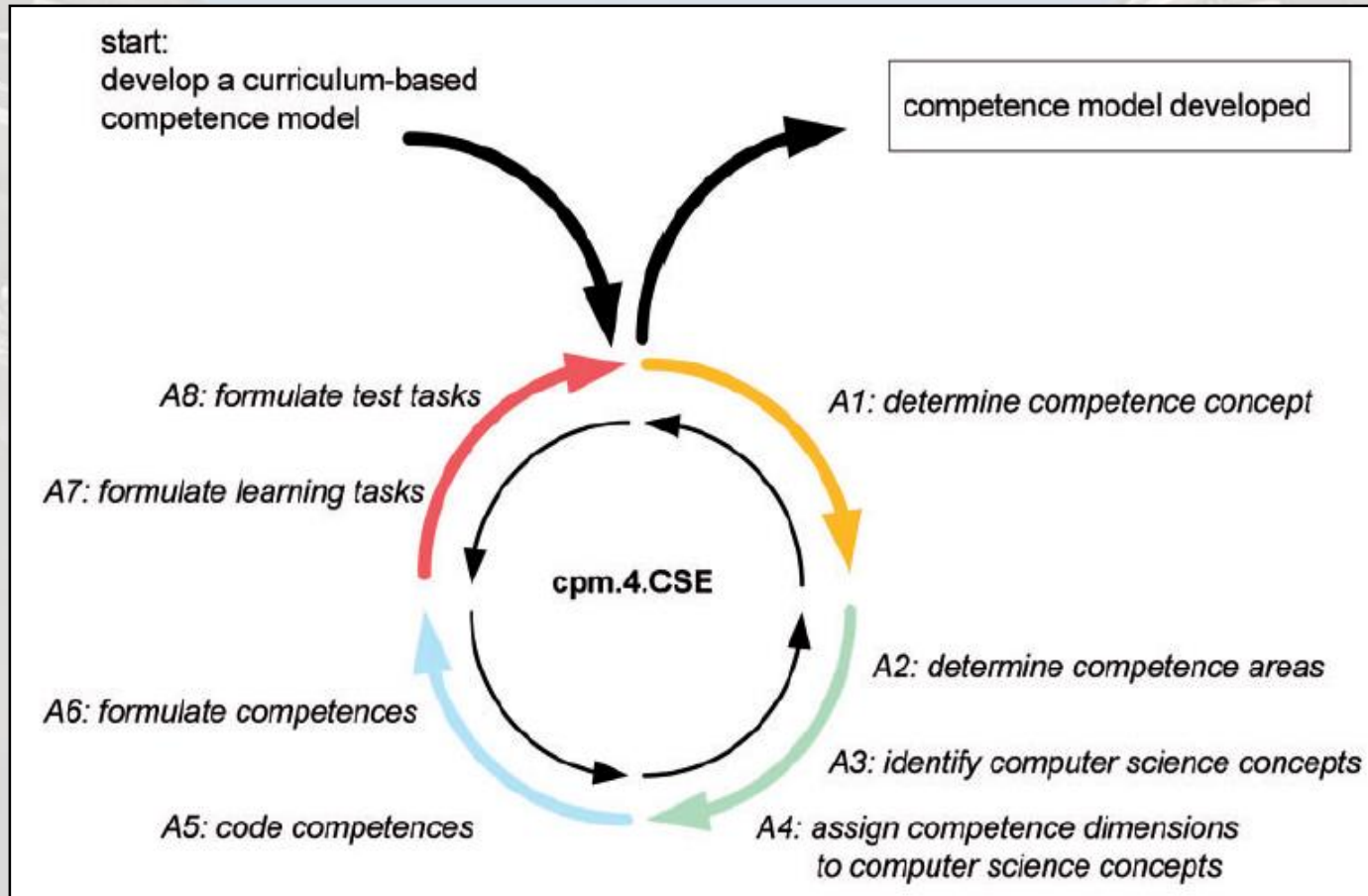


Funkcinio modeliavimo (IDEF0) metodas

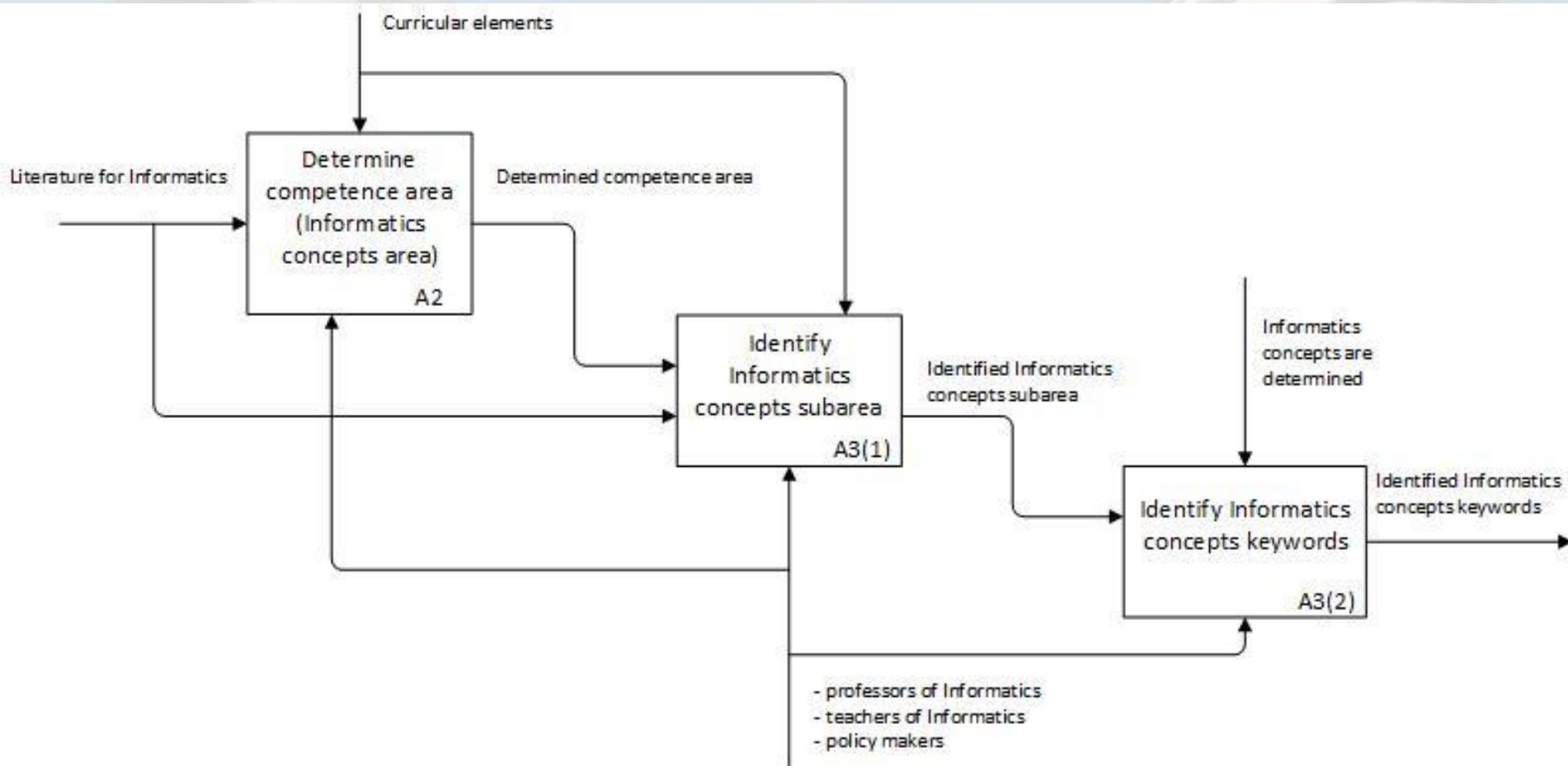




Kompetencijų modelis informatikos mokymui (cpm.4.CSE)



Praplėstas cpm.4.CSE





Input to subprocess A2

Literature for Informatics education in school, e.g.,

- Australian Curriculum: Digital Technologies, v8.3, 2016;
- The national curriculum in England, 2013;
- K-12 Computer Science Framework, 2016;
- CSTA K–12 Computer Science Standards, 2011, Bell et al., 2014;
- Caspersen, Nowack, 2013;
- Sysło, Kwiatkowska, 2015;
- Barendsen, Steenvoorden, 2016;
- Barendsen et al., 2016.

INFORMATICS CONCEPTS AREA	INFORMATICS CONCEPTS SUBAREA	INFORMATICS CONCEPTS KEYWORDS
Data, Data Structures, and Representations	Data	Classification; Databases; Data mining; Information; Metadata; RAID array;
	Data structuring	Array; Biconnected graph; Binary tree; Graph; Hash table; Index; Linked list; List; Queue; Record; Set; Stack; String; Tree;
	Information representation	Binary representations; Bitmap; Character encoding; Color representation; Coordinates; Data compression; Finite-state machine; Graph representation; Hexadecimal representations; Image/Sound representation; Integer; Real numbers representation; Pattern; Vector graphics;
Algorithms and Programming	Algorithms	Binary search; Bubble sort; Breadth-first search; Depth-first search; Dijkstra's algorithm; Kruskal's algorithm; Prim's algorithm; Quick sort; Selection sort;
	Computing problems	Eulerian path; Fractal; Knapsack problem; Maximum flow; Pattern recognition; Searching; Shortest path; Sorting; Scheduling; Traveling salesman problem;
	Design principles	Automaton; Bottom up; Brute-force search; Computational complexity; Divide and conquer; Dynamic programming; Greedy strategy; Heuristic; Invariant; Optimization; Priority; Permutation; Sequencing; State; Top down;
	Programming	Algorithm; Coding; Command; Constants; Constraints; Encapsulation; Flowcharts; Function; IF conditions; Inheritance; Iteration; Loop; Object; Parameter; Procedure; Program; Programming language; Recursion; Pseudocode; Variable;
	Logic	Boolean algebra; Logic circuits; Logic expression; Logic gates; Operations AND, OR, NOT;

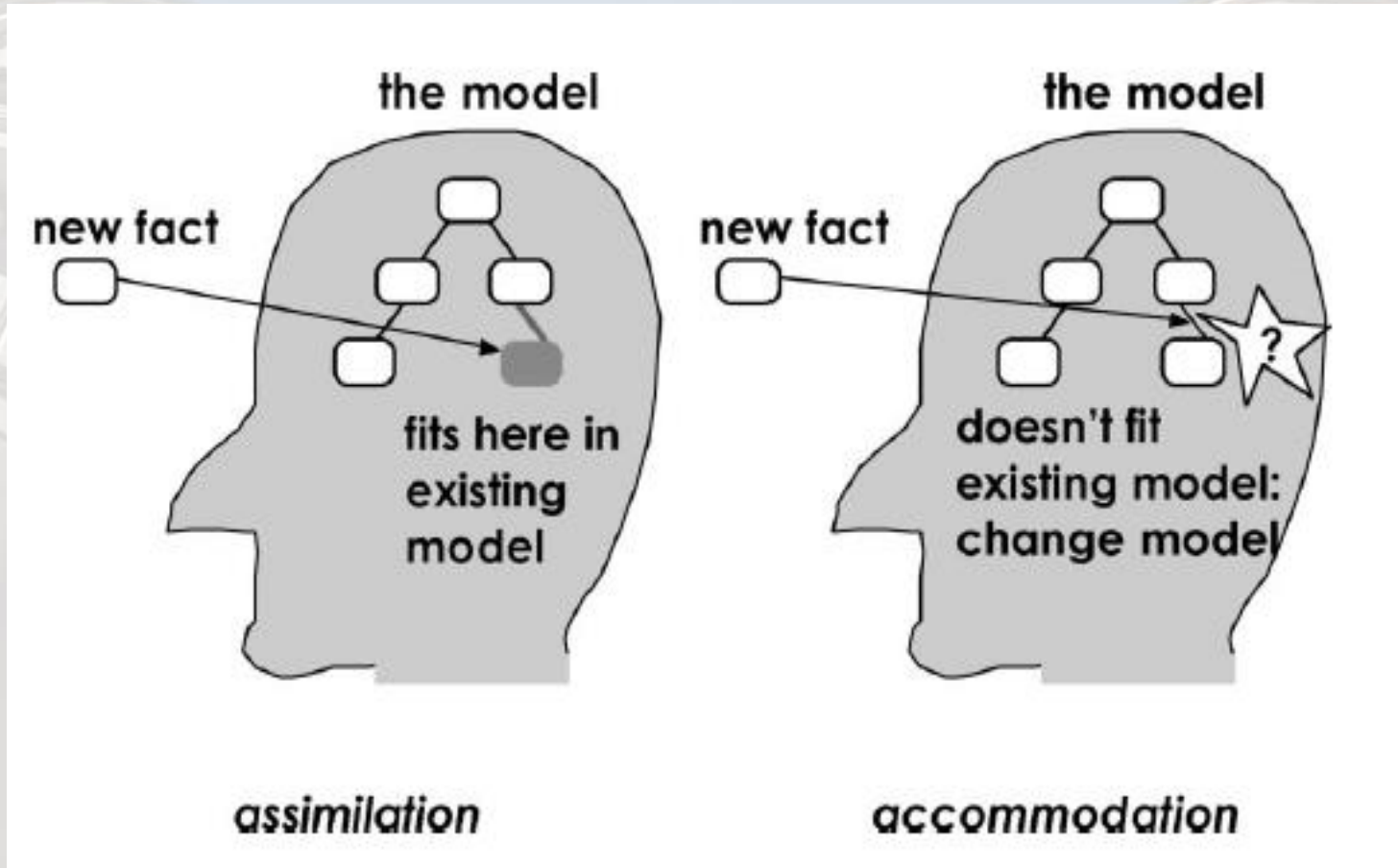
INFORMATICS CONCEPTS AREA	INFORMATICS CONCEPTS SUBAREA	INFORMATICS CONCEPTS KEYWORDS
Computer Processes and Hardware	Hardware and related software	Assembler; Cloud computing; Computer components; Computer devices; Fetch-execute cycle; Grid computing; Interpreter; Logic gates; Logic circuits; Machine code; Memory; Operating systems; Registers; Translator; Virtualization;
	Processes	Deadlock; Multithreading; Parallel processing; Process scheduling; Semaphore; Turing machine;
Communication and Networking	Cryptography	Authentication; Code; Cryptography; E-signature; Encryption; Parity bit; RSA algorithm; Security;
	Networking	Client/server; Computer network; Protocol; Secure data transmission; Topology; Peer-to-peer; Watchdog; Data transmission; Web services;
Interactions, Systems, and Society	Interaction	Graphical user interface; Interaction; Robotics; Online processing; Batch processing; Input/Output; Webbots; Digital assistant;
	Society	Authentication; Cloud computing; Computing history; Copyright; Digital footprint; E-bullying; E-commerce; Ethics; Hacking; Legal issues; License; Malware; Netiquette; Open Source; Password; Phishing; Self-identity; Social engineering; Social issues; Virus;
	Software design	Agile; Alpha and Beta testing; Black-box testing; Debugging; Localization; Program tracing; Templates; Testing; Waterfall; White-box testing;



Conceptualization is formation of concepts (Papaurelytė-Klovienė, 2007). The term that is associated to conceptualization is categorization. Thus it obvious that when we deal with concepts, we cannot forget the importance of conceptualization and categorization.

The process of conceptualization allows us to form concepts in our minds. Categorization allows us to categorize them according to some certain features.

Learning in constructivism



Machanick, P. (2007). A social construction approach to computer science education. *Computer Science Education*, 17(1), 1-20.



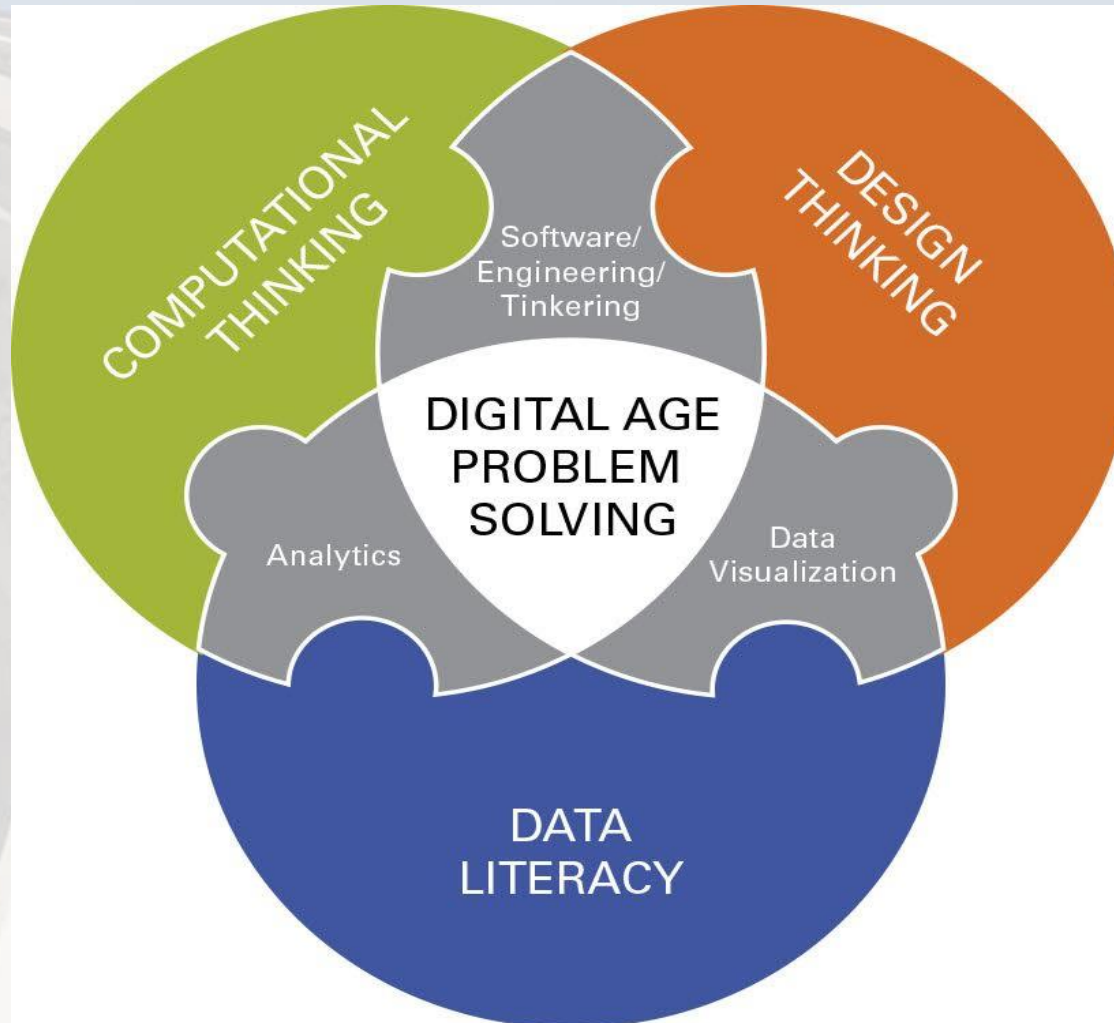
Dviejų dimensijų kategorizavimo sistema

Skirta informatikos mokomiesiems uždaviniams klasifikuoti bei integruoja informatinio mąstymo įgūdžius ir informatikos konceptus.

	Data, Data Structures, and Representations	Algorithms and Programming	Computer Processes and Hardware	Communication and Networking	Interactions, Systems, and Society
Abstraction					
Algorithmic thinking					
Decomposition					
Evaluation					
Generalisation					



Digital age problem solving elements





Informatinis mąstymas

Computational thinking (CT) is a problem solving process that **includes a number of characteristics**, such as logically ordering and analyzing data and creating solutions using a series of ordered steps (or algorithms), **and dispositions**, such as the ability to confidently deal with complexity and open-ended problems.

CT is essential to the development of computer applications, but it can also be used to support problem solving across all disciplines, including math, science, and the humanities.

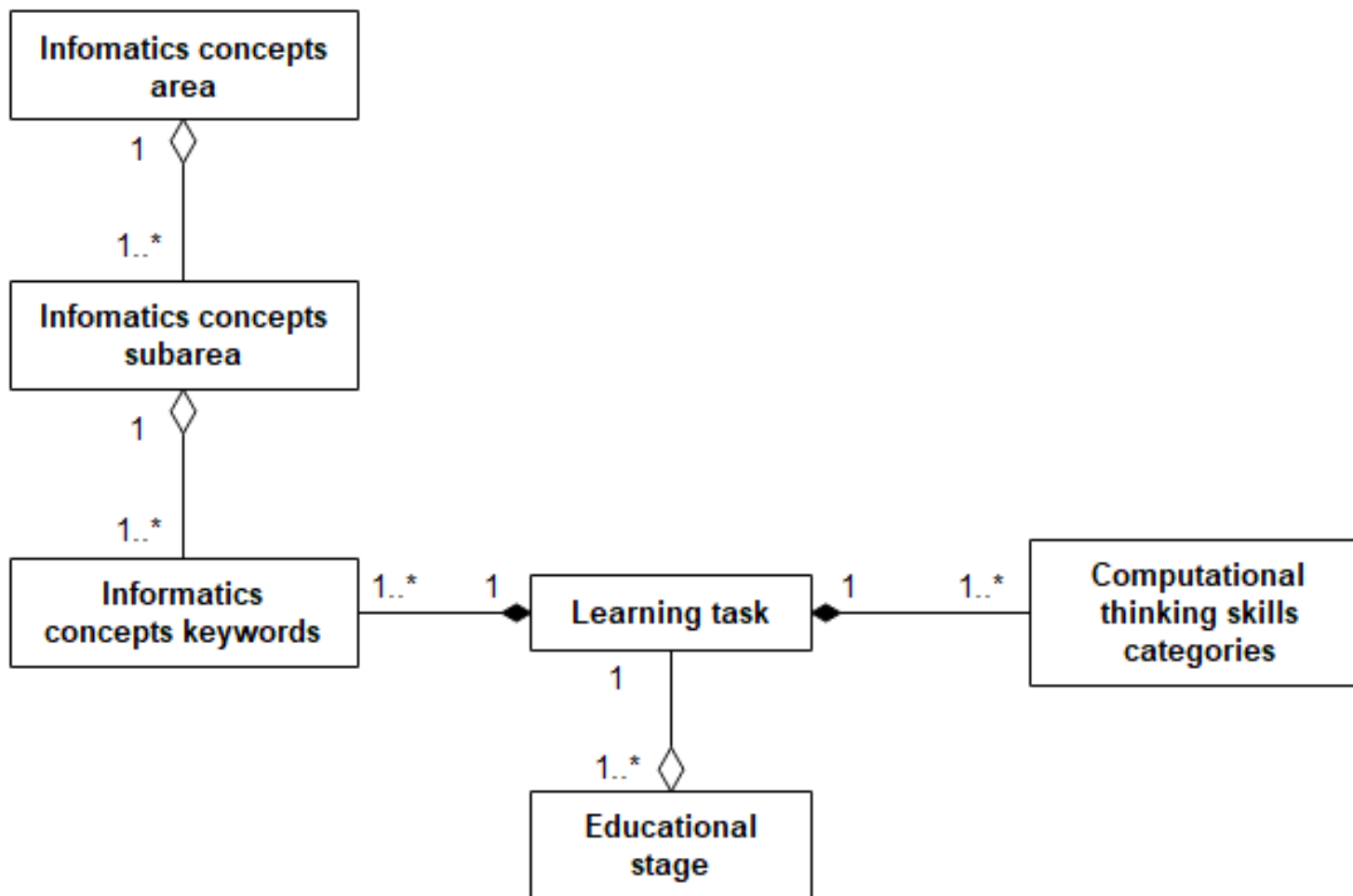


Informatinio mąstymo įgūdžiai

Computational thinking skill	How to spot use of that skill
Abstraction	Removing unnecessary details; Spotting key elements in problem; Choosing a representation of a system
Algorithmic thinking	Thinking in terms of sequences and rules; Executing an algorithm; Creating an algorithm
Decomposition	Breaking down tasks; Thinking about problems in terms of component parts; Making decisions about dividing into sub-tasks with integration in mind, e.g. deduction
Evaluation	Finding best solution; Making decisions about good use of resources; Fitness for purpose
Generalization	Identifying patterns as well as similarities and connections; Solving new problems based on already-solved problems; Utilizing the general solution, e.g. induction



Siūlomo modelio UML duomenų modelis





2017/2018 m. m. darbo planas:

- Sukurto pagrindinių informatikos konceptų modelio ekspertinis vertinimas.
- Atskirų daktaro disertacijos dalių (tyrimo metodikos, rezultatų, ginamų teiginių, išvadų, ir kt.) parengimas.
- Straipsnis tarptautiniame recenzuojamame žurnale.



Dėkoju už dėmesį

2017 m. II pusm. studentei skirta LMT parama
akademinei išvykai.